



# **XT6384-1**

## **Product Manual**

Firmware Version: 1133MA3

Revised October 24, 2022

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## 1. RELEASE NOTES

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### 1.1. FIRMWARE

Firmware: 1133MA3

### 1.2. MANUAL

Firmware: 1133MA3

- Doc improvements and stability
- Added ClearDriverID(<index>) interpreter command
- Added diesel pcrs and driver ID pcrs
- Added DTC packet parsing information
- Added TPM configuration

## 2. FUNCTIONAL DESCRIPTION

### 2.1. OVERVIEW

The XT6384-1 is a device that interfaces with a vehicle's on-board diagnostics port to monitor and record vehicle activity. The XT6384-1 was developed primarily for clientele with large automotive fleets such as vehicle rental companies or courier delivery services. The XT6384-1 uses an OBD-II interface, a cellular modem, a Bluetooth modem, a GPS modem, a piezo speaker, LED's, and an accelerometer to collect information that may be of interest to a client's application. Alongside these build in services, a SWI and UART interface are available to interact with external devices to gather additional information.

One key benefit of the XT6384-1 is the ability to easily adjust the device's operation to suit an individual client's desires. The XT6384-1 devices can be controlled through various channels, ranging from simple system parameters to more complex device interpreter scripts, which offer maximum customization as they are written completely by the customer. By configuring custom system parameters and interpreter scripts, not only can device functionality be adjusted, but entirely new functionality can be added to the device. In theory, the XT6384-1 can emulate any other Xirgo device if properly configured through the system script.

### 2.2. MECHANICAL

#### 2.2.1. XT6384-1



| Mechanical            |                                                |
|-----------------------|------------------------------------------------|
| Dimensions            | 3.35" x 3.1" x 0.8" (8.5 cm x 7.9 cm x 2.0 cm) |
| Weight                | 3 oz. (85 g)                                   |
|                       | 3.2 oz. (92g) with internal battery            |
| Physical Connections  | 14-pin micro-fit connector                     |
|                       | 24-pin micro-fit connector                     |
| Operating Temperature | -30°C to 75°C (No internal battery)            |
|                       | -30°C to 60°C (Internal battery)               |

## 3. DEVICE SETUP

---

### 3.1. CONFIGURE DEVICE VIA PC (RS232 TO USB)

1. Connect the device to a variable power supply.
2. Set the power supply to output average 12 volts and verify the device is drawing current after it has powered up (the device will automatically switch on when it receives power).
3. Open "Device Manager" on windows and click the drop-down next to "Ports (COM & LPT)".
4. Attach a USB to RS232 coverter (Ex. USB-RS232-0.0) cable to a port on the computer and pins 17 and 18 of the 24-pin connector.



**NOTE:** A "USB Serial Device" and the associated COM number should appear under "Ports". If nothing shows up, unplug the connection to the Device, flip it over, and plug it back in. Take note of the COM port number.

5. Open Secure CRT and double-click on the session with the correct COM port number. This should connect the device to the terminal.
6. Right-click the session and go to "Properties".
7. Ensure the following is set for the session:
  - a. Connection > Protocol > **Serial**
  - b. Connection > Serial > Baud rate > **115200**
  - c. Terminal > Check **Auto reconnect**
  - d. Terminal > Emulation > **Terminal [VT100]**
8. Click "Okay".



**NOTE:** The device should now be connected to the terminal and commands can be sent.

## 4. INTERFACES

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### 4.1. UART

XT6384-1 devices include a 2-wire asynchronous serial interface (UART) operated through RS232 for communication with a host device. RS232 interface is TIA/EIA-232-F compliant and will accept 0-5V signaling. The UART interface is a 3.0V TTL interface conforming to the ITU-T V.24 recommendation, with CMOS compatible signal levels (0V for low data bit or ON state and 3.0V for high data bit or OFF state). If the

- The default baud rate is 115200 bits/s
- The default frame format is 8N1 (8 data bits, no parity, 1 stop bit)
- The interface does not support flow-control

The UART interface is active and requires no authentication by default. AES-128 challenge/response authentication can be enabled by enabling the console-authentication bit in the firmware flags setting of the device description.

### 4.2. LED BEHAVIOR

#### 4.2.1. Amber LED

##### Primary Operation

*Indicate Cellular Communication Status*

| Cell Status                 | LED Status        |
|-----------------------------|-------------------|
| Off (Low power mode/ sleep) | Off               |
| Searching for network       | Fast Blink (5 Hz) |
| Registered home/roaming     | On                |

##### Secondary Operation

*Indicate Active Inputs (1-4)*

When any or all user inputs (1-4) are active, the LED will flash (1 Hz) the amount of times corresponding to the active input index, pause, then repeat.

When multiple inputs are active, the LED will flash (1 Hz) the input index for each one that is active with a pause between to differentiate.

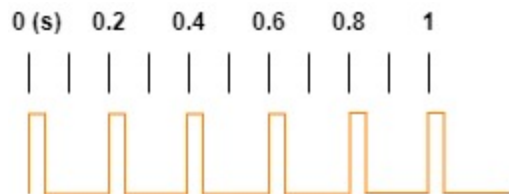
When all active inputs have been indicated, the LED will pause before repeating everything again. If no user inputs are active, the LED will revert to Primary Operation.

## Override Operation

When ignition state is off, the LED will flash continuously at 0.5 Hz. When ignition state is on, the LED will revert to Primary Operation.

When ignition state is off and there is no cellular registration, the LED will double-flash at 0.33Hz. When the ignition state is off and there is cellular registration, the LED will flash continuously at 0.5 Hz. When ignition state is on, the LED will revert to Primary Operation.

*Example: The diagram below shows the amber LED blink pattern indicating cellular searching for network.*



### 4.2.2. Green LED

#### Primary Operation

*Indicate GPS Lock Status*

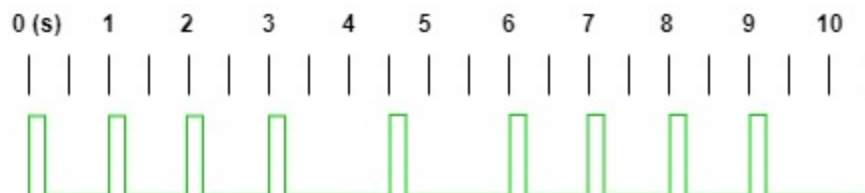
| GPS Lock Status         | LED Status                                                   |
|-------------------------|--------------------------------------------------------------|
| Off (sleep) or unlocked | Off                                                          |
| Locked                  | On for 2 seconds before transitioning to secondary operation |

#### Secondary Operation

*Indicate Locked Current Satellite Count*

When GPS solution is Locked Good and the Primary Operation has completed, the LED will flash (1Hz) the amount of times corresponding to the number of satellites utilized in the current GPS solution, with a pause before repeating.

*Example: LED Blink Pattern (after GPS solution is Locked Good and Primary Operation has completed) indicating number of satellites utilized in the current GPS solution. The example below shows the green LED indicating four satellites utilized in the GPS solution with a single blip at approximately 4.5 seconds before repeating.*



### 4.2.3. Blue LED

#### Primary Operation

*Indicate bluetooth connection status*

| BT Status          | LED Status         |
|--------------------|--------------------|
| Off or unconnected | Off                |
| Connected          | Slow blink (0.5Hz) |

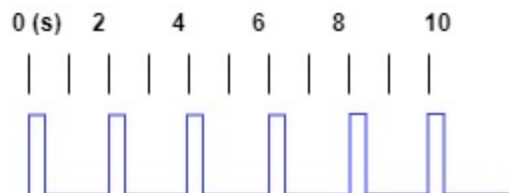
#### Secondary Operation

Indicate System Module Faults

If a system module fault is detected in firmware, the LED will flash at 1 Hz, the number of times corresponding to the fault index defined below, with a pause before repeating.

| LED Blinks | Description                |
|------------|----------------------------|
| 1          | TPS module fault           |
| 2          | Cellular module fault      |
| 3          | GPS module fault           |
| 4          | N/A                        |
| 5          | Bluetooth Module fault     |
| 6          | Accelerometer module fault |
| 7          | OBD module fault           |

*Example: The diagram below expresses a blue LED blink pattern indicating Bluetooth connection.*



## 5. BLUETOOTH®/BLE

### 5.1. OVERVIEW

The XT6384-1 uses Bluetopia provided by StoneStreet one; the GAP and GATT profiles are of specific interest.

#### 5.1.1. Security

There are several layers

| Target | Pairing    | Authentication          | Encryption | Android/iOS | Advertising Name                   |
|--------|------------|-------------------------|------------|-------------|------------------------------------|
| AAb1   | Just Works | None                    | None       | Both        | HarpBT_<serial>                    |
| AAb3   | Just Works | SHA256<br>Client/Server | AES-CBC    | Both        | HarpBT_<serial><br>or Configurable |
| AAb4   | N/A        | N/A                     | N/A        | None        | N/A                                |
| AAb5   | Just Works | None                    | None       | Both        | Link2_<serial>                     |
| AAb6   | Just Works | None                    | None       | Both        | HarpBT_<serial><br>or Configurable |

#### 5.1.2. Definitions

| Keyword        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |             |            |                                                                                                               |         |                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|------------|---------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Pairing        | Bluetooth LE standard mechanism to exchange encryption keys, primarily handled by Bluetooth stack on client (phone or tablet). OS may prompt user for permission to pair and/or for a passkey. <table> <tr> <th>Keyword</th><th>Description</th></tr> <tr> <td>Just Works</td><td>Mechanism in simple secure pairing (SSP) that allows for devices to pair with no explicit user authentication</td></tr> <tr> <td>Passkey</td><td>Authentication used when pairing with a remote device; device displays a number the user must enter using the keypad on the remote device</td></tr> </table> | Keyword | Description | Just Works | Mechanism in simple secure pairing (SSP) that allows for devices to pair with no explicit user authentication | Passkey | Authentication used when pairing with a remote device; device displays a number the user must enter using the keypad on the remote device |
| Keyword        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |             |            |                                                                                                               |         |                                                                                                                                           |
| Just Works     | Mechanism in simple secure pairing (SSP) that allows for devices to pair with no explicit user authentication                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |             |            |                                                                                                               |         |                                                                                                                                           |
| Passkey        | Authentication used when pairing with a remote device; device displays a number the user must enter using the keypad on the remote device                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |             |            |                                                                                                               |         |                                                                                                                                           |
| Authentication | Custom service providing another layer of security; the XT6384-1 won't let client read/write without completing the authentication process.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |             |            |                                                                                                               |         |                                                                                                                                           |
| Encryption     | Another layer of encryption (AES) on top of Bluetooth. Characteristics are expanded out to a multiple of 16 bytes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |             |            |                                                                                                               |         |                                                                                                                                           |

## 5.2. AAB1/AAB6 BLE

### 5.2.1. HOS Service UUID

The HOS service does not have encrypted characteristics

| Description | UUID                                 |
|-------------|--------------------------------------|
| HOS         | a59611ba-78b7-4fd2-96fb-9b0f66d2311e |

### 5.2.2. HOS Service UUID List

| Descriptions                     | UUID                                 |
|----------------------------------|--------------------------------------|
| GPS Info                         | e7737830-1018-11e6-a148-3e1d05defe78 |
| Speed                            | 5eed6ea2-0390-11e5-8418-1697f925ec7b |
| True Odo                         | 5eed6d4e-0390-11e5-8418-1697f925ec7b |
| Derived Odo                      | 5eed6719-0390-11e5-8418-1697f925ec7b |
| Eng/Ign                          | 5eed665c-0390-11e5-8418-1697f925ec7b |
| RPM                              | 31e6e24b-f2fb-4bb9-a16b-9d17a9c4e4ad |
| Protocol                         | 5eed6477-0390-11e5-8418-1697f925ec7b |
| VIN                              | a9b9f487-5e60-43d5-a249-4d1d3f317d7e |
| Eng Hours                        | 95dbace5-fcee-467f-bbe9-fe42e195bb04 |
| Moving                           | 5eed659a-0390-11e5-8418-1697f925ec7b |
| ECM                              | 5eed70e6-0390-11e5-8418-1697f925ec7b |
| Fuel Level                       | 1c3917a6-7d33-4152-9a33-858b6f1fc99b |
| Eng Run Time                     | b71eb3aa-4ed7-4990-ab22-ced09cf58f34 |
| Eng Hours Seconds                | 87e22dd2-e27b-4094-968a-03e1537e7eb7 |
| External Power                   | 0dd2af9d-7220-474f-8b34-4a94a6a97498 |
| Start Trip GPS info              | d7b083dd-bf65-44e5-9fa1-959bddf2af0b |
| Start Trip True Odo              | ba4ac777-52ec-4133-9f18-adad8b98f142 |
| Start Trip Eng Hours Seconds     | 40418a44-9b8d-49f8-8ef2-afcea1643786 |
| ECU Eng Hours Seconds            | 0d407e4c-39c9-11e8-b467-0ed5f89f718b |
| Start Trip ECU Eng Hours Seconds | d4fb1556-39d2-11e8-b467-0ed5f89f718b |
| Start Trip System Unix Time      | 0f834728-39d5-11e8-b467-0ed5f89f718b |
| System Unix Time                 | 48969a7e-39d5-11e8-b467-0ed5f89f718b |
| Driver ID                        | 66aa658a-0003-4cee-86f0-4c775bbe5a54 |
| Start Trip Derived Odom          | 5ceb24b2-c273-40b4-b84b-f499e14c3f09 |

### 5.2.3. HOS Service Characteristics Table

| Descriptions | Type        | Size | Encr. Size | Data / Units                 |
|--------------|-------------|------|------------|------------------------------|
| GPS Info     | Read Notify | 19   | 32         | See GPS Info Structure below |

| Descriptions           | Type                                | Size | Encr. Size | Data / Units                                                                                            |  |
|------------------------|-------------------------------------|------|------------|---------------------------------------------------------------------------------------------------------|--|
|                        | Type: Notify on lock or time change |      |            |                                                                                                         |  |
| Speed                  | Read                                | 2+1  | 16         | 0.1 KPH + 1 byte updated indicator                                                                      |  |
| True Odo               | Read                                | 4+1  | 16         | Meters + 1 byte updated indicator                                                                       |  |
| Derived Odo            | Read                                | 4+1  | 16         | Meters + 1 byte updated indicator                                                                       |  |
| Eng/Ign                | Read Notify                         | 1    | 16         | Index      Description                                                                                  |  |
|                        |                                     |      |            | 0      Engine off                                                                                       |  |
|                        |                                     |      |            | 1      Engine on                                                                                        |  |
|                        |                                     |      |            | Type: Notify on change                                                                                  |  |
| RPM                    | Read                                | 4+1  | 16         | RPM + 1 byte updated indicator                                                                          |  |
| Protocol               | Read                                | 1    | 16         | Index      Description                                                                                  |  |
|                        |                                     |      |            | 0      None                                                                                             |  |
|                        |                                     |      |            | 1      J-Bus                                                                                            |  |
|                        |                                     |      |            | 2      OBDII                                                                                            |  |
| VIN                    | Read                                | 18   | 32         | Null Terminated String                                                                                  |  |
| Eng Hours              | Read                                | 4    | 16         | Hours (Only available on Heavy Duty Vehicles, won't default to persist, not commonly used by customers) |  |
| Moving                 | Read Notify                         | 1    | 16         | Index      Description                                                                                  |  |
|                        |                                     |      |            | 0      Not Moving                                                                                       |  |
|                        |                                     |      |            | 1      Moving (speed > 5KPH)                                                                            |  |
|                        |                                     |      |            | Type: Notify on change                                                                                  |  |
| ECM                    | Read Notify                         | 1    | 16         | Index      Description                                                                                  |  |
|                        |                                     |      |            | 0      Inactive                                                                                         |  |
|                        |                                     |      |            | 1      Pending                                                                                          |  |
|                        |                                     |      |            | 2      Connected                                                                                        |  |
|                        |                                     |      |            | 3      Active                                                                                           |  |
|                        |                                     |      |            | 4      Disabled by cinfig                                                                               |  |
| Type: Notify on change |                                     |      |            |                                                                                                         |  |
| Fuel Level             | Read                                | 2    | 16         | Tenths of a percent                                                                                     |  |
| Eng Run Time           | Read                                | 4    | 16         | Seconds                                                                                                 |  |
| Eng Hours              | Read                                | 4    | 16         | Seconds (Defaults to persist when on non-heavy-duty vehicles)                                           |  |
| External Power         | Read                                | 1    | 16         | Index      Description                                                                                  |  |
|                        |                                     |      |            | 0      No external power                                                                                |  |
|                        |                                     |      |            | 1      External power                                                                                   |  |

| Descriptions                     | Type       | Size          | Encr. Size | Data / Units                                                                             |
|----------------------------------|------------|---------------|------------|------------------------------------------------------------------------------------------|
| Start Trip GPS info              | Read       | 19            | 32         | See Below (but now historically flavored!)                                               |
| Start Trip True Odo              | Read       | 4+1           | 16         | Meters + 1 byte updated indicator                                                        |
| Start Trip Eng Hours Seconds     | Read       | 4             | 16         | Seconds (Defaults to persist when on non-heavy-duty vehicles)                            |
| ECU Eng Hours Seconds            | Read       | 4             | 16         | ECU only (s)                                                                             |
| Start Trip ECU Eng Hours Seconds | Read       | 4             | 16         | ECU only (s)                                                                             |
| Start Trip System Unix Time      | Read       | 4             | 16         | Seconds since epoch                                                                      |
| System Unix Time                 | Read       | 4             | 16         | Seconds since epoch                                                                      |
| Driver ID                        | Read Write | 4(R)/<br>8(W) | 16         | ROM ID, i.e., 0x12345678.<br><br>Driver ID values must be written in reverse byte order. |
| Start Trip Derived Odom          | Read       | 4             | 16         | Meters                                                                                   |

#### 5.2.4. GPS Info Structure

| Name      | Size | Type   | Description          |             |
|-----------|------|--------|----------------------|-------------|
| Unix Time | 4    | sint32 | seconds since epoch  |             |
| Lat       | 4    | sint32 | degrees * 1e6        |             |
| Lon       | 4    | sint32 | degrees * 1e6        |             |
| Speed     | 1    | uchar  | 0.1 KPH              |             |
| Heading   | 2    | sint16 | degrees * 10         |             |
| HDOP      | 2    | uint16 | hdop * 10            |             |
| Sats      | 1    | uchar  | Number of Satellites |             |
| Lock      | 1    | uchar  | Index                | Description |
|           |      |        | 0                    | Unknown     |
|           |      |        | 1                    | Unlocked    |
|           |      |        | 2                    | Locked      |
|           |      |        | 3                    | Sleep       |
|           |      |        | 4                    | LockedGood  |

### 5.3. AAb3 BLE

AAb3 BLE implementation supports three services:

- Identity
- Engine
- Authentication

#### 5.3.1. Identity Service Information

| Description | UUID                                 |
|-------------|--------------------------------------|
| Identity    | decc0000-dc4f-4376-9df9-8de1f845b254 |

#### 5.3.2. Identity Service UUID List

| Descriptions      | UUID                                 |
|-------------------|--------------------------------------|
| Device ID         | decc0001-dc4f-4376-9df9-8de1f845b254 |
| Product ID        | decc0002-dc4f-4376-9df9-8de1f845b254 |
| Interface Version | decc0003-dc4f-4376-9df9-8de1f845b254 |

#### 5.3.3. Identity Service Characteristic Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions      | Type | Size | Data / Units           |
|-------------------|------|------|------------------------|
| Device ID         | Read | 10   | Esn                    |
| Product ID        | Read | 5    | "AAb3"                 |
| Interface Version | Read | 4    | Integer Version Number |

#### 5.3.4. Engine Service Information

| Description    | UUID                                 |
|----------------|--------------------------------------|
| Engine Service | 1B19B844-038F-11E5-8418-1697F925EC7B |

#### 5.3.5. HOS Service UUID List

| Descriptions | UUID                                 |
|--------------|--------------------------------------|
| GPS Info     | e7737830-1018-11e6-a148-3e1d05defe78 |

| Descriptions                     | UUID                                 |
|----------------------------------|--------------------------------------|
| Speed                            | 5eed6ea2-0390-11e5-8418-1697f925ec7b |
| True Odo                         | 5eed6d4e-0390-11e5-8418-1697f925ec7b |
| Derived Odo                      | 5eed6719-0390-11e5-8418-1697f925ec7b |
| Eng/Ign                          | 5eed665c-0390-11e5-8418-1697f925ec7b |
| RPM                              | 31e6e24b-f2fb-4bb9-a16b-9d17a9c4e4ad |
| Protocol                         | 5eed6477-0390-11e5-8418-1697f925ec7b |
| VIN                              | a9b9f487-5e60-43d5-a249-4d1d3f317d7e |
| Eng Hours                        | 95dbace5-fcee-467f-bbe9-fe42e195bb04 |
| Moving                           | 5eed659a-0390-11e5-8418-1697f925ec7b |
| ECM                              | 5eed70e6-0390-11e5-8418-1697f925ec7b |
| Fuel Level                       | 1c3917a6-7d33-4152-9a33-858b6f1fc99b |
| Eng Run Time                     | b71eb3aa-4ed7-4990-ab22-ced09cf58f34 |
| Eng Hours Seconds                | 87e22dd2-e27b-4094-968a-03e1537e7eb7 |
| External Power                   | 0dd2af9d-7220-474f-8b34-4a94a6a97498 |
| Start Trip GPS info              | d7b083dd-bf65-44e5-9fa1-959bddf2af0b |
| Start Trip True Odo              | ba4ac777-52ec-4133-9f18-adad8b98f142 |
| Start Trip Eng Hours Seconds     | 40418a44-9b8d-49f8-8ef2-afcea1643786 |
| ECU Eng Hours Seconds            | 0d407e4c-39c9-11e8-b467-0ed5f89f718b |
| Start Trip ECU Eng Hours Seconds | d4fb1556-39d2-11e8-b467-0ed5f89f718b |
| Start Trip System Unix Time      | 0f834728-39d5-11e8-b467-0ed5f89f718b |
| System Unix Time                 | 48969a7e-39d5-11e8-b467-0ed5f89f718b |
| Driver ID                        | 66aa658a-0003-4cee-86f0-4c775bbe5a54 |
| Start Trip Derived Odom          | 5ceb24b2-c273-40b4-b84b-f499e14c3f09 |

### 5.3.6. HOS Service Characteristics Table

The AAb3 HOS service has encrypted characteristics.

- Types available are Read, Write, and Notify
- Size and Encrypted Size is measured in bytes

| Descriptions | Type                                                                             | Size           | Encr. Size | Data / Units                 | Data Type      |
|--------------|----------------------------------------------------------------------------------|----------------|------------|------------------------------|----------------|
| GPS Info     | Read<br>Notify<br><br><i>Type:<br/>Notify on<br/>lock or<br/>time<br/>change</i> | 19             | 32         | See GPS Info Structure below |                |
| Speed        | Read                                                                             | 2 <sup>‡</sup> | 16         | 0.1 KPH                      | uint16 + uint8 |

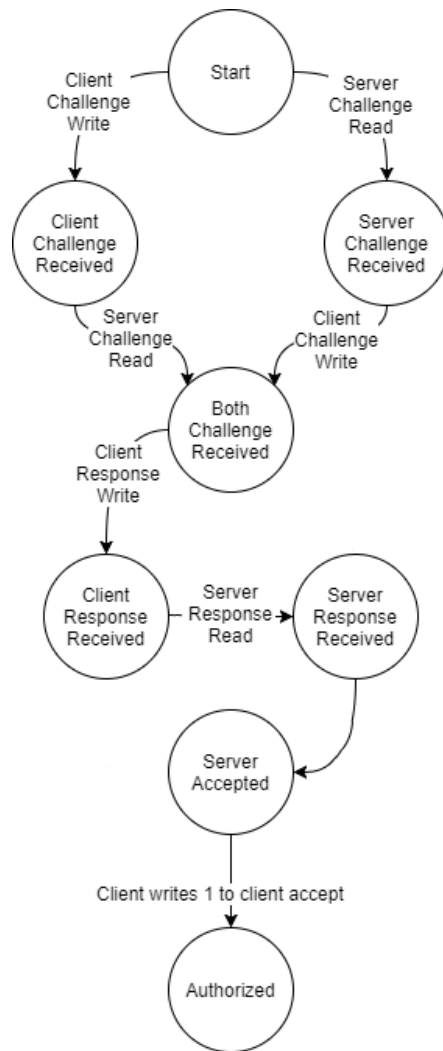
| Descriptions      | Type                                                        | Size           | Encr. Size | Data / Units                                                                                |                        | Data Type                                             |
|-------------------|-------------------------------------------------------------|----------------|------------|---------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------|
| True Odo          | Read                                                        | 4 <sup>‡</sup> | 16         | Meters                                                                                      |                        | uint32 + uint8                                        |
| Derived Odo       | Read                                                        | 4 <sup>‡</sup> | 16         | Meters                                                                                      |                        | uint32 + uint8                                        |
| Eng/Ign           | Read<br>Notify<br><br><i>Type:<br/>Notify on<br/>change</i> | 1              | 16         | <b>Index</b>                                                                                | <b>Description</b>     | uint8                                                 |
|                   |                                                             |                |            | 0                                                                                           | Engine off             |                                                       |
|                   |                                                             |                |            | 1                                                                                           | Engine on              |                                                       |
| RPM               | Read                                                        | 4 <sup>‡</sup> | 16         | RPM                                                                                         |                        | uint32 + uint8                                        |
| Protocol          | Read                                                        | 1              | 16         | <b>Index</b>                                                                                | <b>Description</b>     | sint8                                                 |
|                   |                                                             |                |            | 0                                                                                           | None                   |                                                       |
|                   |                                                             |                |            | 1                                                                                           | J-Bus                  |                                                       |
|                   |                                                             |                |            | 2                                                                                           | OBDII                  |                                                       |
| VIN               | Read                                                        | 18             | 32         | Null Terminated String                                                                      |                        | Null Terminated String                                |
| Eng Hours         | Read                                                        | 4              | 16         | Configurable via ovr[0] to be ECU only, derived only, or derived if ECU unavailable (hours) |                        | uint32                                                |
| Moving            | Read<br>Notify<br><br><i>Type:<br/>Notify on<br/>change</i> | 1              | 16         | <b>Index</b>                                                                                | <b>Description</b>     | sint8 (value will not change if interpreted as uint8) |
|                   |                                                             |                |            | 0                                                                                           | Not Moving             |                                                       |
|                   |                                                             |                |            | 1                                                                                           | Moving (speed > 5 KPH) |                                                       |
| ECM               | Read<br>Notify<br><br><i>Type:<br/>Notify on<br/>change</i> | 1              | 16         | <b>Index</b>                                                                                | <b>Description</b>     | sint8 (value will not change if interpreted as uint8) |
|                   |                                                             |                |            | 0                                                                                           | Inactive               |                                                       |
|                   |                                                             |                |            | 1                                                                                           | Pending                |                                                       |
|                   |                                                             |                |            | 2                                                                                           | Connected              |                                                       |
|                   |                                                             |                |            | 3                                                                                           | Active                 |                                                       |
|                   |                                                             |                |            | 4                                                                                           | Disabled by config     |                                                       |
| Fuel Level        | Read                                                        | 2              | 16         | Tenths of a percent                                                                         |                        | uint16                                                |
| Eng Run Time      | Read                                                        | 4              | 16         | Seconds                                                                                     |                        | uint32                                                |
| Eng Hours Seconds | Read                                                        | 4              | 16         | Seconds. Configurable via ovr[0] to be ECU or Derived ONLY, or                              |                        | uint32                                                |

| Descriptions                     | Type  | Size       | Encr. Size | Data / Units                                                                               | Data Type                                             |
|----------------------------------|-------|------------|------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------|
| External Power                   | Read  | 1          | 16         | Derived unless ECU is available                                                            |                                                       |
|                                  |       |            |            | <b>Index</b>                                                                               | <b>Description</b>                                    |
|                                  |       |            |            | 0                                                                                          | No external power                                     |
|                                  |       |            |            | 1                                                                                          | External power                                        |
|                                  |       |            |            |                                                                                            | sint8 (value will not change if interpreted as uint8) |
| Start Trip GPS info              | Read  | 19         | 32         | See Below                                                                                  |                                                       |
| Start Trip True Odo              | Read  | 4          | 16         | Meters                                                                                     | uint32                                                |
| Start Trip Eng Hours Seconds     | Read  | 4          | 16         | Configurable via ovr[0] to be ECU only, derived only, or Derived if ECU is unavailable (s) | uint32                                                |
| ECU Eng Hours Seconds            | Read  | 4          | 16         | ECU only (seconds)                                                                         | uint32                                                |
| Start Trip ECU Eng Hours Seconds | Read  | 4          | 16         | ECU only (seconds)                                                                         | uint32                                                |
| Start Trip System Unix Time      | Read  | 4          | 16         | Seconds since epoch                                                                        | uint32                                                |
| System Unix Time                 | Read  | 4          | 16         | Seconds since epoch                                                                        | uint32                                                |
| Driver ID                        | Read  | 4(R)/8 (W) | 16         | ROM ID, i.e., 0x12345678.                                                                  | uint32                                                |
|                                  | Write |            |            | Driver ID values must be written in reverse byte order.                                    |                                                       |
| Start Trip Derived Odom          | Read  | 4          | 16         | Meters                                                                                     | uint32                                                |



**NOTE:** (‡) Contains a +1 updated byte only when in the encrypted version

5.3.7. Authentication Service Process



5.3.8. Authentication Service UUID

SHA256 is used for the authentication service on the AAb3 target. The input for each response includes the two challenges along with the customer AES key.

| Description    | UUID                                 |
|----------------|--------------------------------------|
| Authentication | 1b19bf16-038f-11e5-8418-1697f925ec7b |

| Descriptions     | UUID                                  |
|------------------|---------------------------------------|
| Server_challenge | 5eedbbdd-0390-11e5-8418-1697f925ec7b  |
| Client_response  | 5eed91ef-0390-11e5-8418-1697f925ec7b  |
| Client_challenge | 5eed8812-0390-11e5-8418-1697f925ec7b: |

| Descriptions    | UUID                                 |
|-----------------|--------------------------------------|
| Server_response | 5eed4793-0390-11e5-8418-1697f925ec7b |
| Client_accepts  | 5eed58ad-0390-11e5-8418-1697f925ec7b |

### 5.3.9. Authentication Service Characteristics Table

| Descriptions     | Type        | Size | Data / Units                                                                                             |                                |
|------------------|-------------|------|----------------------------------------------------------------------------------------------------------|--------------------------------|
| Server_challenge | Read        | 16   | Randomly generated challenge value                                                                       |                                |
| Client_response  | Write       | 16   | SHA256 Response computed by client<br><br>sha256( cat(client_challenge, server_challenge, secret_key ) ) |                                |
| Client_challenge | Write       | 16   | Randomly generated challenge value                                                                       |                                |
| Server_response  | Read Notify | 16   | SHA256 response computed by server<br><br>sha256( cat(server_challenge, client_challenge, secret_key ) ) |                                |
| Client_accepts   | Write       | 1    | <b>Index</b>                                                                                             | <b>Description</b>             |
|                  |             |      | 0                                                                                                        | Client rejects server response |
|                  |             |      | 1                                                                                                        | Client accepts server response |

### 5.3.10. GPS Info Structure

| Name      | Size | Type   | Description          |                    |
|-----------|------|--------|----------------------|--------------------|
| Unix Time | 4    | sint32 | seconds since epoch  |                    |
| Lat       | 4    | sint32 | degrees * 1e6        |                    |
| Lon       | 4    | sint32 | degrees * 1e6        |                    |
| Speed     | 1    | uchar  | 0.1 KPH              |                    |
| Heading   | 2    | sint16 | degrees * 10         |                    |
| HDOP      | 2    | uint16 | hdop * 10            |                    |
| Sats      | 1    | uchar  | Number of Satellites |                    |
| Lock      | 1    | uchar  | <b>Index</b>         | <b>Description</b> |
|           |      |        | 0                    | Unknown            |
|           |      |        | 1                    | Unlocked           |
|           |      |        | 2                    | Locked             |
|           |      |        | 3                    | Sleep              |
|           |      |        | 4                    | LockedGood         |

## 5.4. LEGACY AAB2 BLE

Legacy AAB2 BLE implementation supports three services:

- Engine
- Timer
- Pass-Through

### 5.4.1. Engine Service Information

| Description | UUID                                 |
|-------------|--------------------------------------|
| Engine      | 1b19b844-038f-11e5-8418-1697f925ec7b |

### 5.4.2. Engine Service UUID List

| Descriptions         | UUID                                 |
|----------------------|--------------------------------------|
| VIN                  | a9b9f487-5e60-43d5-a249-4d1d3f317d7e |
| ECM Status           | 5eed70e6-0390-11e5-8418-1697f925ec7b |
| Ignition             | 5eed665c-0390-11e5-8418-1697f925ec7b |
| RPM                  | 31e6e24b-f2fb-4bb9-a16b-9d17a9c4e4ad |
| Engine Time          | 95dbace5-fcee-467f-bbe9-fe42e195bb04 |
| Engine Hours         | 5eed639c-0390-11e5-8418-1697f925ec7b |
| Derived Engine Hours | 5eed628e-0390-11e5-8418-1697f925ec7b |
| GPS Status           | 5eed7230-0390-11e5-8418-1697f925ec7b |
| Date Time            | 2a08                                 |
| Longitude            | 2aaf                                 |
| Latitude             | 2aae                                 |
| Speed                | 5eed6ea2-0390-11e5-8418-1697f925ec7b |
| Odometer (True)      | 5eed6d4e-0390-11e5-8418-1697f925ec7b |
| Odometer (Derived)   | 5eed6719-0390-11e5-8418-1697f925ec7b |
| Odo Interval         | f05252bb-9263-4491-9e06-40ab3e37dcf1 |
| Moving               | 5eed659a-0390-11e5-8418-1697f925ec7b |
| Protocol             | 5eed6477-0390-11e5-8418-1697f925ec7b |

### 5.4.3. Engine Service Characteristic Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions | Type   | Size | Data / Units               |                    |
|--------------|--------|------|----------------------------|--------------------|
| VIN          | Read   | 18   | Null terminated VIN string |                    |
| ECM Status   | Read   | 1    | <b>Index</b>               | <b>Description</b> |
|              | Notify |      | 0                          | Off                |
|              |        |      | 1                          | Pending            |

| Descriptions         | Type           | Size | Data / Units                                                                                                          |                       |
|----------------------|----------------|------|-----------------------------------------------------------------------------------------------------------------------|-----------------------|
|                      |                |      | <b>Index</b>                                                                                                          | <b>Description</b>    |
|                      |                |      | 2                                                                                                                     | Connected             |
|                      |                |      | 3                                                                                                                     | Active                |
|                      |                |      | 4                                                                                                                     | Disabled by config    |
| Ignition             | Read<br>Notify | 1    | <b>Index</b>                                                                                                          | <b>Description</b>    |
|                      |                |      | 0                                                                                                                     | Ignition off          |
|                      |                |      | 1                                                                                                                     | Ignition On           |
| RPM                  | Read           | 4    | Engine RPM                                                                                                            |                       |
| Engine Time          | Read           | 4    | Seconds since last engine on. Once a trip ends, it reports the trip length and then restart to 0 on next ignition on. |                       |
| Engine Hours         | Read           | 4    | Number of hours engine has been on from OBD if available, otherwise the number is derived.                            |                       |
| Derived Engine Hours | Read           | 4    | Number of hours engine has been on, derived.                                                                          |                       |
| GPS Status           | Read<br>Notify | 1    | <b>Index</b>                                                                                                          | <b>Description</b>    |
|                      |                |      | 0                                                                                                                     | Unlocked or Unknown   |
|                      |                |      | 4                                                                                                                     | Locked and Integrated |
| Date Time            | Read           | 7    | See GATT standard                                                                                                     |                       |
| Longitude            | Read           | 4    | Longitude according to GATT standard; defaults to 0 if unavailable                                                    |                       |
| Latitude             | Read           | 4    | Latitude according to GATT standard; defaults to 0 if unavailable                                                     |                       |
| Speed                | Read           | 2    | Units in 0.1 KPH (or KPH * 10)                                                                                        |                       |
| Odometer (True)      | Read<br>Notify | 4    | From OBD (m)                                                                                                          |                       |
| Odometer (Derived)   | Read<br>Notify | 1    | Derived (m)                                                                                                           |                       |
| Odo Interval         | Read<br>Write  | 1    | Notify frequency (km)                                                                                                 |                       |
| Moving               | Read<br>Notify | 1    | <b>Index</b>                                                                                                          | <b>Description</b>    |
|                      |                |      | 0                                                                                                                     | Not Moving            |
|                      |                |      | 1                                                                                                                     | Moving                |
| Protocol             | Read           | 1    | <b>Index</b>                                                                                                          | <b>Description</b>    |
|                      |                |      | 0                                                                                                                     | Unknown               |
|                      |                |      | 1                                                                                                                     | J-Bus                 |
|                      |                |      | 2                                                                                                                     | OBDII                 |

| Descriptions | Type | Size | Data / Units |
|--------------|------|------|--------------|
|--------------|------|------|--------------|

#### 5.4.4. Timer Service Information

| Description | UUID                                 |
|-------------|--------------------------------------|
| Timer       | 1b19bb5a-038f-11e5-8418-1697f925ec7b |

#### 5.4.5. Timer Service UUID List

| Descriptions | UUID                                 |
|--------------|--------------------------------------|
| Timer        | 1B19BB5A-038F-11E5-8418-1697F925EC7B |
| Interval     | 5eed73b6-0390-11e5-8418-1697f925ec7b |

#### 5.4.6. Timer Service Characteristic Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions | Type        | Size | Data / Units          |
|--------------|-------------|------|-----------------------|
| Timer        | Read Notify | 4    | Current Unix Time (s) |
| Interval     | Read Write  | 1    | Notify interval (s)   |

#### 5.4.7. Pass-Through Service Information

| Description  | UUID                                 |
|--------------|--------------------------------------|
| Pass-through | 1b19bce0-038f-11e5-8418-1697f925ec7b |

#### 5.4.8. Pass-Through Service UUID List

| Descriptions | UUID                                 |
|--------------|--------------------------------------|
| TX           | 5eed63d4-0390-11e5-8418-1697f925ec7b |
| RX           | 5eed640e-0390-11e5-8418-1697f925ec7b |
| Header       | 5eed627e-0390-11e5-8418-1697f925ec7b |

#### 5.4.9. Pass-through Service Characteristics Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions | Type        | Size | Data / Units      |
|--------------|-------------|------|-------------------|
| TX           | R/W/N       | 512  | See documentation |
| RX           | Read Notify | 512  | N/A               |
| Header       | Read Write  | 16   | N/A               |
| Cell State   | Read Notify | 1    | N/A               |

## 5.5. AAb4 BLE

### 5.5.1. Overview

AAb4 BLE supports two services:

- EDL
- Info

### 5.5.2. EDL Service UUID

| Description | UUID                                 |
|-------------|--------------------------------------|
| EDL         | 4117a79a-6c31-4ecc-a779-f1c9b177177b |

### 5.5.3. EDL UUID List

| Descriptions         | UUID                                 |
|----------------------|--------------------------------------|
| VIN                  | a9b9f487-5e60-43d5-a249-4d1d3f317d7e |
| Moving               | 5eed659a-0390-11e5-8418-1697f925ec7b |
| Mileage/Odo Interval | f05252bb-9263-4491-9e06-40ab3e37dcf1 |
| Mileage (True Odo)   | 5eed6d4e-0390-11e5-8418-1697f925ec7b |
| GPS Info             | 53b13abb-41af-42de-8156-21e7b48143d7 |
| Gear Position        | 9b342763-249d-46b5-9301-ba4612a5d9f6 |
| Engine Status        | 5eed665c-0390-11e5-8418-1697f925ec7b |
| Engine Hours Sec     | 42d80e22-fc83-11e7-8450-fea9aa178066 |
| Engine Hours         | 95dbace5-fcee-467f-bbe9-fe42e195bb04 |
| ECU Status           | 5eed70e6-0390-11e5-8418-1697f925ec7b |
| Driver ID            | 66aa658a-0003-4cee-86f0-4c775bbe5a54 |
| Date/Time ("Unix")   | 2A08                                 |
| Buffer Full          | 7beb654c-98dc-4d8b-8cce-a427c8f3187f |

#### 5.5.4. EDL Service Characteristic table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions         | Type                      | Size       | Data / Units                                                                         |                    |
|----------------------|---------------------------|------------|--------------------------------------------------------------------------------------|--------------------|
| VIN                  | Read                      | 18         | char[18] (Null Terminated)                                                           |                    |
| Moving               | Read Notify               | 1          | <b>Bool</b>                                                                          | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Stopped            |
|                      |                           |            | 1                                                                                    | Moving             |
| Mileage/Odo Interval | Read Write                | 1          | Kilometers                                                                           |                    |
| Mileage (True Odo)   | Read Notify (on interval) | 4(R)/1 (W) | Meters (designed to fallback to gps lifetime odo when not available from engine bus) |                    |
| GPS Info             | Read                      | 23         | See GPS Info Structure                                                               |                    |
| Gear Position        | Read Notify               | 1          | <b>Index</b>                                                                         | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Neutral            |
|                      |                           |            | 1                                                                                    | Forward            |
|                      |                           |            | 2                                                                                    | Reverse            |
|                      |                           |            | 3                                                                                    | Park               |
| Engine Status        | Read Notify               | 1          | <b>Bool</b>                                                                          | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Off                |
|                      |                           |            | 1                                                                                    | On                 |
| Engine Hours Sec     | Read                      | 4          | Seconds                                                                              |                    |
| Engine Hours         | Read                      | 4          | Hours                                                                                |                    |
| ECU Status           | Read                      | 1          | <b>Index</b>                                                                         | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Off                |
|                      |                           |            | 1                                                                                    | Pending            |
|                      |                           |            | 2                                                                                    | Connected          |
|                      |                           |            | 3                                                                                    | Active             |
|                      |                           |            | 4                                                                                    | Disabled by config |
| Driver ID            | Read Write                | 4(R)/8 (W) | char[8]**                                                                            |                    |
| Date/Time ("Unix")   | Read                      | 7          | (See GATT Standard)                                                                  |                    |

| Descriptions | Type        | Size | Data / Units |                    |
|--------------|-------------|------|--------------|--------------------|
| Buffer Full  | Read Notify | 1    | <b>Bool</b>  | <b>Description</b> |
|              |             |      | 0            | Not full           |
|              |             |      | 1            | Full               |

#### 5.5.5. Info Service UUID

| Description | UUID                                 |
|-------------|--------------------------------------|
| Info        | ede3469c-f706-11e7-8c3f-9a214cf093ae |

#### 5.5.6. Info Service UUID List

| Descriptions          | UUID                                 |
|-----------------------|--------------------------------------|
| Main FW Version       | 75ee1b84-f707-11e7-8c3f-9a214cf093ae |
| Bootloader FW Version | 0cb8b4d8-f709-11e7-8c3f-9a214cf093ae |
| gcv[0] value          | 60fd30d2-f709-11e7-8c3f-9a214cf093ae |
| Device ID             | d1371d4a-f709-11e7-8c3f-9a214cf093ae |

#### 5.5.7. Info Service Characteristic Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions          | Type | Size | Data / Units   |
|-----------------------|------|------|----------------|
| Main FW Version       | Read | 16   | Version string |
| Bootloader FW Version | Read | 16   | Version string |
| gcv[0] value          | Read | 4    | Unsigned long  |
| Device ID             | Read | 4    | ESN            |

#### 5.5.8. GPS Info Structure

| Name      | Type   | Size | Description         |
|-----------|--------|------|---------------------|
| Unix Time | sint32 | 4    | seconds since epoch |
| Lat       | sint32 | 4    | degrees * 1e6       |
| Lon       | sint32 | 4    | degrees * 1e6       |
| speed     | uchar  | 1    | 0.1 KPH             |
| Heading   | sint16 | 2    | degress*10          |

| Name     | Type   | Size | Description          |             |
|----------|--------|------|----------------------|-------------|
| HDOP     | uint16 | 2    | HDOP*10              |             |
| Sats     | uchar  | 1    | Number of Satellites |             |
| Lock     | uchar  | 1    | Value                | Description |
|          |        |      | 0                    | Unknown     |
|          |        |      | 1                    | Unlocked    |
|          |        |      | 2                    | Locked      |
|          |        |      | 3                    | Sleep       |
|          |        |      | 4                    | LockedGood  |
| Altitude | sint32 | 4    | meters*10            |             |

## 5.6. AAb5 BLE

### 5.6.1. Overview

AAb5 BLE supports two services:

- EDL
- Info

### 5.6.2. EDL Service UUID

| Description | UUID                                 |
|-------------|--------------------------------------|
| EDL         | 4117a79a-6c31-4ecc-a779-f1c9b177177b |

### 5.6.3. EDL UUID List

| Descriptions         | UUID                                 |
|----------------------|--------------------------------------|
| VIN                  | a9b9f487-5e60-43d5-a249-4d1d3f317d7e |
| Moving               | 5eed659a-0390-11e5-8418-1697f925ec7b |
| Mileage/Odo Interval | f05252bb-9263-4491-9e06-40ab3e37dcf1 |
| Mileage (True Odo)   | 5eed6d4e-0390-11e5-8418-1697f925ec7b |
| GPS Info             | 53b13abb-41af-42de-8156-21e7b48143d7 |
| Gear Position        | 9b342763-249d-46b5-9301-ba4612a5d9f6 |
| Engine Status        | 5eed665c-0390-11e5-8418-1697f925ec7b |
| Engine Hours Sec     | 42d80e22-fc83-11e7-8450-fea9aa178066 |
| Engine Hours         | 95dbace5-fcee-467f-bbe9-fe42e195bb04 |
| ECU Status           | 5eed70e6-0390-11e5-8418-1697f925ec7b |
| Driver ID            | 66aa658a-0003-4cee-86f0-4c775bbe5a54 |

| Descriptions       | UUID                                 |
|--------------------|--------------------------------------|
| Date/Time ("Unix") | 2A08                                 |
| Buffer Full        | 7beb654c-98dc-4d8b-8cce-a427c8f3187f |

#### 5.6.4. EDL Service Characteristic table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions         | Type                      | Size       | Data / Units                                                                         |                    |
|----------------------|---------------------------|------------|--------------------------------------------------------------------------------------|--------------------|
| VIN                  | Read                      | 18         | char[18] (Null Terminated)                                                           |                    |
| Moving               | Read Notify               | 1          | <b>Bool</b>                                                                          | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Stopped            |
|                      |                           |            | 1                                                                                    | Moving             |
| Mileage/Odo Interval | Read Write                | 4(R)/1 (W) | Kilometers                                                                           |                    |
| Mileage (True Odo)   | Read Notify (on interval) | 4          | Meters (designed to fallback to gps lifetime odo when not available from engine bus) |                    |
| GPS Info             | Read                      | 23         | See GPS Info Structure                                                               |                    |
| Gear Position        | Read Notify               | 1          | <b>Index</b>                                                                         | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Neutral            |
|                      |                           |            | 1                                                                                    | Forward            |
|                      |                           |            | 2                                                                                    | Reverse            |
|                      |                           |            | 3                                                                                    | Park               |
| Engine Status        | Read Notify               | 1          | <b>Bool</b>                                                                          | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Off                |
|                      |                           |            | 1                                                                                    | On                 |
| Engine Hours Sec     | Read                      | 4          | Seconds                                                                              |                    |
| Engine Hours         | Read                      | 4          | Hours                                                                                |                    |
| ECU Status           | Read                      | 1          | <b>Index</b>                                                                         | <b>Description</b> |
|                      |                           |            | 0                                                                                    | Off                |
|                      |                           |            | 1                                                                                    | Pending            |
|                      |                           |            | 2                                                                                    | Connected          |
|                      |                           |            | 3                                                                                    | Active             |
|                      |                           |            | 4                                                                                    | Disabled by config |

| Descriptions          | Type        | Size          | Data / Units        |             |
|-----------------------|-------------|---------------|---------------------|-------------|
| Driver ID             | Read Write  | 4(R)/8<br>(W) | char[8]**           |             |
| Date/Time<br>("Unix") | Read        | 7             | (See GATT Standard) |             |
| Buffer Full           | Read Notify | 1             | Bool                | Description |
|                       |             |               | 0                   | Not full    |
|                       |             |               | 1                   | Full        |

#### 5.6.5. Info Service UUID

| Description | UUID                                 |
|-------------|--------------------------------------|
| Info        | ede3469c-f706-11e7-8c3f-9a214cf093ae |

#### 5.6.6. Info Service UUID List

| Descriptions          | UUID                                 |
|-----------------------|--------------------------------------|
| Main FW Version       | 75ee1b84-f707-11e7-8c3f-9a214cf093ae |
| Bootloader FW Version | 0cb8b4d8-f709-11e7-8c3f-9a214cf093ae |
| gcv[0] value          | 60fd30d2-f709-11e7-8c3f-9a214cf093ae |
| Device ID             | d1371d4a-f709-11e7-8c3f-9a214cf093ae |

#### 5.6.7. Info Service Characteristic Table

- Types available are Read, Write, and Notify
- Size is measured in bytes

| Descriptions          | Type | Size | Data / Units   |
|-----------------------|------|------|----------------|
| Main FW Version       | Read | 16   | Version string |
| Bootloader FW Version | Read | 16   | Version string |
| gcv[0] value          | Read | 4    | Unsigned long  |
| Device ID             | Read | 4    | ESN            |

#### 5.6.8. GPS Info Structure

| Name      | Type   | Size | Description         |
|-----------|--------|------|---------------------|
| Unix Time | SINT32 | 4    | seconds since epoch |

| Name     | Type   | Size | Description          |
|----------|--------|------|----------------------|
| Lat      | SINT32 | 4    | degrees * 1e6        |
| Lon      | SINT32 | 4    | degrees *1e6         |
| Speed    | UCHAR  | 1    | 0.1 KPH              |
| Heading  | SINT16 | 2    | Degrees*10           |
| HDOP     | UINT16 | 2    | HDOP*10              |
| Sats     | UCHAR  | 1    | Number of Satellites |
| LOCK     | UCHAR  | 1    | <b>Value</b>         |
|          |        |      | <b>Description</b>   |
|          |        |      | 0                    |
|          |        |      | Unknown              |
|          |        |      | 1                    |
|          |        |      | Unlocked             |
|          |        |      | 2                    |
|          |        |      | Locked               |
|          |        |      | 3                    |
|          |        |      | Sleep                |
|          |        |      | 4                    |
|          |        |      | LockedGood           |
| Altitude | SINT32 | 4    | Meters*10            |

## 6. DEVICE CONFIGURATION

---

System parameters are designed to be non-volatile and have the ability to be updated through a serial connection, USB, SMS, UDP and are used for many modules within the device. All system parameters (aka configs, params) have a default value that can always be restored in case the device ends up in an unknown state.

The following two commands will be most relevant when dealing with the following configurations:

- `:rycfg` -- Used to read a system configuration
- `:wycfg` -- Used to write a system configuration

When using either of these commands, you must specify what configuration slot you wish to read/write, otherwise the console will default to the first slot (index[0]). In the case that the desired parameter does not have a factory default setting (configs PCR, PCA, & GFN) the console will not default to the first slot unless it has already been written.

Example:

```
:wycfg tmr 30 0
:OK
```

```
:rycfg dst
| dst[0]: addr:"us.address.com", port:1234 (0x4d2)
: OK
```

## 6.1. ACCELERATION EVENT THRESHOLD (AET)

The *Acceleration Event Threshold* parameter determines which conditions must be met for an event to register.

*Configuration instances: 8*

| Command Type | Syntax                                                                                                                                                                                     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg aet[x] <direction> <start_duration> <end_duration> <mg_thresh><br><b>Response</b><br>:OK                                                                          |
| READ         | <b>Command</b><br>:rycfg aet[x]<br><b>Response</b><br>  aet[x]: dir:<direction> (hex_val), start:<start_duration> (hex_val), end:<end_duration> (hex_val), mg:<mg_thresh> (hex_val)<br>:OK |

| Parameter      | Range      | Description                                                                                                                                                                                                          |
|----------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| direction      | N/A        | <b>Value</b> <b>Description</b>                                                                                                                                                                                      |
|                |            | 0              Acceleration                                                                                                                                                                                          |
|                |            | 1              Deceleration                                                                                                                                                                                          |
|                |            | 2              Left Turn                                                                                                                                                                                             |
|                |            | 3              Right Turn                                                                                                                                                                                            |
| start_duration | 0 to 65535 | Time the acceleration in the target direction must stay above the mg_thresh before an event is considered to have started (ms).                                                                                      |
| end_duration   | 0 to 65535 | Time that an acceleration in the target direction must stay below the mg_thresh before an event is considered to have concluded. If another acceleration threshold is exceeded before this time, it is negated (ms). |
| mg_thresh      | 0 to 2000  | The threshold that determines when start_duration and end_duration trigger (mg).                                                                                                                                     |

| Target                 | Default Value(s)                                                                                                                                                                                                 |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAb1, AAa4, AAb5, AAb6 | aet[0] 0 1500 1000 100<br>aet[1] 1 1500 1000 100<br>aet[2] 2 1500 1000 100<br>aet[3] 3 1500 1000 100<br>aet[4] 0 60000 1000 100<br>aet[5] 1 60000 1000 100<br>aet[6] 2 60000 1000 100<br>aet[7] 3 60000 1000 100 |

| Target | Default Value(s)        |
|--------|-------------------------|
| AAb3   | aet[0] 0 1000 1000 240  |
|        | aet[1] 1 1000 1000 280  |
|        | aet[2] 2 2000 1000 900  |
|        | aet[3] 3 2000 1000 900  |
|        | aet[4] 0 60000 1000 100 |
|        | aet[5] 1 60000 1000 100 |
|        | aet[6] 2 60000 1000 100 |
|        | aet[7] 3 60000 1000 100 |

## 6.2. ACCELERATION FILTER COEFFICIENTS (AFC)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                                              |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg afc <filter_len> <coef_1> <coef_2> ..... <coef_31><br><b>Response</b><br>:OK                                                                                               |
| READ         | <b>Command</b><br>:rycfg afc<br><b>Response</b><br>  afc: stages:<filter_len> (hex_val), coef1:<coef_val_1> (hex_val), coef2:<coef_val_2><br>..... (hex_val), coef32:<coef_val_31> (hex_val)<br>:OK |

| Parameter   | Range           | Description                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| filter_len  | 0 to 31         | The number of stages to be used in the FIR filter                                                                                                                                                                                                                                                                                                                                            |
| coef_val_XX | 0 to 4294967295 | The coefficient for the filter stage denoted by 'XX'. It can be input as a decimal number (1.234567), as the internal system representation of the decimal value multiplied by one million (1234567), or as the raw hex of the system representation of the decimal value (0x12D687).<br><br>NOTE: Ideally, all filter coefficients should sum to one unless attenuation or gain is desired. |



**NOTE:** This parameter does not have a factory default setting

### 6.3. ACCELERATION PERCENT CORRECTION (APC)

The *Acceleration Percent Correction* parameter is a scalar value multiplied by the filter output to produce gain or attenuation. APC is input as the explicit percent change interested in.

Configuration instances: 1



**NOTE:** *apc* (and *arc*) corrections are only applied to the max mg value at the end of the event. They do NOT affect the determination of accelerometer events. The equation is (roughly) as follows:

$$reported\_max\_mg = \frac{(actual)(apc)}{100} + arc$$

E.g., if an APC of 50% is desired, set *apc* to the value of 50. There is a separate percent correction factor for the x axis and the y axis. There is no percent correction factor for the z axis.

| Command Type | Syntax                                                                                                                                                                    |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg apc <percent_correction_factor_x_axis> <percent_correction_factor_y_axis><br><b>Response</b><br>:OK                                              |
| READ         | <b>Command</b><br>:rycfg apc<br><b>Response</b><br>  apc: corr_x:<percent_correction_factor_x_axis> (hex_val), corr_y:<percent_correction_factor_y_axis> (hex_val)<br>:OK |

| Parameter                        | Range    | Description      |
|----------------------------------|----------|------------------|
| percent_correction_factor_x_axis | 1 to 200 | Percentage value |
| percent_correction_factor_y_axis | 1 to 200 | Percentage value |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | apc[0] 100 100   |

## 6.4. APNs (APN)

The *APN* parameter contains settings for APN gateway, username, and password.

The device will hunt through the APNs in sequence (0, 1, 2, 3), attempting to activate context once on each, until it is successful.

*Configuration instances: 4*

| Command Type | Syntax                                                                                                                           |
|--------------|----------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg apn[x] "<apn_name>" "<username>" "<password>"<br><b>Response</b><br>:OK                                 |
| READ         | <b>Command</b><br>:rycfg apn[x]<br><b>Response</b><br>  apn[x]: name:"<apn_name>", user:"<username>", passwd:"<password>"<br>:OK |

| Parameter | Range   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| apn_name  | 64 Char | <p>The name of the APN gateway used for GSM, GPRS, 3G and 4G cellular networks. Examples of APN's are as follows:internet.t-mobile, wap.cingular, internet.mnc012.mcc345.gprs</p> <p>If instances 1 to 3 are configured as "disabled", the given slot will be skipped during APN hunting procedures.</p> <div>  <b>NOTE:</b> For 4G AT&amp;T modules, a blank APN configuration triggers a network-pushed APN. </div> <div>  <b>NOTE:</b> APN characters are case sensitive. </div> |
| username  | 32 Char | The username used to access the APN given by the first argument.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| password  | 32 Char | The password used to access the APN given by the first argument.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Target                       | Default Value(s)                                       |
|------------------------------|--------------------------------------------------------|
| AAb1, AAb3, AAb4, AAb5, AAb6 | apn[0] "" "user" "passwd"<br>apn[1] "" "user" "passwd" |

| Target | Default Value(s)          |
|--------|---------------------------|
|        | apn[2] "" "user" "passwd" |
|        | apn[3] "" "user" "passwd" |



**NOTE:** Network carriers are inconsistent with handling special characters (~`!@\$%^&\*()-\_+={};/?.,) over SMS. It is recommended to only use UDP commands to set passwords that contain special characters.

## 6.5. ACCELERATION REPORT CORRECTION (ARC)

The *acceleration report correction* factor is a scalar value that is added to the output of the filter to add a DC offset to the signal. It can be input as a decimal number (1.234567), the internal system representation of the decimal value multiplied by one million (1234567), or as the raw hex of the system representation of the decimal value (0x12D687).

There is a separate correction factor for the x axis and the y axis; there is no correction factor for the z axis.

*Configuration instances: 1*



**NOTE:** arc (and apc) corrections are only applied to the max mg value at the end of the event. They do NOT affect the determination of accelerometer events. The equation is (roughly) as follows:

$$\text{reported\_max\_mg} = \frac{(\text{actual\_max\_mg})(\text{apc})}{100} + \text{arc}$$

| Command Type | Syntax                                                                                                                                                    |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg arc <correction_factor_x_axis> <correction_factor_y_axis><br><b>Response</b><br>:OK                                              |
| READ         | <b>Command</b><br>:rycfg arc<br><b>Response</b><br>  arc: corr_x:<correction_factor_x_axis> (hex_val), corr_y:<correction_factor_y_axis> (hex_val)<br>:OK |

| Parameter                | Range         | Description  |
|--------------------------|---------------|--------------|
| correction_factor_x_axis | -2000 to 2000 | Scalar value |
| correction_factor_y_axis | -2000 to 2000 | Scalar value |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | arc[0] 0 0       |

## 6.6. ALTERNATOR STATE THRESHOLD (AST)

The *Alternator State Threshold* configuration determines the voltage and time thresholds that cause logic events. There are four alternator state thresholds, each with their own parameter ranges:

- ast[0] -> Alternator On Threshold
- ast[1] -> Alternator Off Threshold
- ast[2] -> 24V Check Threshold
- ast[3] -> Dynamic Alternator Delta

Configuration instances: 4

| Command Type | Syntax                                                                                                                         |
|--------------|--------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ast[x] <threshold> <time_val><br><b>Response</b><br>:OK                                               |
| READ         | <b>Command</b><br>:rycfg ast[x]<br><b>Response</b><br>  ast[x]: thresh:<threshold> (hex_val), time:<time_val> (hex_val)<br>:OK |

| Instance | Range                      | Description                                                                                                                                                                                            |
|----------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ast[0]   | 120 to 400                 | Threshold (0.1 V per bit)                                                                                                                                                                              |
|          | 1 to 60                    | Time_val (seconds)<br>Number of seconds voltage is above threshold to begin OBD Ignition On logic                                                                                                      |
| ast[1]   | 100 to 400                 | Threshold (0.1 V per bit)<br>If Alternator Off Threshold is greater than or equal to Alternator On Threshold, the internal Alternator Off Threshold will be limited to Alternator On Threshold - 0.1V. |
|          | 1 to 60                    | Time_val (seconds)<br>Number of seconds voltage is below threshold to detect OBD Ignition Off logic                                                                                                    |
| ast[2]   | 0 (disable),<br>140 to 200 | Threshold (0.1 V per bit)                                                                                                                                                                              |
|          | 1 to 10                    |                                                                                                                                                                                                        |

| Instance | Range                | Description                                                          |
|----------|----------------------|----------------------------------------------------------------------|
|          |                      | <i>Time_val (seconds)</i>                                            |
|          |                      | Number of seconds voltage is above threshold to detect 24V system    |
| ast[3]   | 0 (disable), 3 to 10 | <i>Threshold (0.1 V per bit) -- See Dynamic Alternator on p. 188</i> |
|          | 1 to 10              | <i>Time_val (seconds)</i>                                            |
|          |                      | Not used                                                             |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ast[0] 132 3     |
|                              | ast[1] 131 3     |
|                              | ast[2] 160 1     |
|                              | ast[3] 0 1       |

## 6.7. BLE AUTHENTICATION DISABLE (BAD)

Disables or enables BLE authentication and encryption of characteristics for the AAb3 target only

*Configuration instances: 1*

| Command Type | Syntax                                                                                       |
|--------------|----------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg bad <disable><br><b>Response</b><br>:OK                             |
| READ         | <b>Command</b><br>:rycfg bad<br><b>Response</b><br>  bad: disable:<disable> (hex_val)<br>:OK |

| Parameter | Description                                                                                                                                                                                                                                        |       |             |   |                                                              |   |                                                               |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|--------------------------------------------------------------|---|---------------------------------------------------------------|
| disable   | Disables Bluetooth:                                                                                                                                                                                                                                |       |             |   |                                                              |   |                                                               |
|           | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>Enables BLE authentication and encryption of characteristics</td></tr> <tr> <td>1</td><td>Disables BLE authentication and encryption of characteristics</td></tr> </table> | Value | Description | 0 | Enables BLE authentication and encryption of characteristics | 1 | Disables BLE authentication and encryption of characteristics |
| Value     | Description                                                                                                                                                                                                                                        |       |             |   |                                                              |   |                                                               |
| 0         | Enables BLE authentication and encryption of characteristics                                                                                                                                                                                       |       |             |   |                                                              |   |                                                               |
| 1         | Disables BLE authentication and encryption of characteristics                                                                                                                                                                                      |       |             |   |                                                              |   |                                                               |

| Target | Default Value(s) |
|--------|------------------|
| AAb3   | bad 1            |

## 6.8. OBD BACKOFF (BKO)

*Configuration instances: 6*

| Command Type | Syntax                                                                                                 |
|--------------|--------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg bko[x] <enable_value><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg bko[x]<br><b>Response</b><br>  bko[x]: enable:<enable_value> (hex_val)<br>:OK |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|-------------------|---|--------|----------|-------------|--------|--------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------|--------|-----------------------------------------------------|-----|-------------|------|----------------|------|---------------|------|---------------------|------|--------------------------|------|------------------------------------------|------|-------------------------------------|
| enable    | <p>OBD stops vehicle bus communication when feature is enabled.</p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable (default)</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table><br><table> <tr> <th>Instance</th><th>Description</th></tr> <tr> <td>bko[0]</td><td>Scantool Detect Enable (retries communication in 60 seconds)</td></tr> <tr> <td>bko[1]</td><td>New MIL Status Detect Enable (end communication until next ignition cycle on a new MIL status detection)</td></tr> <tr> <td>bko[2]</td><td>Persistent MIL Status Detect Enable (read MIL status for each ignition on, if still set, end communication)</td></tr> <tr> <td>bko[3]</td><td>Protocol Detect Failure (OBD protocol failed start protocol three consecutive ignition cycles - disable OBD communication until this feature is disabled)</td></tr> <tr> <td>bko[4]</td><td>Scantool Detect Enable (backs off until next ignition cycle)</td></tr> <tr> <td>bko[5]</td><td>Scantool Detect Mask (for use with Scantool Detect)</td></tr> </table> <p>OBD stops vehicle bus communication on specific messages when mask is set.</p> <p><i>Mask range:</i></p> <table> <tr> <th>Hex</th><th>Description</th></tr> <tr> <td>0x01</td><td>OnStar request</td></tr> <tr> <td>0x02</td><td>OBDII request</td></tr> <tr> <td>0x04</td><td>Diagnostic requests</td></tr> <tr> <td>0x08</td><td>Security access requests</td></tr> <tr> <td>0x10</td><td>User defined (currently not implemented)</td></tr> <tr> <td>0x20</td><td>Ford EOL request (Target AAb3 only)</td></tr> </table> | Index | Description | 0 | Disable (default) | 1 | Enable | Instance | Description | bko[0] | Scantool Detect Enable (retries communication in 60 seconds) | bko[1] | New MIL Status Detect Enable (end communication until next ignition cycle on a new MIL status detection) | bko[2] | Persistent MIL Status Detect Enable (read MIL status for each ignition on, if still set, end communication) | bko[3] | Protocol Detect Failure (OBD protocol failed start protocol three consecutive ignition cycles - disable OBD communication until this feature is disabled) | bko[4] | Scantool Detect Enable (backs off until next ignition cycle) | bko[5] | Scantool Detect Mask (for use with Scantool Detect) | Hex | Description | 0x01 | OnStar request | 0x02 | OBDII request | 0x04 | Diagnostic requests | 0x08 | Security access requests | 0x10 | User defined (currently not implemented) | 0x20 | Ford EOL request (Target AAb3 only) |
| Index     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0         | Disable (default)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 1         | Enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| Instance  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[0]    | Scantool Detect Enable (retries communication in 60 seconds)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[1]    | New MIL Status Detect Enable (end communication until next ignition cycle on a new MIL status detection)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[2]    | Persistent MIL Status Detect Enable (read MIL status for each ignition on, if still set, end communication)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[3]    | Protocol Detect Failure (OBD protocol failed start protocol three consecutive ignition cycles - disable OBD communication until this feature is disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[4]    | Scantool Detect Enable (backs off until next ignition cycle)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| bko[5]    | Scantool Detect Mask (for use with Scantool Detect)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| Hex       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x01      | OnStar request                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x02      | OBDII request                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x04      | Diagnostic requests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x08      | Security access requests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x10      | User defined (currently not implemented)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |
| 0x20      | Ford EOL request (Target AAb3 only)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |                   |   |        |          |             |        |                                                              |        |                                                                                                          |        |                                                                                                             |        |                                                                                                                                                           |        |                                                              |        |                                                     |     |             |      |                |      |               |      |                     |      |                          |      |                                          |      |                                     |

| Target                       | Default Value(s)                                                                                   |
|------------------------------|----------------------------------------------------------------------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | <p>bko[0] 0</p> <p>bko[1] 0</p> <p>bko[2] 0</p> <p>bko[3] 0</p> <p>bko[4] 0</p> <p>bko[5] 0x03</p> |

## 6.9. BLUETOOTH ENABLED (BLT)

The *Bluetooth Enabled* configuration sets the Bluetooth communication state.

*Configuration instances: 1*

| Command Type | Syntax                                                                                 |
|--------------|----------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg blt <enable><br><b>Response</b><br>:OK                        |
| READ         | <b>Command</b><br>:rycfg blt<br><b>Response</b><br>  blt: en:<enable> (hex_val)<br>:OK |

| Param  | Description                                                                                                                                                                                                               |       |             |   |                                   |   |                                                                 |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|-----------------------------------|---|-----------------------------------------------------------------|
| enable | Enables Bluetooth:                                                                                                                                                                                                        |       |             |   |                                   |   |                                                                 |
|        | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>Disables bluetooth communications</td></tr> <tr> <td>1</td><td>Enables bluetooth communications (not available on AAa4 target)</td></tr> </table> | Value | Description | 0 | Disables bluetooth communications | 1 | Enables bluetooth communications (not available on AAa4 target) |
| Value  | Description                                                                                                                                                                                                               |       |             |   |                                   |   |                                                                 |
| 0      | Disables bluetooth communications                                                                                                                                                                                         |       |             |   |                                   |   |                                                                 |
| 1      | Enables bluetooth communications (not available on AAa4 target)                                                                                                                                                           |       |             |   |                                   |   |                                                                 |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | blt[0] 0         |

## 6.10. BLUETOOTH TRANSMIT POWER (BTP)

*Configuration instances: 1*

| Command Type | Syntax                                                                                       |
|--------------|----------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg btp <power_val><br><b>Response</b><br>:OK                           |
| READ         | <b>Command</b><br>:rycfg btp<br><b>Response</b><br>  btp: power:<power_val> (hex_val)<br>:OK |

| Parameter | Range  | Description                                                            |
|-----------|--------|------------------------------------------------------------------------|
| power_val | 0 to 4 | The Bluetooth Transmit Power setting; requires a reset to take effect. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | btp 4            |

## 6.11. BUZZER SONGS (BZR)

The *Buzzer Songs* configuration sets the frequency and duration of up to 8 notes on the device buzzer.

*Configuration instances: 10*

| Command Type | Syntax                                                                                                                                                                                           |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg bzc[x] <frequency1> <duration1> ... <frequency8> <duration8><br><b>Response</b><br>:OK                                                                                  |
| READ         | <b>Command</b><br>:rycfg bzc[x]<br><b>Response</b><br>  bzc[x]: freq1:<frequency1> (hex_val), dur1:<duration1> (hex_val), ...<br>freq8:<frequency8> (hex_val), dur8:<duration8> (hex_val)<br>:OK |

| Param      | Range                   | Description                                                                  |
|------------|-------------------------|------------------------------------------------------------------------------|
| frequencyX | 0 to 65535              | A frequency that corresponds to the Xth note to be played (Hz); 0 is silent. |
| durationX  | 0 (disable),<br>10-6535 | The duration of the Xth note to be played (ms)                               |

| Target                               | Default Value(s)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAAb1, AAAb3, AAAb4, AAAb5,<br>AAAb6 | bzc[0] 3000 500 0 200 0 0 0 0 0 0 0 0 0 0 0<br>bzc[1] 3000 500 0 50 0 0 0 0 0 0 0 0 0 0 0<br>bzc[2] 3000 200 0 800 0 0 0 0 0 0 0 0 0 0 0<br>bzc[3] 3000 200 0 300 0 0 0 0 0 0 0 0 0 0 0<br>bzc[4] 3000 3000 0 2 0 0 0 0 0 0 0 0 0 0 0<br>bzc[5] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0<br>bzc[6] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0<br>bzc[7] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0<br>bzc[8] 262 125 294 125 349 125 294 125 440 125 0 125 440 300 392 300<br>bzc[9] 262 250 294 125 349 125 294 125 392 125 0 125 392 300 349 300 |

## 6.12. CAN CONTROLLER SETTINGS (CAN)

Configuration instances: 6

| Command Type | Syntax                                                                                 |
|--------------|----------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg can[x] <param_val><br><b>Response</b><br>:OK                  |
| READ         | <b>Command</b><br>:rycfg can[x]<br><b>Response</b><br>can[x]: value:<param_val><br>:OK |

| Parameter | Description                        |                                            |                    |                      |
|-----------|------------------------------------|--------------------------------------------|--------------------|----------------------|
| param_val | Voltage threshold in 0.1 V per bit |                                            |                    |                      |
|           | can[0]                             | N/A                                        | CAN transmit Retry |                      |
|           |                                    |                                            |                    |                      |
|           |                                    |                                            | <b>Index</b>       | <b>Description</b>   |
|           |                                    |                                            | 0                  | Disable retry        |
|           |                                    |                                            | 1                  | Enable retry         |
|           |                                    |                                            |                    |                      |
|           |                                    |                                            |                    |                      |
|           |                                    |                                            |                    |                      |
|           |                                    |                                            |                    |                      |
|           | can[1]                             | N/A                                        | CAN Baud rate      |                      |
|           |                                    |                                            |                    |                      |
|           |                                    |                                            | <b>Index</b>       | <b>Description</b>   |
|           |                                    |                                            | 0                  | Autodetect (default) |
|           |                                    |                                            | 1                  | 500k                 |
|           |                                    |                                            | 2                  | 250k                 |
|           |                                    | 3                                          | 125k               |                      |
|           |                                    | 4                                          | 33k                |                      |
| can[2]    | 2 to 16                            | CAN TSEG1 Time Segment Before Sample Point |                    |                      |
| can[3]    | 1 to 8                             | CAN TSEG2 Time Segment After Sample Point  |                    |                      |
| can[4]    | 1 to 4                             | CAN SJW Synchronization Jump Width         |                    |                      |
| can[5]    | 1 to 1024                          | BRP Baud Rate Prescaler                    |                    |                      |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | can[0] 1         |

| Target | Default Value(s) |
|--------|------------------|
|        | can[1] 0         |
|        | can[2] 8         |
|        | can[3] 6         |
|        | can[4] 4         |
|        | can[5] 8         |

## 6.13. CRASH EVENT PARAMETERS (CEP)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                    |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg cep <delta_mg_thresh> <poll_freq> <hist_depth><br><b>Response</b><br>:OK                                                         |
| READ         | <b>Command</b><br>:rycfg cep<br><b>Response</b><br>  cep: mg:<delta_mg_thresh> (hex_val), freq:<poll_freq> (hex_val), depth:<hist_depth> (hex_val)<br>:OK |

| Parameter       | Range     | Description                                                                                           |
|-----------------|-----------|-------------------------------------------------------------------------------------------------------|
| delta_mg_thresh | 1 to 2000 | If the change in force in any direction exceeds this mg value, the event will trigger.                |
| poll_freq       | 1 to 5    | How often the accelerometer is polled for history data (Hz).                                          |
| hist_depth      | 1 to 75   | Number of accelerometer plots saved; each plot is a reoriented simple accelerometer vector (x, y, z). |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | cep 1000 5 75    |

## 6.14. ACCELEROMETER CONFIDENCE SLEW (CSL)

Configuration only available for target AAb3

| Command Type | Syntax                                                                                     |
|--------------|--------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg csl <rate_val><br><b>Response</b><br>:OK                          |
| READ         | <b>Command</b><br>:rycfg csl<br><b>Response</b><br>  csl: rate:<rate_val> (hex_val)<br>:OK |

| Parameter | Range              | Description                                        |
|-----------|--------------------|----------------------------------------------------|
| rate_val  | 1 to<br>4294967295 | Scalar for accelerometer orientation falling slew. |

| Target | Default Value(s) |
|--------|------------------|
| AAb3   | csl 10000        |

## 6.15. ACCELEROMETER CONFIDENCE THRESHOLD (CTH)

Configuration instances: 1

| Command Type | Syntax                                                                                                                              |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg cth <confidence_threshold> <hysteresis><br><b>Response</b><br>:OK                                          |
| READ         | <b>Command</b><br>:rycfg cth<br><b>Response</b><br>  cth: conf:<confidence_threshold> (hex_val), hyst:<hysteresis> (hex_val)<br>:OK |

| Parameter            | Range    | Description                                                                    |
|----------------------|----------|--------------------------------------------------------------------------------|
| confidence_threshold | 1 to 255 | A value, above which accelerometer events will be reported to the interpreter. |
| hysteresis           | 0 to 255 | A hysteresis value applied to a falling confidence level.                      |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | cth 120 60       |

## 6.16. DESTINATION (DST)

The dst[9] instance is utilized for all Device Manager interactions, including device Checkin Messages; configure accordingly.

Configuration instances: 10

| Command Type | Syntax                                                                                                                                    |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg dst[x] "<ip> <hostname> <local serial>" <port_number><br><b>Response</b><br>:OK                                  |
| READ         | <b>Command</b><br>:rycfg dst[x]<br><b>Response</b><br>  dst[x]: addr:"<ip> <hostname> <local serial>" port:<port_number> (hex_val)<br>:OK |

| Parameter                      | Range         | Description                                                                                                                                                                                                                                                                                                      |
|--------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ip> <hostname> <local serial> | 64 Characters | This id is the location specified by the dst. It can take the form of an IP address (192.0.0.0), a hostname limited to 64 characters, or a local serial port. The valid local serial ports are as follows: <ul style="list-style-type: none"> <li>"SERIAL_AUX0"</li> <li>"SERIAL_AUX1"</li> <li>"USB"</li> </ul> |
| port_number                    | 1 to 65533    | If using an IP address or a hostname, can be used to specify the port on which to connect.                                                                                                                                                                                                                       |

| Target                 | Default Value(s)                                                                                                                                                                                                                                             |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AAb1, AAa4, AAb5, AAb6 | dst[0] "0.0.0.0" 1024<br>dst[1] "0.0.0.0" 1024<br>dst[2] "0.0.0.0" 1024<br>dst[3] "0.0.0.0" 1024<br>dst[4] "0.0.0.0" 1024<br>dst[5] "0.0.0.0" 1024<br>dst[6] "0.0.0.0" 1024<br>dst[7] "0.0.0.0" 1024<br>dst[8] "0.0.0.0" 1024<br>dst[9] "216.70.51.106" 3110 |
| AAb3                   | dst[0] "0.0.0.0" 1024<br>dst[1] "0.0.0.0" 1024<br>dst[2] "0.0.0.0" 1024<br>dst[3] "0.0.0.0" 1024<br>dst[4] "0.0.0.0" 1024<br>dst[5] "0.0.0.0" 1024<br>dst[6] "0.0.0.0" 1024<br>dst[7] "0.0.0.0" 1024<br>dst[8] "0.0.0.0" 1024<br>dst[9] null                 |

## 6.17. OBD DTC THRESHOLD (DTC)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                        |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg dtc <poll period> <speed threshold 1mph/bit><br><b>Response</b><br>:OK                                               |
| READ         | <b>Command</b><br>:rycfg dtc<br><b>Response</b><br>  dtc: polfreq:<poll period> (hex_val), thresh:<speed threshold 1mph/bit> (hex_val)<br>:OK |

| Parameter       | Range    | Description                                                                                                                                                                                 |
|-----------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| poll period     | 0 to 30  | When vehicle speed is at or below <speed threshold>, periodically poll for DTC change (in minutes)<br><br>NOTE: Setting this to 5, for example, means the device will poll once every 5 min |
| speed threshold | 0 to 100 | Begin DTC reading when vehicle is at or below <speed threshold> in mph                                                                                                                      |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | dtc[0] 0 10      |

## 6.18. FLAG SAVE MASK (FSM)

*Configuration instances: 1*

| Command Type | Syntax                                                                           |
|--------------|----------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg fsm <32bit_mask><br><b>Response</b><br>:OK              |
| READ         | <b>Command</b><br>:rycfg fsm<br><b>Response</b><br>fsm: mask:<32bit_mask><br>:OK |

| Parameter   | Range                | Description                                                                                 |
|-------------|----------------------|---------------------------------------------------------------------------------------------|
| 32bit_mask: | 0x0 to<br>0xFFFFFFFF | A bitmask value corresponding to which scriptable user flags will be saved in persist data. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | fsm 0            |

## 6.19. FTP CONFIGURATION (FTP)

FTP is only supported on SARA-R410M, LARA-4202 and ELS61-US cellular modules at this time.

*Configuration instances: 1*

| Command Type | Syntax                                                                                                                                                                                                                                                |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ftp "<ip> <hostname>" <port_number> "<directory>" "<username>"<br>"<password>" <mode_val> <retry_max><br><b>Response</b><br>:OK                                                                                              |
| READ         | <b>Command</b><br>:rycfg ftp<br><b>Response</b><br>  ftp: addr:"<ip> <hostname>", port:<port_number> (hex_val), dir:"<directory>" ,<br>user:"<username>", passwd:"<password>", mode:<mode_val> (hex_val),<br>rtrymax:<retry_max_val> (hex_val)<br>:OK |

| Parameter       | Range          | Description                                                                                                                                                                                                                                                                           |       |             |   |                |   |         |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|----------------|---|---------|
| <ip> <hostname> | 63 char        | Takes the form of an IP address (192.0.0.0), or a hostname .                                                                                                                                                                                                                          |       |             |   |                |   |         |
| port_number     | 1 to 65533     | Specifies the port on which to connect to when using an IP address or hostname.                                                                                                                                                                                                       |       |             |   |                |   |         |
| directory       | 31 char        | A sub-directory on the FTP server where the requested files can be found.                                                                                                                                                                                                             |       |             |   |                |   |         |
| username        | 24 char        | Username used to access the FTP server given by the first argument.                                                                                                                                                                                                                   |       |             |   |                |   |         |
| password        | 12 char        | Password used to access the FTP server given by the first argument.<br><br>NOTE: Network carriers are inconsistent with handling special characters (~`!@\$%^&*()-_+={};/?,. ) over SMS. It is recommended to only use UDP commands to set passwords that contain special characters. |       |             |   |                |   |         |
| mode_val        | N/A            | <table><tr><th>Index</th><th>Description</th></tr><tr><td>0</td><td>(Discontinued)</td></tr><tr><td>1</td><td>Passive</td></tr></table>                                                                                                                                               | Index | Description | 0 | (Discontinued) | 1 | Passive |
| Index           | Description    |                                                                                                                                                                                                                                                                                       |       |             |   |                |   |         |
| 0               | (Discontinued) |                                                                                                                                                                                                                                                                                       |       |             |   |                |   |         |
| 1               | Passive        |                                                                                                                                                                                                                                                                                       |       |             |   |                |   |         |
| retry_max_val   | 0 to 255       | Number of times the device tries to fetch the requested file before giving up and flushing the request queue.                                                                                                                                                                         |       |             |   |                |   |         |

| Target                       | Default Value(s)                       |
|------------------------------|----------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ftp "0.0.0.0" 21 "dir" "usr" "pwd" 0 3 |

## 6.20. GARMIN™ BLACKLIST (GBL)

Configuration instances: 16

| Command Type | Syntax                                                                                                                                                                |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg gbl[x] <flags_hex> <pid_hex> <size_val> <byte0_hex> <byte1_hex><br><b>Response</b><br>:OK                                                    |
| READ         | <b>Command</b><br>:rycfg gbl<br><b>Response</b><br>  gbl[x]: flags:<flags_hex>, pid:<pid_hex>, size:<size_val> (hex_val), byte0:<byte0_hex>, byte1:<byte1_hex><br>:OK |

| Parameter | Range       | Description                                 |              |
|-----------|-------------|---------------------------------------------|--------------|
| flags_hex | N/A         | Mask that configures the match method:      |              |
|           |             | Hex                                         | Description  |
|           |             | 0x1                                         | Match byte 1 |
|           |             | 0x2                                         | Match byte 0 |
|           |             | 0x4                                         | Match size   |
|           |             | 0x8                                         | Match PID    |
| pid       | 0x0 to 0xFF | Single byte PID id match                    |              |
| size      | 0 to 255    | Single byte Garmin packet size match        |              |
| byte0_hex | 0x0 to 0xFF | Single byte Garmin packet first byte match  |              |
| byte1_hex | 0x0 to 0xFF | Single byte Garmin packet second byte match |              |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | gbl[x] 0         |

## 6.21. GENERIC CONFIG VALUE (GCV)

Configuration instances: 64

| Command Type | Syntax                                                                                                 |
|--------------|--------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg gcv[x] <unsigned_long><br><b>Response</b><br>:OK                              |
| READ         | <b>Command</b><br>:rycfg gcv[x]<br><b>Response</b><br>  gcv[x]: value:<unsigned_long> (hex_val)<br>:OK |

| Parameter     | Range           | Description                                               |
|---------------|-----------------|-----------------------------------------------------------|
| unsigned_long | 0 to 4494967295 | A generic configuration value accessible within a script. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | gcv[x] 0         |

## 6.22. GEOFENCE (GFN)

This config allows for both circular and polygonal geofences.

Configuration instances: 50

### Circular Fence

| Command Type | Syntax                                                                                                                                                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg gfn[x] <latitude> <longitude> <radius_value><br><b>Response</b><br>:OK                                                             |
| READ         | <b>Command</b><br>:rycfg gfn[x]<br><b>Response</b><br>  gfn[x]: lat:<latitude> (hex_val), lon:<longitude> (hex_val), radius:<radius_value> (hex_val)<br>:OK |

## Polygonal Fence

At least 3, but no more than 11 coordinate pairs needed

| Command Type | Syntax                                                                                                                                                                                          |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg gfn[x] <latitude0> <longitude0>...<latitude10> <longitude10><br><b>Response</b><br>:OK                                                                                 |
| READ         | <b>Command</b><br>:rycfg gfn[x]<br><b>Response</b><br>  gfn[x]: lat0:<latitude0> (hex_val), lon0:<longitude0> (hex_val), ... lat10:<latitude10> (hex_val), lon10:<longitude10> (hex_val)<br>:OK |



**NOTE:** This parameter does not have a factory default setting.

| Parameter    | Range                     | Description                                                                                 |
|--------------|---------------------------|---------------------------------------------------------------------------------------------|
| latitude     | -90.000000 to 90.000000   | Latitude point to 6 decimal places (e.g. 44.863511)                                         |
| longitude    | -180.000000 to 180.000000 | Longitude point to 6 decimal places (e.g. -93.340138)                                       |
| radius_value | 1 to 1000000              | Only for circular fences, distance in meters from center point of circle to outer perimeter |

| Target                       | Default Value(s)               |
|------------------------------|--------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | all gfn[x] args default to '0' |

## 6.23. GPS MOTION THRESHOLDS (GPS)

Configuration instances: 1

| Command Type | Syntax                                                                                                                        |
|--------------|-------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg gps <motion_start> <motion_stop><br><b>Response</b><br>:OK                                           |
| READ         | <b>Command</b><br>:rycfg gps<br><b>Response</b><br>  gps: start:<motion_start> (hex_val), stop:<motion_stop> (hex_val)<br>:OK |

| Parameter    | Range    | Description                                                            |
|--------------|----------|------------------------------------------------------------------------|
| motion_start | 0 to 200 | Configure GPS motion detection start speed threshold in tenths of MPH. |
| motion_stop  | 0 to 200 | Configure GPS motion detection stop speed threshold in tenths of MPH   |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | gps 100 10       |

## 6.24. GARMIN™ CONFIGURATION (GRM)

*Configuration instances: 1*

| Command Type | Syntax                                                                                            |
|--------------|---------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg grm<filter_enable><br><b>Response</b><br>:OK                             |
| READ         | <b>Command</b><br>:rycfg grm<br><b>Response</b><br>  grm: enable:<filter_enable> (hex_val)<br>:OK |

| Parameter     | Range | Description                                                                                                                     |
|---------------|-------|---------------------------------------------------------------------------------------------------------------------------------|
| filter_enable | N/A   | Activates Garmin message filter that drops the first delete all stops request and the first stop 1 status request in a session. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | grm 0            |

## 6.25. IMPEDE DEVICE MANAGER (IDM)

Configuration instances: 1

| Command Type | Syntax                                                                                  |
|--------------|-----------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg idm <select><br><b>Response</b><br>:OK                         |
| READ         | <b>Command</b><br>:rycfg idm<br><b>Response</b><br>  idm: sel:<select> (hex_val)<br>:OK |

| Parameter | Range | Description |                                                   |
|-----------|-------|-------------|---------------------------------------------------|
| select    | N/A   | Index       | Description                                       |
|           |       | 0           | DM service operates normally                      |
|           |       | 1           | DM checkin messages and interactions are disabled |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | idm 0            |

## 6.26. INPUT DEFAULT POLARITY (IDP)

- idp[0] -> PUD on user input 1
- idp[1] -> PUD on user input 2
- idp[2] -> PUD on user input 3
- idp[3] -> PUD on user input 4

Configuration instances: 4

| Command Type | Syntax                                                                                                   |
|--------------|----------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg idp[x] <pullup_disable><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg idp[x]<br><b>Response</b><br>  idp[x]: polrty:<pullup_disable> (hex_val)<br>:OK |

| Parameter          | Range  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input active level | 0 to 1 | Sets the corresponding user input "active" level by engaging an external pullup ('0') or pulldown ('1') on corresponding that user input.<br><br>An idp setting of '1' means the user input is configured active high, so the user input is pulled down when not driven by external influences.<br><br>An idp setting of '0' means the user input is configured active low, so the user input is pulled up when not driven by external influences. |

| Target                       | Default Value(s)                             |
|------------------------------|----------------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | idp[0] 0<br>idp[1] 0<br>idp[2] 0<br>idp[3] 0 |

## 6.27. IGNITION SENSE (IGN)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                       |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ign <type> <onsec> <offsec><br><br>OR<br>:wycfg ign <type> <andmask> <ormask><br><b>Response</b><br>:OK             |
| READ         | <b>Command</b><br>:rycfg ign<br><b>Response</b><br>  ign: type:<type> (hex_val), param1:<param1> (hex_val), param2:<param2> (hex_val)<br>:OK |

| Parameter      | Range          | Description                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
|----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|--------|----------------|--------|-------------|--------|-------------|--------|-----|--------|-----|--------|----------|--------|----------|--------|----------|
| type           | 1 to 3         | Ignition detection type. Type 1 and 2 use ignition onsec and offsec parameters. Type 3 is used for and/or masks. <table><tr><th>Index</th><th>Description</th></tr><tr><td>1</td><td>Wired</td></tr><tr><td>2</td><td>Vehicle Bus</td></tr><tr><td>3</td><td>(Composite)</td></tr></table>                                                                                                                    | Index | Description | 1      | Wired          | 2      | Vehicle Bus | 3      | (Composite) |        |     |        |     |        |          |        |          |        |          |
| Index          | Description    |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 1              | Wired          |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 2              | Vehicle Bus    |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 3              | (Composite)    |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| onsec          | 1 to 65535     | Configured ignition type source must be true for x seconds before reported to script.                                                                                                                                                                                                                                                                                                                         |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| offsec         | 1 to 65535     | Configured ignition type source must be false for x seconds before reported to script.                                                                                                                                                                                                                                                                                                                        |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| andmask/ormask | N/A            | Ignition detection masks <table><tr><th>Index</th><th>Description</th></tr><tr><td>0x0001</td><td>Wired Ignition</td></tr><tr><td>0x0002</td><td>IN1</td></tr><tr><td>0x0004</td><td>IN2</td></tr><tr><td>0x0008</td><td>IN3</td></tr><tr><td>0x0010</td><td>IN4</td></tr><tr><td>0x0020</td><td>Reserved</td></tr><tr><td>0x0040</td><td>Reserved</td></tr><tr><td>0x0080</td><td>Reserved</td></tr></table> | Index | Description | 0x0001 | Wired Ignition | 0x0002 | IN1         | 0x0004 | IN2         | 0x0008 | IN3 | 0x0010 | IN4 | 0x0020 | Reserved | 0x0040 | Reserved | 0x0080 | Reserved |
| Index          | Description    |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0001         | Wired Ignition |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0002         | IN1            |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0004         | IN2            |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0008         | IN3            |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0010         | IN4            |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0020         | Reserved       |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0040         | Reserved       |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |
| 0x0080         | Reserved       |                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |        |                |        |             |        |             |        |     |        |     |        |          |        |          |        |          |

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Range                                                                                                                                                                                                                                                              | Description |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-------------|--------|-------------|--------|---------------------------------------------------------------------------|--------|--------------------------------------|--------|-------------------------------------------------------------------------|--------|----------|--------|----------|--------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div> <b>NOTE:</b> Ignition sources above will attempt to have a 1:1 with Input/Output State Bits on p. 158</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                    |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| <table><tr><th>Index</th><th>Description</th></tr><tr><td>0x0100</td><td>Vehicle Bus</td></tr><tr><td>0x0200</td><td>Virtual Battery (Configured by Alternator State Threshold (ast) on p. 39)</td></tr><tr><td>0x0400</td><td>Virtual Vibration (Non-configurable)</td></tr><tr><td>0x0800</td><td>GPS-based movement (Configured by GPS Motion Thresholds (gps) on p. 57)</td></tr><tr><td>0x1000</td><td>Reserved</td></tr><tr><td>0x2000</td><td>Reserved</td></tr><tr><td>0x4000</td><td>Reserved</td></tr><tr><td>0x8000</td><td>ANDMODE bit<ul style="list-style-type: none"><li>• Default (when cleared): ANDMODE=ALL_OFF</li><li>• when bit is set the ANDMODE=ANY_OFF</li><li>• ANDMODE only affects the judgement of ignition-off. All AND-sources must be on to judge ignition-on.</li></ul></td></tr></table> |                                                                                                                                                                                                                                                                    |             | Index | Description | 0x0100 | Vehicle Bus | 0x0200 | Virtual Battery (Configured by Alternator State Threshold (ast) on p. 39) | 0x0400 | Virtual Vibration (Non-configurable) | 0x0800 | GPS-based movement (Configured by GPS Motion Thresholds (gps) on p. 57) | 0x1000 | Reserved | 0x2000 | Reserved | 0x4000 | Reserved | 0x8000 | ANDMODE bit <ul style="list-style-type: none"><li>• Default (when cleared): ANDMODE=ALL_OFF</li><li>• when bit is set the ANDMODE=ANY_OFF</li><li>• ANDMODE only affects the judgement of ignition-off. All AND-sources must be on to judge ignition-on.</li></ul> |
| Index                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Description                                                                                                                                                                                                                                                        |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x0100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Vehicle Bus                                                                                                                                                                                                                                                        |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x0200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Virtual Battery (Configured by Alternator State Threshold (ast) on p. 39)                                                                                                                                                                                          |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x0400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Virtual Vibration (Non-configurable)                                                                                                                                                                                                                               |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x0800                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GPS-based movement (Configured by GPS Motion Thresholds (gps) on p. 57)                                                                                                                                                                                            |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reserved                                                                                                                                                                                                                                                           |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reserved                                                                                                                                                                                                                                                           |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reserved                                                                                                                                                                                                                                                           |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |
| 0x8000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ANDMODE bit <ul style="list-style-type: none"><li>• Default (when cleared): ANDMODE=ALL_OFF</li><li>• when bit is set the ANDMODE=ANY_OFF</li><li>• ANDMODE only affects the judgement of ignition-off. All AND-sources must be on to judge ignition-on.</li></ul> |             |       |             |        |             |        |                                                                           |        |                                      |        |                                                                         |        |          |        |          |        |          |        |                                                                                                                                                                                                                                                                    |

| Target                 | Default Value(s) |
|------------------------|------------------|
| AAb1, AAb3, AAb5, AAb6 | ign 1 1 1        |
| AAa4                   | ign 2 1 1        |

## 6.28. IOT DESTINATION ADDRESS/PORT (IIP)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                            |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg iip "<ip> <hostname>" <port_number> <QoS Level> <Keep Alive><br><b>Response</b><br>:OK                                                                   |
| READ         | <b>Command</b><br>:rycfg iip<br><b>Response</b><br>  iip: addr:"<ip> <hostname>", port:<port_number> (hex_val), qoslev:<QoS Level> (hex_val), keepa:<Keep Alive> (hex_val)<br>:OK |

| Parameter        | Range                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                   |       |             |   |                                                 |   |                                                       |
|------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|-------------------------------------------------|---|-------------------------------------------------------|
| <ip> <hostname>: | 128 Characters                                        | Can take the form of an IP address (192.0.0.0), or a hostname, e.g., www.xirgotech.com                                                                                                                                                                                                                                                                                                        |       |             |   |                                                 |   |                                                       |
| port_number      | 1 to 65533                                            | When using an IP address or hostname, port can be used to specify the port on which to connect.                                                                                                                                                                                                                                                                                               |       |             |   |                                                 |   |                                                       |
| QoS Level        | N/A                                                   | Quality of service level                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                                                 |   |                                                       |
|                  |                                                       | <table><tr><th>Index</th><th>Description</th></tr><tr><td>0</td><td>Fire and forget; device will send messages once</td></tr><tr><td>1</td><td>ACK required; device will send messages at least once</td></tr></table>                                                                                                                                                                        | Index | Description | 0 | Fire and forget; device will send messages once | 1 | ACK required; device will send messages at least once |
| Index            | Description                                           |                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                                 |   |                                                       |
| 0                | Fire and forget; device will send messages once       |                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                                 |   |                                                       |
| 1                | ACK required; device will send messages at least once |                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                                 |   |                                                       |
| Keep Alive       | 30 to 1200                                            | MQTT keepalive interval. This tells the server how often to expect MQTT PING packets before disconnecting the device. An interval of 60 seconds will tell the server to expect a PING or some other traffic from the device every 60 seconds. If the device does not reply for 90 seconds (keepalive x 1.5) the server will assume the device has gone offline and will close the TLS socket. |       |             |   |                                                 |   |                                                       |

| Target                       | Default Value(s)        |
|------------------------------|-------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | iip "0.0.0.0" 1024 1 60 |

## 6.29. IOT SHADOW PARAMS (ISH)

Configuration instances: 1

| Command Type | Syntax                                                                                                                      |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ish "<topic_string>" <shadow trim val><br><b>Response</b><br>:OK                                   |
| READ         | <b>Command</b><br>:rycfg ish<br><b>Response</b><br>  ish: topic:"<topic_string>", shadtrm:<shadow trimval> (hex_val)<br>:OK |

| Parameter       | Range              | Description                                                                                                                                           |       |             |   |                    |   |                   |
|-----------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|--------------------|---|-------------------|
| topic_string    | 128 Characters     | AWS Shadow topic string                                                                                                                               |       |             |   |                    |   |                   |
| Shadow trim val | N/A                | Shadow trim enable                                                                                                                                    |       |             |   |                    |   |                   |
|                 |                    | <table><tr><th>Index</th><th>Description</th></tr><tr><td>0</td><td>Disable AWS shadow</td></tr><tr><td>1</td><td>Enable AWS shadow</td></tr></table> | Index | Description | 0 | Disable AWS shadow | 1 | Enable AWS shadow |
| Index           | Description        |                                                                                                                                                       |       |             |   |                    |   |                   |
| 0               | Disable AWS shadow |                                                                                                                                                       |       |             |   |                    |   |                   |
| 1               | Enable AWS shadow  |                                                                                                                                                       |       |             |   |                    |   |                   |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | Ish "" 0         |

### 6.30. INPUT STATE SOURCE (ISS)

- iss[0] -> Source for user input 1
- iss[1] -> Source for user input 2
- iss[2] -> Source for user input 3
- iss[3] -> Source for user input 4

Configuration instances: 4

| Command Type | Syntax                                                                                               |
|--------------|------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg iss[x] <source_val><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg iss[x]<br><b>Response</b><br>  idp[x]: source:<source_val> (hex_val)<br>:OK |

| Parameter  | Description                                                                                                                                                                                              |       |             |   |                                                 |   |                                  |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|-------------------------------------------------|---|----------------------------------|
| source_val | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Physical hardware pins determine reported state</td></tr> <tr> <td>1</td><td>Script determines reported state</td></tr> </table> | Index | Description | 0 | Physical hardware pins determine reported state | 1 | Script determines reported state |
| Index      | Description                                                                                                                                                                                              |       |             |   |                                                 |   |                                  |
| 0          | Physical hardware pins determine reported state                                                                                                                                                          |       |             |   |                                                 |   |                                  |
| 1          | Script determines reported state                                                                                                                                                                         |       |             |   |                                                 |   |                                  |

| Target                       | Default Value(s)                             |
|------------------------------|----------------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | iss[0] 0<br>iss[1] 0<br>iss[2] 0<br>iss[3] 0 |

## 6.31. IOT THING STRING (ITS)

Configuration instances: 1

| Command Type | Syntax                                                                                                               |
|--------------|----------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg its "<topic_string>" "<client id string>"<br><b>Response</b><br>:OK                         |
| READ         | <b>Command</b><br>:rycfg its<br><b>Response</b><br>  its: topic:"<topic_string>", clntid:"<client id string>"<br>:OK |

| Parameter        | Range          | Description                                                      |
|------------------|----------------|------------------------------------------------------------------|
| topic_string     | 128 Characters | AWS topic string                                                 |
| client id string | 64 Characters  | AWS client id string. If left blank, defaults to "XT6379_<IMEI>" |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAn6 | its "" ""        |

## 6.32. MIP/SIP CONTROL (MIP)

Configuration instances: 1

| Command Type | Syntax                                                                                       |
|--------------|----------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg mip <mode_value><br><b>Response</b><br>:OK                          |
| READ         | <b>Command</b><br>:rycfg mip<br><b>Response</b><br>  mip: mode:<mode_value> (hex_val)<br>:OK |

| Parameter  | Description                                                                                                                                                                                            |       |             |   |                |   |                     |   |                |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|----------------|---|---------------------|---|----------------|
| mode value | Select cellular mobile IP mode:                                                                                                                                                                        |       |             |   |                |   |                     |   |                |
|            | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Simple IP only</td></tr> <tr> <td>1</td><td>Mobile IP preferred</td></tr> <tr> <td>2</td><td>Mobile IP only</td></tr> </table> | Index | Description | 0 | Simple IP only | 1 | Mobile IP preferred | 2 | Mobile IP only |
| Index      | Description                                                                                                                                                                                            |       |             |   |                |   |                     |   |                |
| 0          | Simple IP only                                                                                                                                                                                         |       |             |   |                |   |                     |   |                |
| 1          | Mobile IP preferred                                                                                                                                                                                    |       |             |   |                |   |                     |   |                |
| 2          | Mobile IP only                                                                                                                                                                                         |       |             |   |                |   |                     |   |                |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | mip 1            |

## 6.33. MPG CONTROL (MPG)

This is a user configuration for MPG calculations.

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                                                             |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg mpg <fuel type value> <use type value> <EFR coefficient> <MAF coefficient><br><b>Response</b><br>:OK                                                                                      |
| READ         | <b>Command</b><br>:rycfg mpg<br><b>Response</b><br>  mpg: fueltyp:<fuel type value> (hex_val), usetype:<use type value> (hex_val), efrcoef:<EFR coefficient> (hex_val), mafcoef:<MAF coefficient> (hex_val)<br>:OK |

| Parameter       | Range   | Description                                         |
|-----------------|---------|-----------------------------------------------------|
| fuel type value | N/A     | <b>Index</b> <b>Description</b>                     |
|                 |         | 0      Discover Fuel Type from vehicle (default)    |
|                 |         | 1      Gasoline                                     |
|                 |         | 2      Diesel                                       |
| use type value  | N/A     | <b>Index</b> <b>Description</b>                     |
|                 |         | 0      Discover support type from vehicle (default) |
|                 |         | 1      Use Engine Fuel Rate                         |
|                 |         | 2      Use Mass Air Flow                            |
| EFR coefficient | 0 to 10 | Coefficient used in EFR calculation                 |
| MAF coefficient | 0 to 10 | Coefficient used in MAF calculation                 |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | mpg 0 0 1 1      |

## 6.34. MOTION SENSITIVITY (MST)

*Configuration instances: 1*

| Command Type | Syntax                                                                                                       |
|--------------|--------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg mst <motion_sensitivity_value><br><b>Response</b><br>:OK                            |
| READ         | <b>Command</b><br>:rycfg mst<br><b>Response</b><br>  mst: motion:<motion_sensitivity_value> (hex_val)<br>:OK |

| Parameter                | Range     | Description                                                                     |
|--------------------------|-----------|---------------------------------------------------------------------------------|
| motion_sensitivity_value | 1 to 2000 | Configure accelerometer motion sensitivity in thousandths of a unit of gravity. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | mst 100          |

## 6.35. NMEA STREAM OUTPUT (NSO)

- nso[0] -> USB
- nso[1] -> Aux0
- nso[2] -> Aux1

Configuration instances: 3

| Command Type | Syntax                                                                                  |
|--------------|-----------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg nso[x] <8bit_mask><br><b>Response</b><br>:OK                   |
| READ         | <b>Command</b><br>:rycfg nso[x]<br><b>Response</b><br>  nso[x]: mask:<8bit_mask><br>:OK |

| Parameter | Description                                                                                                                                                                                                                                                     |     |             |      |        |      |        |      |        |      |        |       |        |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|------|--------|------|--------|------|--------|------|--------|-------|--------|
| 8bit_mask | One bit for each of the available NMEA sentences; values can be added to stream more than one sentence type. Set mask to zero to stop streaming.                                                                                                                |     |             |      |        |      |        |      |        |      |        |       |        |
|           | <table> <tr> <th>Hex</th><th>Description</th></tr> <tr> <td>0x01</td><td>GP GGA</td></tr> <tr> <td>0x02</td><td>GP GLL</td></tr> <tr> <td>0x04</td><td>GP GSA</td></tr> <tr> <td>0x08</td><td>GP GSV</td></tr> <tr> <td>0x010</td><td>GP RMC</td></tr> </table> | Hex | Description | 0x01 | GP GGA | 0x02 | GP GLL | 0x04 | GP GSA | 0x08 | GP GSV | 0x010 | GP RMC |
| Hex       | Description                                                                                                                                                                                                                                                     |     |             |      |        |      |        |      |        |      |        |       |        |
| 0x01      | GP GGA                                                                                                                                                                                                                                                          |     |             |      |        |      |        |      |        |      |        |       |        |
| 0x02      | GP GLL                                                                                                                                                                                                                                                          |     |             |      |        |      |        |      |        |      |        |       |        |
| 0x04      | GP GSA                                                                                                                                                                                                                                                          |     |             |      |        |      |        |      |        |      |        |       |        |
| 0x08      | GP GSV                                                                                                                                                                                                                                                          |     |             |      |        |      |        |      |        |      |        |       |        |
| 0x010     | GP RMC                                                                                                                                                                                                                                                          |     |             |      |        |      |        |      |        |      |        |       |        |

| Target                       | Default Value(s)                 |
|------------------------------|----------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | nso[0] 0<br>nso[1] 0<br>nso[2] 0 |

## 6.36. OBD ACCEL AND DECEL (OAD)

Configuration instances: 2

| Command Type | Syntax                                                                                         |
|--------------|------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg oad[x] <rate><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg oad[x]<br><b>Response</b><br>  oad[x]: accdec:<rate> (hex_val)<br>:OK |

| Parameter | Descriptions               |           |                                                                                                                      |
|-----------|----------------------------|-----------|----------------------------------------------------------------------------------------------------------------------|
| rate      | rate is measured in .1 mph |           |                                                                                                                      |
|           | Instance                   | Range     | Description                                                                                                          |
|           | oad[0]                     | 10 to 200 | OBD acceleration threshold.<br><br>Speed rate of change to exceed on acceleration to declare Hard Acceleration Event |
|           | oad[1]                     | 10 to 200 | OBD deceleration threshold.<br><br>Speed rate of change to exceed on deceleration to declare Hard Deceleration Event |

| Target                       | Default Value(s)         |
|------------------------------|--------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | oad[0] 100<br>oad[1] 100 |

## 6.37. OBD FEATURE ENABLE/DISABLE (OBD)

Configuration instances: 8

| Command Type | Syntax                                                                                                                            |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg obd[x] <flags_index> <mode_index><br><b>Response</b><br>:OK                                              |
| READ         | <b>Command</b><br>:rycfg obd[x]<br><b>Response</b><br>  obd[x]: flags:<flags_index> (hex_val), mode:<mode_index> (hex_val)<br>:OK |



**NOTE:** This parameter does not have a factory default setting.

| Instance | Description                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |         |   |        |       |             |   |           |   |                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|---------|---|--------|-------|-------------|---|-----------|---|----------------------------|
| obd[0]   | <p>Obd Comms Enable.</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table> <p><i>mode_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Immediate</td></tr> <tr> <td>1</td><td>Next Ignition off detected</td></tr> </table>                                      | Index | Description | 0 | Disable | 1 | Enable | Index | Description | 0 | Immediate | 1 | Next Ignition off detected |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |         |   |        |       |             |   |           |   |                            |
| 0        | Disable                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |         |   |        |       |             |   |           |   |                            |
| 1        | Enable                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |         |   |        |       |             |   |           |   |                            |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |         |   |        |       |             |   |           |   |                            |
| 0        | Immediate                                                                                                                                                                                                                                                                                                                                                                                                            |       |             |   |         |   |        |       |             |   |           |   |                            |
| 1        | Next Ignition off detected                                                                                                                                                                                                                                                                                                                                                                                           |       |             |   |         |   |        |       |             |   |           |   |                            |
| obd[1]   | <p>Obd VIN Read Enable.</p> <p>The OBD[1] VIN Read Enable feature can be configured using masks to perform a Ford VIN Read and a VIN Read. Using this configuration will look for Ford VIN first. If VIN not obtained via Ford VIN read the device will attempt alternate VIN read.</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> </table> | Index | Description | 0 | Disable |   |        |       |             |   |           |   |                            |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |         |   |        |       |             |   |           |   |                            |
| 0        | Disable                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |         |   |        |       |             |   |           |   |                            |

| Instance | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------------|-------|----------------------|-------|----------------------------------------------|---------|-----------------------------------|
|          | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>1</td><td>VIN enable</td></tr> <tr> <td>2</td><td>Ford VIN Read enable</td></tr> <tr> <td>3</td><td>Ford VIN Read enable and VIN Read enable</td></tr> </table>                                                                                                                                                                  | Index | Description | 1 | VIN enable | 2     | Ford VIN Read enable | 3     | Ford VIN Read enable and VIN Read enable     |         |                                   |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | VIN enable                                                                                                                                                                                                                                                                                                                                                                                     |       |             |   |            |       |                      |       |                                              |         |                                   |
| 2        | Ford VIN Read enable                                                                                                                                                                                                                                                                                                                                                                           |       |             |   |            |       |                      |       |                                              |         |                                   |
| 3        | Ford VIN Read enable and VIN Read enable                                                                                                                                                                                                                                                                                                                                                       |       |             |   |            |       |                      |       |                                              |         |                                   |
| obd[2]   | <p>Obd Debug Enable (OBD Datalogger).</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>1</td><td>Enable</td></tr> </table> <p><i>mode_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Overwrite old debug data continuously</td></tr> <tr> <td>1</td><td>Cease logging when memory is full</td></tr> </table> | Index | Description | 1 | Enable     | Index | Description          | 0     | Overwrite old debug data continuously        | 1       | Cease logging when memory is full |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | Enable                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |            |       |                      |       |                                              |         |                                   |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 0        | Overwrite old debug data continuously                                                                                                                                                                                                                                                                                                                                                          |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | Cease logging when memory is full                                                                                                                                                                                                                                                                                                                                                              |       |             |   |            |       |                      |       |                                              |         |                                   |
| obd[3]   | <p>Obd Monitor Only (no bus requests) Enable.</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> <tr> <td>2</td><td>Listen Only CAN/J1708 during protocol detect</td></tr> </table>                                                                                                   | Index | Description | 0 | Disable    | 1     | Enable               | 2     | Listen Only CAN/J1708 during protocol detect |         |                                   |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 0        | Disable                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | Enable                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |            |       |                      |       |                                              |         |                                   |
| 2        | Listen Only CAN/J1708 during protocol detect                                                                                                                                                                                                                                                                                                                                                   |       |             |   |            |       |                      |       |                                              |         |                                   |
| obd[4]   | <p>Obd Electric (JBUS only) Enable.</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table>                                                                                                                                                                                       | Index | Description | 0 | Disable    | 1     | Enable               |       |                                              |         |                                   |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 0        | Disable                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | Enable                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |            |       |                      |       |                                              |         |                                   |
| obd[5]   | <p>Obd ECO Enable.</p> <p><i>flags_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table> <p><i>mode_index</i></p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0 to 10</td><td>Eco mode end trip minutes</td></tr> </table>                                                    | Index | Description | 0 | Disable    | 1     | Enable               | Index | Description                                  | 0 to 10 | Eco mode end trip minutes         |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 0        | Disable                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |            |       |                      |       |                                              |         |                                   |
| 1        | Enable                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |            |       |                      |       |                                              |         |                                   |
| Index    | Description                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |            |       |                      |       |                                              |         |                                   |
| 0 to 10  | Eco mode end trip minutes                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |            |       |                      |       |                                              |         |                                   |

| Instance | Description                                                                                                                            |       |             |   |         |   |        |
|----------|----------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|---------|---|--------|
| obd[6]   | Obd Wake Listen Enable.<br><br><i>flags_index</i>                                                                                      |       |             |   |         |   |        |
|          | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table> | Index | Description | 0 | Disable | 1 | Enable |
| Index    | Description                                                                                                                            |       |             |   |         |   |        |
| 0        | Disable                                                                                                                                |       |             |   |         |   |        |
| 1        | Enable                                                                                                                                 |       |             |   |         |   |        |
| obd[7]   | Obd Wake GPS Movement Enable.<br><br><i>flags_index</i>                                                                                |       |             |   |         |   |        |
|          | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Disable</td></tr> <tr> <td>1</td><td>Enable</td></tr> </table> | Index | Description | 0 | Disable | 1 | Enable |
| Index    | Description                                                                                                                            |       |             |   |         |   |        |
| 0        | Disable                                                                                                                                |       |             |   |         |   |        |
| 1        | Enable                                                                                                                                 |       |             |   |         |   |        |

| Target                       | Default Value(s)                                                                                             |
|------------------------------|--------------------------------------------------------------------------------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | obd[0] 1 1<br>obd[1] 1 1<br>obd[2] 1 0<br>obd[3] 0 1<br>obd[4] 0 0<br>obd[5] 1 3<br>obd[6] 1 0<br>obd[7] 1 0 |

## 6.38. OBD IGN OFF ACCUM (OIO)

- oio[0] -> Gps Lifetime Odometer ignition off accumulation
- oio[1] -> Gps Trip Odometer 1 ignition off accumulation
- oio[2] -> Gps Trip Odometer 2 ignition off accumulation

Configuration instances: 3

| Command Type | Syntax                                                                                          |
|--------------|-------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg oio[x] <accum><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg oio[x]<br><b>Response</b><br>  oio[x]: offacc:<accum> (hex_val)<br>:OK |

| Parameter | Description                                                                                                                                                                                                      |       |             |   |                                                 |   |                                          |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|-------------------------------------------------|---|------------------------------------------|
| accum     | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Do not accumulate distance when ignition is off</td></tr> <tr> <td>1</td><td>Accumulate distance when ignition is off</td></tr> </table> | Index | Description | 0 | Do not accumulate distance when ignition is off | 1 | Accumulate distance when ignition is off |
| Index     | Description                                                                                                                                                                                                      |       |             |   |                                                 |   |                                          |
| 0         | Do not accumulate distance when ignition is off                                                                                                                                                                  |       |             |   |                                                 |   |                                          |
| 1         | Accumulate distance when ignition is off                                                                                                                                                                         |       |             |   |                                                 |   |                                          |

| Target                       | Default Value(s)                 |
|------------------------------|----------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | oio[0] 0<br>oio[1] 0<br>oio[2] 0 |

## 6.39. OBD RPM AND SPEED EVENTS (ORS)

Configuration instances: 2

| Command Type | Syntax                                                                                                                         |
|--------------|--------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ors[x] <threshold> <time sec><br><b>Response</b><br>:OK                                               |
| READ         | <b>Command</b><br>:rycfg ors[x]<br><b>Response</b><br>  ors[x]: thresh:<threshold> (hex_val), time:<time sec> (hex_val)<br>:OK |

| Instance | Description     |                           |                                                                             |
|----------|-----------------|---------------------------|-----------------------------------------------------------------------------|
| ors[0]   | RPM Threshold   |                           |                                                                             |
|          | Parameter       | Range                     | Description                                                                 |
|          | threshold       | 0 (disable), 100 to 20000 | RPM in 1 rpm to exceed                                                      |
|          | time sec        | 1 to 60                   | Time RPM must be greater than threshold to declare an RPM Exceeded Event    |
| ors[1]   | Speed Threshold |                           |                                                                             |
|          | Parameter       | Range                     | Description                                                                 |
|          | threshold       | 0 (disable), 20 to 150    | Speed in 1 mph to exceed                                                    |
|          | Time sec        | 1 to 60                   | Time Speed must be greater than threshold to declare a Speed Exceeded Event |

| Target                       | Default Value(s)               |
|------------------------------|--------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ors[0] 1500 15<br>ors[1] 75 15 |

## 6.40. OTA PREVENT (OTA)

Configuration instances: 1

| Command Type | Syntax                                                                                              |
|--------------|-----------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ota <enable_mask><br><b>Response</b><br>:OK                                |
| READ         | <b>Command</b><br>:rycfg ota <enable_mask><br><b>Response</b><br>  ota: enable:<enable_mask><br>:OK |

| Parameter   | Description                                                                                                                                                                                                                                                                                                                                                                      |     |             |     |                                                                      |     |                                                                              |     |                                                                       |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|-----|----------------------------------------------------------------------|-----|------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------|
| enable_mask | <table> <tr> <th>Hex</th><th>Description</th></tr> <tr> <td>0x0</td><td>OTA is not prevented due to OBD Communications state or TPS Transfer</td></tr> <tr> <td>0x1</td><td>Prevent OTA when OBD Communications are Active (OBD Communications detected)</td></tr> <tr> <td>0x2</td><td>Prevent OTA when TPS Transfer is Active (TPS Transfer is in progress)</td></tr> </table> | Hex | Description | 0x0 | OTA is not prevented due to OBD Communications state or TPS Transfer | 0x1 | Prevent OTA when OBD Communications are Active (OBD Communications detected) | 0x2 | Prevent OTA when TPS Transfer is Active (TPS Transfer is in progress) |
| Hex         | Description                                                                                                                                                                                                                                                                                                                                                                      |     |             |     |                                                                      |     |                                                                              |     |                                                                       |
| 0x0         | OTA is not prevented due to OBD Communications state or TPS Transfer                                                                                                                                                                                                                                                                                                             |     |             |     |                                                                      |     |                                                                              |     |                                                                       |
| 0x1         | Prevent OTA when OBD Communications are Active (OBD Communications detected)                                                                                                                                                                                                                                                                                                     |     |             |     |                                                                      |     |                                                                              |     |                                                                       |
| 0x2         | Prevent OTA when TPS Transfer is Active (TPS Transfer is in progress)                                                                                                                                                                                                                                                                                                            |     |             |     |                                                                      |     |                                                                              |     |                                                                       |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ota[0] 0         |

## 6.41. OBD OVERRIDE (OVR)

Configuration instances: 3

| Command Type | Syntax                                                                                                 |
|--------------|--------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ovr[x] <enable_value><br><b>Response</b><br>:OK                               |
| READ         | <b>Command</b><br>:rycfg ovr[x]<br><b>Response</b><br>  ovr[x]: enable:<enable_value> (hex_val)<br>:OK |

| Parameter               | Description                                                                                                                                                               |                                                     |                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------|
| enable_value            | Instance                                                                                                                                                                  | Description                                         |                                                                                     |
|                         | ovr[0]                                                                                                                                                                    | Override Engine Hours                               |                                                                                     |
|                         |                                                                                                                                                                           | Index                                               | Description                                                                         |
|                         |                                                                                                                                                                           | 0                                                   | use derived engine hours if ECU engine hours not available                          |
|                         |                                                                                                                                                                           | 1                                                   | use Derived Engine Hours only – ignore ECU engine hours                             |
|                         |                                                                                                                                                                           | 2                                                   | use ECU Engine Hours only (keep in persist) – do not calculate derived engine hours |
|                         | ovr[1]                                                                                                                                                                    | Override ECU Vehicle Speed                          |                                                                                     |
|                         |                                                                                                                                                                           | Index                                               | Description                                                                         |
|                         |                                                                                                                                                                           | 0                                                   | use ECU Vehicle Speed                                                               |
|                         |                                                                                                                                                                           | 1                                                   | use GPS Vehicle Speed                                                               |
| enable_value (protocol) | Instance                                                                                                                                                                  | Description                                         |                                                                                     |
|                         | ovr[2]                                                                                                                                                                    | Override OBD Protocol Discovery                     |                                                                                     |
|                         |                                                                                                                                                                           | Index                                               | Description                                                                         |
|                         |                                                                                                                                                                           | 0                                                   | No override                                                                         |
|                         | 0x001 to 0x200                                                                                                                                                            | OBD Protocol Table in OBD Run States Bits on p. 159 |                                                                                     |
|                         | <div> <b>NOTE:</b> Any specified Protocol ID will be the ONLY protocol attempted</div> |                                                     |                                                                                     |
|                         |                                                                                                                                                                           |                                                     |                                                                                     |

| Target                       | Default Value(s)                 |
|------------------------------|----------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ovr[0] 0<br>ovr[1] 0<br>ovr[2] 0 |

## 6.42. PACKET CREATION APPEND (PCA)

Configuration instances: 16

| Command Type | Syntax                                                                                                         |
|--------------|----------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg pca[x] "<append_hex_string>"<br><b>Response</b><br>:OK                                |
| READ         | <b>Command</b><br>:rycfg pca[x]<br><b>Response</b><br>  pca[x]: append_hex_string:"<append_hex_string>"<br>:OK |



**NOTE:** This parameter does not have a factory default setting.

| Parameter         | Description                                                               |
|-------------------|---------------------------------------------------------------------------|
| append_hex_string | Refer to <a href="#">Packet Creation Append</a> for configuration details |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | pca[x] ""        |

## 6.43. PACKET CREATION RECIPE (PCR)

Configuration instances: 128

| Command Type | Syntax                                                                                                         |
|--------------|----------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg pcr[x] "<recipe_hex_string>"<br><b>Response</b><br>:OK                                |
| READ         | <b>Command</b><br>:rycfg pcr[x]<br><b>Response</b><br>  pcr[x]: resipe_hex_string:"<recipe_hex_string>"<br>:OK |



**NOTE:** This parameter does not have a factory default setting.

| Parameter         | Description                                           |
|-------------------|-------------------------------------------------------|
| recipe_hex_string | See Packet Recipe on p. 125 for configuration details |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | pcr[x] ""        |

## 6.44. PACKET CONFIGURE TPS (PCT)

Configuration instances: 5

| Command Type | Syntax                                                                                                                                                                                                                                            |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg pct[x] <reason_lo> <reason_hi> <Tps_Tag0> <Sz_size0> ... <Tps_Tag9> <Sz_size9><br><b>Response</b><br>:OK                                                                                                                 |
| READ         | <b>Command</b><br>:rycfg pct[x]<br><b>Response</b><br>  pct[x]: rsnlo:<reason_lo> (hex_val), rsnhi:<reason_hi> (hex_val), tag0:<Tps_Tag0> (hex_val), size0:<Sz_size0> (hex_val), ... tag9:<Tps_Tag9> (hex_val), size9:<Sz_size9> (hex_val)<br>:OK |

| Parameter | Range      | Description                                                                     |
|-----------|------------|---------------------------------------------------------------------------------|
| reason_lo | 0 to 255   | Reason code range low end for TPS event data fetch                              |
| reason_hi | 0 to 255   | Reason code range high end for TPS event data fetch                             |
| Tps_Tagn  | 0 to 65535 | Tag identifier to be fetched from TPS engine and placed into an outgoing packet |
| Sz_Sizen  | 0 to 255   | Data size of the TPS tag data being fetched from the TPS engine                 |

| Target                       | Default Value(s)               |
|------------------------------|--------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | all pct[x] args default to '0' |

## 6.45. PDP RESET (PDP)

Configuration instances: 1

| Command Type | Syntax                                                                                                                      |
|--------------|-----------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg pdp <minutes> <sessions><br><b>Response</b><br>:OK                                                 |
| READ         | <b>Command</b><br>:rycfg pdp<br><b>Response</b><br>  pdp: rsttime:<minutes> (hex_val), rsstintv:<sessions> (hex_val)<br>:OK |

| Parameter | Range      | Description                                        |
|-----------|------------|----------------------------------------------------|
| minutes   | 0 to 65535 | Time threshold to issue a PDP connection reset     |
| sessions  | 0 to 255   | Sessions threshold to issue a PDP connection reset |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | pdp 0 0          |

## 6.46. PACKET RETRY (PRT)

- prt[0] -> Ignition off
- prt[1] -> Ignition on

*Configuration instances: 2*

| Command Type | Syntax                                                                                         |
|--------------|------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg prt[x] <seconds><br><b>Response</b><br>:OK                            |
| READ         | <b>Command</b><br>:rycfg prt[x]<br><b>Response</b><br>  prt[x]: sec:<seconds> (hex_val)<br>:OK |

| Parameter | Range      | Description                                             |
|-----------|------------|---------------------------------------------------------|
| seconds   | 0 to 65535 | Number of seconds to wait between message send attempts |

| Target                       | Default Value(s)        |
|------------------------------|-------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | prt[0] 300<br>prt[1] 15 |

## 6.47. SMS RECEIVE MASK (SMS)

Configuration instances: 1

| Command Type | Syntax                                                                                                        |
|--------------|---------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg sms "<sms source match>"<br><b>Response</b><br>:OK                                   |
| READ         | <b>Command</b><br>:rycfg sms <sms source match><br><b>Response</b><br>  sms: numb:"<sms source match>"<br>:OK |

| Parameter        | Range   | Description                                                                                      |
|------------------|---------|--------------------------------------------------------------------------------------------------|
| sms source match | 32 Char | ASCII string limiting SMS received messages to those whose source matches; 0 disables the match. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | sms "0"          |

## 6.48. SERIAL PORT SETTINGS (SPS)

- sps[0] -> Aux port 0
- sps[1] -> Aux port 1

Configuration instances: 2

| Command Type | Syntax                                                                                                                                                                                     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg sps[x] <baudrate> <dps_value> <mode_value> <console_print><br><b>Response</b><br>:OK                                                                              |
| READ         | <b>Command</b><br>:rycfg sps[x]<br><b>Response</b><br>  sps[x]: baud:<baudrate> (hex_val), dps:<dps_value> (hex_val), mode:<mode_value> (hex_val), conprt:<console_print> (hex_val)<br>:OK |

| Parameter     | Range                                                                          | Description                                                                                                                                                                                                                                                       |       |             |   |         |   |          |   |                                                                                |
|---------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|---------|---|----------|---|--------------------------------------------------------------------------------|
| baudrate      | N/A                                                                            | Acceptable baudrates: <ul style="list-style-type: none"><li>• 115200 bit/sec</li><li>• 57600 bit/sec</li><li>• 38400 bit/sec</li><li>• 19200 bit/sec</li><li>• 9600 bit/sec</li><li>• 4800 bit/sec</li><li>• 2400 bit/sec</li><li>• 1200 bit/sec</li></ul>        |       |             |   |         |   |          |   |                                                                                |
| dps_value     | 3 Char                                                                         | Acceptable dps values: 8N1                                                                                                                                                                                                                                        |       |             |   |         |   |          |   |                                                                                |
| Mode_value    | N/A                                                                            | Acceptable mode values: <table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>Console</td></tr><tr><td>3</td><td>Garmin</td></tr><tr><td>6</td><td>Aux Passthru -- Only one serial port can be an Aux Passthru at any given time.</td></tr></table> | Value | Description | 0 | Console | 3 | Garmin   | 6 | Aux Passthru -- Only one serial port can be an Aux Passthru at any given time. |
| Value         | Description                                                                    |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| 0             | Console                                                                        |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| 3             | Garmin                                                                         |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| 6             | Aux Passthru -- Only one serial port can be an Aux Passthru at any given time. |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| Console_print | N/A                                                                            | Scripted console print from BuildAndSend() format <table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>(ASCII)</td></tr><tr><td>1</td><td>(Binary)</td></tr></table>                                                                               | Value | Description | 0 | (ASCII) | 1 | (Binary) |   |                                                                                |
| Value         | Description                                                                    |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| 0             | (ASCII)                                                                        |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |
| 1             | (Binary)                                                                       |                                                                                                                                                                                                                                                                   |       |             |   |         |   |          |   |                                                                                |

| Target                 | Default Value(s)                                   |
|------------------------|----------------------------------------------------|
| AAb3, AAa4, AAb5, AAb6 | sps[0] 115200 "8N1" 0 0<br>sps[1] 115200 "8N1" 0 0 |
| AAb1                   | sps[0] 9600 "8N1" 3 0<br>sps[1] 115200 "8N1" 0 0   |

## 6.49. SERIAL PASS THRU SETTINGS (STS)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                    |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg sts <PktTimeoutMs> <PktByteCount><PktDataFormat><br><b>Response</b><br>:OK                                                                       |
| READ         | <b>Command</b><br>:rycfg sts<br><b>Response</b><br>  sts: timeout:<PktTimeoutMs> (hex_val), numbyte:<PktByteCount> (hex_val),<br>datafmt:<PktDataFormat> (hex_val)<br>:OK |

| Parameter     | Range      | Description                                                                                                                                            |
|---------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| PktTimeoutMs  | 0 to 60000 | A non-zero value defines a passthru packet with an inter-byte timeout. Setting 0 disables this packet delimiter.                                       |
| PktByteCount  | 0 to 256   | A non-zero value defines a passthru packet as a specific number of bytes. Setting 0 disables this packet delimiter.                                    |
| PktDataFormat | 0 to 1     | Represents the packet data format. A setting of 0 means passthru data sent out over cellular will be in ASCII format; 1 will be in binary hexadecimal. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | sts 1000 0 0     |

## 6.50. SYNCH TIME THRESHOLD (STT)

Configuration instances: 1

| Command Type | Syntax                                                                                                    |
|--------------|-----------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg stt <threshold><br><b>Response</b><br>:OK                                        |
| READ         | <b>Command</b><br>:rycfg stt <threshold><br><b>Response</b><br>  stt: thresh:<threshold> (hex_val)<br>:OK |

| Parameter | Range    | Description                                                                                                                                      |
|-----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| threshold | 3 to 255 | If the current system time is more than +/- thresh seconds different than the latest GPS sourced time, an automatic system time-sync will occur. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | stt 3            |

## 6.51. TPS CONFIG VALUES (TCV)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                                                      |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg tcv <destination_index> <timeout> <retries_value> <discovery_time><br><b>Response</b><br>:OK                                                                                       |
| READ         | <b>Command</b><br>:rycfg tcv<br><b>Response</b><br>  tcv: index:<destination_index> (hex_val), seconds:<timeout> (hex_val),<br>retries:<retries_value> (hex_val), distime:<discovery_time> (hex_val)<br>:OK |

| Parameter         | Range           | Description                                                                                                        |
|-------------------|-----------------|--------------------------------------------------------------------------------------------------------------------|
| Destination_Index | 0 to 9          | The index of the DST that is used to point to the server                                                           |
| Timeout           | 1 to 4294967295 | The time (sec) that the device will wait for a reply from the server                                               |
| Retries_value     | -1 to 32767     | The number of times the device will try to reach the server again after a timeout before cancelling communications |
| Discovery_time    | 0 to 4294967295 | The minimum amount of time (sec) that the device accepts a successful "discovery session".                         |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | tcv 7 30 3 60    |

## 6.52. TESTER PRESENT MESSAGE (TPM)

| Command Type | Syntax                                                                   |
|--------------|--------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg tpm <enable><br><b>Response</b><br>:OK          |
| READ         | <b>Command</b><br>:rycfg tpm<br><b>Response</b><br>  tpm: en:0 (0x0) :OK |

| Parameter | Range                                 | Description                                                                                                                                                                                 |       |             |   |                                       |   |                                      |
|-----------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|---------------------------------------|---|--------------------------------------|
| enable    | 0 to 1                                | Enables tester present message.                                                                                                                                                             |       |             |   |                                       |   |                                      |
|           |                                       | <table><tr><th>Value</th><th>Description</th></tr><tr><td>0</td><td>Disables OBDII tester present message</td></tr><tr><td>1</td><td>Enables OBDII tester present message</td></tr></table> | Value | Description | 0 | Disables OBDII tester present message | 1 | Enables OBDII tester present message |
| Value     | Description                           |                                                                                                                                                                                             |       |             |   |                                       |   |                                      |
| 0         | Disables OBDII tester present message |                                                                                                                                                                                             |       |             |   |                                       |   |                                      |
| 1         | Enables OBDII tester present message  |                                                                                                                                                                                             |       |             |   |                                       |   |                                      |

| Target                 | Default Value(s) |
|------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5 | tpm 0            |

### 6.53. TIMER DURATION (TMR)

Configuration instances: 32

| Command Type | Syntax                                                                                                                        |
|--------------|-------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg tmr[x] <Duration> <auto_start><br><b>Response</b><br>:OK                                             |
| READ         | <b>Command</b><br>:rycfg tmr[x]<br><b>Response</b><br>  tmr[x]: sec:<Duration> (hex_val), flags:<auto_start> (hex_val)<br>:OK |

| Parameter  | Range              | Description                                                                                                                                           |       |             |   |                    |   |                   |
|------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|--------------------|---|-------------------|
| Duration   | 0 to 4294967295    | The time that is set as the duration of the timer (s)                                                                                                 |       |             |   |                    |   |                   |
| auto_start | N/A                | Determines if the timer is set to start automatically or needs to be manually started.                                                                |       |             |   |                    |   |                   |
|            |                    | <table><tr><th>Index</th><th>Description</th></tr><tr><td>0</td><td>Disables autostart</td></tr><tr><td>1</td><td>Enables autostart</td></tr></table> | Index | Description | 0 | Disables autostart | 1 | Enables autostart |
| Index      | Description        |                                                                                                                                                       |       |             |   |                    |   |                   |
| 0          | Disables autostart |                                                                                                                                                       |       |             |   |                    |   |                   |
| 1          | Enables autostart  |                                                                                                                                                       |       |             |   |                    |   |                   |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | tmr[x] 0 0       |

## 6.54. THIRD-PARTY CONFIG VALUES (TPV)

Configuration instances: 1

| Command Type | Syntax                                                                                                                                                                                                |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg tpv <dst_index> <checkin_freq> <pid_list_1> <pid_list_2> <Flag_value><br><b>Response</b><br>:OK                                                                              |
| READ         | <b>Command</b><br>:rycfg tpv<br><b>Response</b><br>  tpv: index:<dst_index> (hex_val), checkin:<checkin_freq> (hex_val), pidlst1:<pid_list1>, pidlst2:<pid_list2>, flag:<Flag_value> (hex_val)<br>:OK |

| Parameter    | Range                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
|--------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|-----------|--------------------------------|-----------|----------------------------|-----------|-----------------------------|-----------|-----------------------------|-----------|-----------------------------|-----------|-----------------------------|-----------|------------------------------|-----------|------------------------------|-----------|------------------------------|-----------|-----------------------------------|-----------|-----------------------------------|-----------|-----------------------|-----------|------------------------------------|-----------|------------------------------|-----------|--------------------------------------------|-----------|-------------------------------------------|-----------|---------------------|
| dst_index    | 0 to 9                                     | Destination config index that points to the Xirgo Gateway Server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| checkin_freq | 0 to 255                                   | Time in hours for periodic check to gateway server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| Pid_list_1   | 0x0 to 0xFFFFFFFF                          | Bit list for supported pids 1 to 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
|              |                                            | <table><tr><th>Hex</th><th>Description</th></tr><tr><td>0x8000000</td><td>Odometer (miles) (ppid 1 0x74)</td></tr><tr><td>0x4000000</td><td>Oil Life (%) (ppid 2 0x75)</td></tr><tr><td>0x2000000</td><td>TPMS LF (psi) (ppid 3 0x76)</td></tr><tr><td>0x1000000</td><td>TPMS RF (psi) (ppid 4 0x77)</td></tr><tr><td>0x0800000</td><td>TPMS LR (psi) (ppid 5 0x78)</td></tr><tr><td>0x0400000</td><td>TPMS RR (psi) (ppid 6 0x8E)</td></tr><tr><td>0x0200000</td><td>TPMS LRI (psi) (ppid 7 0x90)</td></tr><tr><td>0x0100000</td><td>TPMS RRI (psi) (ppid 8 0x90)</td></tr><tr><td>0x0080000</td><td>TPMS SPR (psi) (ppid 9 0x91)</td></tr><tr><td>0x0040000</td><td>Seatbelt D (ascii) (ppid 10 0x92)</td></tr><tr><td>0x0020000</td><td>Seatbelt P (ascii) (ppid 11 0x9c)</td></tr><tr><td>0x0010000</td><td>Fuel Level (%) (0x5A)</td></tr><tr><td>0x0008000</td><td>Airbag Lamp (ascii) (ppid 12 0x9d)</td></tr><tr><td>0x0004000</td><td>PRNDL (ascii) (ppid 13 0x9e)</td></tr><tr><td>0x0002000</td><td>Parking Brake State (ascii) (ppid 14 0x9F)</td></tr><tr><td>0x0001000</td><td>Parking Brake Lamp (ascii) (ppid 15 0xA0)</td></tr><tr><td>0x0000800</td><td>0x000001 (reserved)</td></tr></table> | Hex | Description | 0x8000000 | Odometer (miles) (ppid 1 0x74) | 0x4000000 | Oil Life (%) (ppid 2 0x75) | 0x2000000 | TPMS LF (psi) (ppid 3 0x76) | 0x1000000 | TPMS RF (psi) (ppid 4 0x77) | 0x0800000 | TPMS LR (psi) (ppid 5 0x78) | 0x0400000 | TPMS RR (psi) (ppid 6 0x8E) | 0x0200000 | TPMS LRI (psi) (ppid 7 0x90) | 0x0100000 | TPMS RRI (psi) (ppid 8 0x90) | 0x0080000 | TPMS SPR (psi) (ppid 9 0x91) | 0x0040000 | Seatbelt D (ascii) (ppid 10 0x92) | 0x0020000 | Seatbelt P (ascii) (ppid 11 0x9c) | 0x0010000 | Fuel Level (%) (0x5A) | 0x0008000 | Airbag Lamp (ascii) (ppid 12 0x9d) | 0x0004000 | PRNDL (ascii) (ppid 13 0x9e) | 0x0002000 | Parking Brake State (ascii) (ppid 14 0x9F) | 0x0001000 | Parking Brake Lamp (ascii) (ppid 15 0xA0) | 0x0000800 | 0x000001 (reserved) |
| Hex          | Description                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x8000000    | Odometer (miles) (ppid 1 0x74)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x4000000    | Oil Life (%) (ppid 2 0x75)                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x2000000    | TPMS LF (psi) (ppid 3 0x76)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x1000000    | TPMS RF (psi) (ppid 4 0x77)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0800000    | TPMS LR (psi) (ppid 5 0x78)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0400000    | TPMS RR (psi) (ppid 6 0x8E)                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0200000    | TPMS LRI (psi) (ppid 7 0x90)               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0100000    | TPMS RRI (psi) (ppid 8 0x90)               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0080000    | TPMS SPR (psi) (ppid 9 0x91)               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0040000    | Seatbelt D (ascii) (ppid 10 0x92)          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0020000    | Seatbelt P (ascii) (ppid 11 0x9c)          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0010000    | Fuel Level (%) (0x5A)                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0008000    | Airbag Lamp (ascii) (ppid 12 0x9d)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0004000    | PRNDL (ascii) (ppid 13 0x9e)               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0002000    | Parking Brake State (ascii) (ppid 14 0x9F) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0001000    | Parking Brake Lamp (ascii) (ppid 15 0xA0)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |
| 0x0000800    | 0x000001 (reserved)                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |             |           |                                |           |                            |           |                             |           |                             |           |                             |           |                             |           |                              |           |                              |           |                              |           |                                   |           |                                   |           |                       |           |                                    |           |                              |           |                                            |           |                                           |           |                     |

| Parameter  | Range             | Description                                       |
|------------|-------------------|---------------------------------------------------|
| Pid_list_2 | 0x0 to 0xFFFFFFFF | Bit list for supported PIDs (32 to 32) <reserved> |
| Flag       | 0 to 255          | Reserved                                          |

| Target                       | Default Value(s)     |
|------------------------------|----------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | tpv 8 24 0x00 0x00 0 |

## 6.55. OBD TRANSMIT DELAY (TXD)

Configuration instances: 2

| Command Type | Syntax                                                                                            |
|--------------|---------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg txd[x] <value ms><br><b>Response</b><br>:OK                              |
| READ         | <b>Command</b><br>:rycfg txd[x]<br><b>Response</b><br>  txd[x]: value:<value ms> (hex_val)<br>:OK |

| Parameter | Description |               |                                                                                       |
|-----------|-------------|---------------|---------------------------------------------------------------------------------------|
| value     | Instance    | Range         | Description                                                                           |
|           | txd[0]      | 0 to 800      | Message transmit delay. Value (ms)                                                    |
|           | txd[1]      | 0 to 10800000 | Start OBD communication after ignition on detect (for immobilizer issues). Value (ms) |

| Target                       | Default Value(s)     |
|------------------------------|----------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | txd[0] 0<br>txd[1] 0 |

## 6.56. VERSION INFO (VER)

- ver[0] -> Script
- ver[1] -> Paramset
- ver[2] -> Overlay0
- ver[3] -> Overlay1
- ver[4] -> Overlay2
- ver[5] -> Overlay3
- ver[6] -> Overlay4
- ver[7] -> Tps

Configuration instances: 8

| Command Type | Syntax                                                                                                                               |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg ver[x] "<string>" <revision no> <flags_hex><br><b>Response</b><br>:OK                                       |
| READ         | <b>Command</b><br>:rycfg ver[x]<br><b>Response</b><br>  ver[x]: str:"<string>" rev:<revision no> (hex_val), flags:<flags_hex><br>:OK |

| Parameter    | Range            | Description                                                                                                                                                                                                                                                  |     |             |      |         |      |                  |      |       |      |        |      |         |
|--------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|------|---------|------|------------------|------|-------|------|--------|------|---------|
| string       | N/A              | ASCII name for a loaded item (31 characters)                                                                                                                                                                                                                 |     |             |      |         |      |                  |      |       |      |        |      |         |
| revision no. | 0 to 4294967295  | Assigned revision number for a loaded item                                                                                                                                                                                                                   |     |             |      |         |      |                  |      |       |      |        |      |         |
| flags_hex    | N/A              | Bitmask of error status values pertaining to loaded item                                                                                                                                                                                                     |     |             |      |         |      |                  |      |       |      |        |      |         |
|              |                  | <table><tr><th>Hex</th><th>Description</th></tr><tr><td>0x01</td><td>Default</td></tr><tr><td>0x02</td><td>Locally Modified</td></tr><tr><td>0x04</td><td>Error</td></tr><tr><td>0x40</td><td>Unused</td></tr><tr><td>0x80</td><td>Unknown</td></tr></table> | Hex | Description | 0x01 | Default | 0x02 | Locally Modified | 0x04 | Error | 0x40 | Unused | 0x80 | Unknown |
| Hex          | Description      |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |
| 0x01         | Default          |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |
| 0x02         | Locally Modified |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |
| 0x04         | Error            |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |
| 0x40         | Unused           |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |
| 0x80         | Unknown          |                                                                                                                                                                                                                                                              |     |             |      |         |      |                  |      |       |      |        |      |         |

| Target                       | Default Value(s)                                |
|------------------------------|-------------------------------------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | ver[0] "~unknown" 0 128<br>ver[1] "default" 0 1 |

| Target | Default Value(s)        |
|--------|-------------------------|
|        | ver[2] "~unused" 0 64   |
|        | ver[3] "~unused" 0 64   |
|        | ver[4] "~unused" 0 64   |
|        | ver[5] "~unused" 0 64   |
|        | ver[6] "~unused" 0 64   |
|        | ver[7] "~unknown" 0 128 |

## 6.57. VIN (VIN)

Configuration instances: 1

| Command Type | Syntax                                                                          |
|--------------|---------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg vin "<string>"<br><b>Response</b><br>:OK               |
| READ         | <b>Command</b><br>:rycfg vin<br><b>Response</b><br>  vin: str:"<string>"<br>:OK |

| Parameter | Rates   | Description                                                         |
|-----------|---------|---------------------------------------------------------------------|
| String    | 17 char | Set VIN for vehicles that do not support VIN or have an invalid VIN |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | VIN ""           |

## 6.58. VARIABLE SAVE MASK (VSM)

- vsm[0] > covers uservar8 0-15, uservar16 0-7, and uservar32 0-7
- vsm[1] > covers uservar8 16-32, uservar16 8-15, and uservar32 8-15

*Configuration instances: 2*

| Command Type | Syntax                                                                                   |
|--------------|------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg vsm[x] <32bit_mask><br><b>Response</b><br>:OK                   |
| READ         | <b>Command</b><br>:rycfg vsm[x]<br><b>Response</b><br>  vsm[x]: mask:<32bit_mask><br>:OK |

| Parameter  | Range              | Description                                                                               |
|------------|--------------------|-------------------------------------------------------------------------------------------|
| 32bit_mask | 0 to<br>0xFFFFFFFF | Bitmask value corresponding to which scriptable user variables are saved in persist data. |

| Target                       | Default Value(s)     |
|------------------------------|----------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | vsm[0] 0<br>vsm[1] 0 |

## 6.59. WAKE BATTERY VOLTAGE (WBV)

Configuration instances: 1

| Command Type | Syntax                                                                                                      |
|--------------|-------------------------------------------------------------------------------------------------------------|
| SET          | <b>Command</b><br>:wycfg wbv <millivolts><br><b>Response</b><br>:OK                                         |
| READ         | <b>Command</b><br>:rycfg wbv <millivolts><br><b>Response</b><br>  wbv: wakemv:<millivolts> (hex_val)<br>:OK |

| Parameter  | Range          | Description                                                                            |
|------------|----------------|----------------------------------------------------------------------------------------|
| millivolts | 10000 to 16000 | Configures the voltage threshold at which the device will wake from sleep if exceeded. |

| Target                       | Default Value(s) |
|------------------------------|------------------|
| AAb1, AAb3, AAa4, AAb5, AAb6 | wbv 13200        |

## 7. DEVICE MANAGER PROTOCOL

---

### 7.1. DEFINITIONS

#### 7.1.1. ACK/NAK

An ACK is used to signal that a command has been accepted. The ACK packet is an echo of the CMD packet's header with the Packet Type changed to ACK. A NAK is used any time a command cannot be accepted (due to improper command formatting, device busy, etc.). The NAK packet is an echo of the CMD packet's header with the Packet Type changed to NAK.

#### 7.1.2. BROADCAST

A broadcast packet type does not expect a RESP/ACK/NAK, it is used to notify or send data that has been requested.

#### 7.1.3. SESSION REJECT

A session reject message can be sent by the device at any time during a transaction to cancel the session.

### 7.2. DEVICE MANAGER PACKET

| Byte(s) | Description          |
|---------|----------------------|
| 0 - 7   | DM Header            |
| 8 - N   | Packet-Specific Data |

### 7.3. DEVICE MANAGER HEADER

| Byte(s) | Description |
|---------|-------------|
| 0 - 1   | Packet Info |
| 2 - 3   | Session ID  |
| 4 - 7   | ESN         |

#### 7.3.1. Device Manager Header: Packet Info

| Bit(s)        | Description      |
|---------------|------------------|
| 0 - 3 (LSB)   | Action/Info Code |
| 4 - 7         | Content Type     |
| 8 - 12        | Content Index    |
| 13 - 15 (MSB) | Packet Type      |

*Packet Info Register View*

| Bit Range/Type           | Description                                                                                                                                                                                                                                                                                    |                                 |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Action/Info Code: 0 - 15 | <b>Bit</b>                                                                                                                                                                                                                                                                                     | <b>Description</b>              |
|                          | 0                                                                                                                                                                                                                                                                                              | SessionAvailable                |
|                          | 1                                                                                                                                                                                                                                                                                              | SessionOpen                     |
|                          | 2                                                                                                                                                                                                                                                                                              | SessionClose                    |
|                          | 3                                                                                                                                                                                                                                                                                              | QueryContent                    |
|                          | 4                                                                                                                                                                                                                                                                                              | Query                           |
|                          | 5                                                                                                                                                                                                                                                                                              | MultiBlockSetup                 |
|                          | 6                                                                                                                                                                                                                                                                                              | MultiBlockSend                  |
|                          | 7                                                                                                                                                                                                                                                                                              | MultiBlockResend                |
|                          | 8                                                                                                                                                                                                                                                                                              | BlockSend                       |
|                          | 9                                                                                                                                                                                                                                                                                              | RunCMDLang (TBD)                |
|                          | 10                                                                                                                                                                                                                                                                                             | CheckInNow (TBD)                |
|                          | 11                                                                                                                                                                                                                                                                                             | SessionReject                   |
| Content Type: 0 - 15     | <b>Bit</b>                                                                                                                                                                                                                                                                                     | <b>Description</b>              |
|                          | 0                                                                                                                                                                                                                                                                                              | Bootloader                      |
|                          | 1                                                                                                                                                                                                                                                                                              | Application                     |
|                          | 2                                                                                                                                                                                                                                                                                              | Script                          |
|                          | 3                                                                                                                                                                                                                                                                                              | ParamSet                        |
|                          | 4                                                                                                                                                                                                                                                                                              | CheckIn                         |
|                          | 5                                                                                                                                                                                                                                                                                              | Control                         |
|                          | 6                                                                                                                                                                                                                                                                                              | TPS                             |
|                          | 7                                                                                                                                                                                                                                                                                              | -----                           |
|                          | 8                                                                                                                                                                                                                                                                                              | Overlay                         |
|                          | 9                                                                                                                                                                                                                                                                                              | CMDlang                         |
|                          | 10                                                                                                                                                                                                                                                                                             | ThirdParty Embedded Application |
|                          | 11                                                                                                                                                                                                                                                                                             | ThirdParty Data                 |
| Content Index: 0 - 31    | <p>Describes the index of the active Content Type.</p> <ul style="list-style-type: none"> <li>Overlays are the only content Type to have multiple instances so the content Index for an overlay could be 0, 1, 2, 3, or 4.</li> <li>All other content types have Content Index = 0.</li> </ul> |                                 |
| Packet Type: 0 - 7       | <b>Bit</b>                                                                                                                                                                                                                                                                                     | <b>Description</b>              |
|                          | 0                                                                                                                                                                                                                                                                                              | ACK                             |
|                          | 1                                                                                                                                                                                                                                                                                              | NAK                             |
|                          | 2                                                                                                                                                                                                                                                                                              | CMD                             |
|                          | 3                                                                                                                                                                                                                                                                                              | RESP                            |
|                          | 4                                                                                                                                                                                                                                                                                              | BROADCAST                       |

| Bit Range/Type | Description |             |
|----------------|-------------|-------------|
|                | Bit         | Description |
|                | 5           | N/A         |
|                | 6           | N/A         |
|                | 7           | N/A         |

## 7.4. PACKET-SPECIFIC DATA

### 7.4.1. BROADCAST: Session Available

| Byte(s)  | Description                                                    |
|----------|----------------------------------------------------------------|
| 8 to 11  | Content Mask: one bit flipped for each content type in session |
| 12 to 15 | Session IP(v4)                                                 |
| 16 to 17 | Session port                                                   |

### 7.4.2. CMD: Multi-block Setup

| Byte(s) | Description                                                                        |
|---------|------------------------------------------------------------------------------------|
| 8 to 9  | Multi-block size code: the size of the block sent is (Multi-block size code * 16). |

### 7.4.3. CMD: Multi-block Send

| Byte(s) | Description                                                                                                                                                                            |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 to 9  | Block-start index: the index of the binary block to start with in the next multi-block sub-session. Where 0 = binary bytes 0 through ((Multi-block size code * 16)-1).                 |
| 10      | Number of blocks: number of consecutive binary blocks to send starting with Block-start index (Valid values 0-31). The actual number of blocks desired/sent is (Number of blocks + 1). |

### 7.4.4. CMD: Multi-block Resend

| Byte(s) | Description                                                                                                                  |
|---------|------------------------------------------------------------------------------------------------------------------------------|
| 8 to 11 | Resend Mask: Each bit from LSB to MSB represents one of the binary blocks missed in the most recent Multi-block sub-session. |

### 7.4.5. CMD: Block Send

| Byte(s) | Description                                     |
|---------|-------------------------------------------------|
| 8 to 11 | Offset: binary offset of active content.        |
| 10      | Size: binary size to send (Starting at offset). |

#### 7.4.6. RESP: Query Content

| Byte(s) | Description                                                                                        |
|---------|----------------------------------------------------------------------------------------------------|
| 8 to 11 | Content Mask: Each bit from LSB to MSB represents one instance of available content (32 possible). |

*Example: if three overlays are available, content mask = 0x7 (0b111).*

#### 7.4.7. RESP: Query



**NOTE:** Bytes 12-N are only used for Script/ParamSet/Overlays/TPS, NOT for BootLoader/Application/ThirdParty.

| Byte(s)  | Description                                            |
|----------|--------------------------------------------------------|
| 8 to 11  | Size: size of available content                        |
| 12 to 15 | Revision: unique revision number of available content. |
| 16 to N  | Version: zero-terminated ASCII string.                 |

#### 7.4.8. BROADCAST: Multi-block Send

| Byte(s) | Description                                               |
|---------|-----------------------------------------------------------|
| 8 to 9  | Block-start index.                                        |
| 10      | Multi-block sub-session index (Value 0-31).               |
| 11 to N | Block: binary block of size (Multi-block size code * 16). |

#### 7.4.9. RESP: Block Send

| Byte(s)  | Description                                     |
|----------|-------------------------------------------------|
| 8 to 11  | Offset: binary offset of active content.        |
| 12 to 15 | Size: binary size to send (starting at offset). |
| 16 to N  | Block: binary block of size.                    |

#### 7.4.10. Example Device Manager Session

This example device manager session shows updating an interpreter script. The script used is an "empty script" which is quite useless on the device but works well for this example.

The binary contents of "empty\_script.bin" are as follows:

```
00 00 00 00 00 00 00 00 00 00
```

Found below are the messages exchanged in the device manager session:

Broadcast:SessionAvail

50 80 ef be 15 cd 5b 07 04 00 00 00 7e 3c f1 32 57 30

-----

>

SessionOpen

51 40 ef be 15 cd 5b 07

<-----

--

Ack:SessionOpen

51 00 ef be 15 cd 5b 07

-----

----->

Query

24 40 ef be 15 cd 5b 07

<-----

-----

Resp:Query

24 60 ef be 15 cd 5b 07 09 00 00 00 01 00 00 00 65 6d 70 74 79 5f 73 63 72 69 70 74  
2e 62 69 6e 00

-----

>

MultiBlockSetup

25 40 ef be 15 cd 5b 07 3f 00

<-----

-----

Ack:MultiBlockSetup

25 00 ef be 15 cd 5b 07

-----

----->

BlockSend

28 40 ef be 15 cd 5b 07 00 00 00 00 09 00 00 00

<-----

-

Resp:BlockSend

28 60 ef be 15 cd 5b 07 00 00 00 00 09 00 00 00 00 00 00 00 00 00 00 00 00

-----

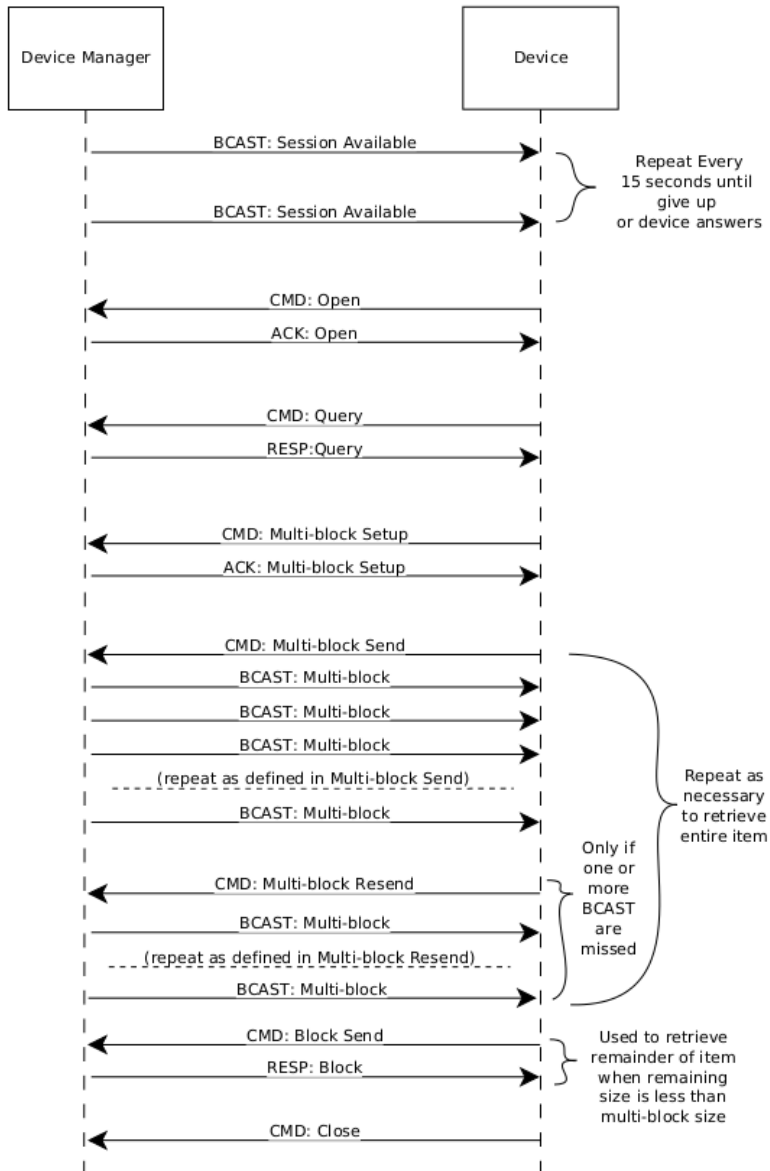
>

## SessionClose

52 80 ef be 15 cd 5b 07

<-----  
-

### Device Manager Session: Upgrade one item



## 7.5. DEVICE MANAGER CHECK-IN



**NOTE:** all 2 to 4 byte items are little endian byte-order.

| Bit(s) | Description                       |
|--------|-----------------------------------|
| 0 – 7  | DM Header (see description above) |
| 8      | Check-in Format Version           |
| 9 – N  | Check-in Data                     |

### 7.5.1. Check-in Data

| Byte(s) | Size     | Format Version | Description                              |
|---------|----------|----------------|------------------------------------------|
| 9       | 1        | 0              | Bootloader Version string size           |
| 10 - x  | variable | 0              | Bootloader Version string                |
| x       | 1        | 0              | FW Version string size                   |
| x - x   | variable | 0              | FW Version string                        |
| x       | 4        | 0              | Script Revision Number                   |
| x       | 1        | 0              | Script Flags                             |
| x       | 4        | 0              | ParamSet Revision Number                 |
| x       | 1        | 0              | ParamSet Flags                           |
| x       | 1        | 0              | Number of Used Overlays                  |
|         |          | 0              | one of the section for each Used Overlay |
| x       | 4        | 0              | Overlay Revision Number                  |
| x       | 1        | 0              | Overlay Flags                            |
| x       | 4        | 0              | IP address (unsigned integer)            |
| x       | 1        | 0              | cell type: 0=CDMA, 1=GSM                 |
|         |          | 0              | if cell type == 0 (CDMA)                 |
| x       | 1        | 0              | MEID string size                         |
| x - x   | variable | 0              | MEID string                              |
| x       | 1        | 0              | MDN string size                          |
| x - x   | variable | 0              | MDN string                               |
|         |          | 0              | if cell type == 1 (GSM)                  |
| x       | 1        | 0              | IMEI string size                         |
| x - x   | variable | 0              | IMEI string                              |
| x       | 1        | 0              | MSISDN string size                       |
| x - x   | variable | 0              | MSISDN string                            |
| x       | 1        | 0              | ICCID string size                        |
| x - x   | variable | 0              | ICCID string                             |
| x       | 1        | 0              | Third Party Version string size          |
| x - x   | variable | 0              | Third Party Version string               |
| x       | 1        | 2              | Check-In message info bitfield           |
| x       | 4        | 3              | TPS File Revision Number                 |
| x       | 1        | 3              | TPS File Flags                           |
| x       | 1        | 4              | Cell Module Model string size            |
| x - x   | variable | 4              | Cell Module Model string                 |

| Byte(s) | Size     | Format Version | Description                                  |
|---------|----------|----------------|----------------------------------------------|
| x       | 1        | 4              | Cell Module FW Version string size           |
| x - x   | variable | 4              | Cell Module FW Version string                |
| x       | 1        | 5              | I/O Box FW version string size (XT2500 Only) |
| x - x   | variable | 5              | I/O Box FW version string (XT2500 Only)      |
| x       | 4        | 5              | I/O Box ESN (XT2500 Only)                    |

### 7.5.2. Script/Parameter Set/Overlay Flags

| Hex  | Description                           |
|------|---------------------------------------|
| 0x01 | Default (Parameter Set ONLY)          |
| 0x02 | Locally Modified (Parameter Set ONLY) |
| 0x04 | Error                                 |
| 0x40 | Unused (Overlays ONLY)                |
| 0x80 | Unknown (Script ONLY)                 |

### 7.5.3. Check-in Message Info Bitfield Definitions

| Hex  | Description          |
|------|----------------------|
| 0x01 | Vehicle Comms active |
| 0x02 | TPS transfer active  |
| 0x04 | N/A                  |
| 0x08 | N/A                  |
| 0x10 | N/A                  |
| 0x20 | N/A                  |
| 0x40 | N/A                  |
| 0x80 | N/A                  |

### 7.5.4. Check-in Message Changelog

| Rev | Description                                                   |
|-----|---------------------------------------------------------------|
| 0   | Initial Offering                                              |
| 1   | Stop truncating bootloader and main firmware revision strings |
| 2   | Added check-in message info bitfield                          |
| 3   | Added TPS file revision information                           |
| 4   | Added cell module model and FW version strings (JA1.1)        |
| 5   | Added I/O Box FW version string and ESN (XT2500 Only)         |

## 8. INTERPRETER

### 8.1. LANGUAGE

#### 8.1.1. Interpreter Language Basics

##### *Overview*

Certain Xirgo products contain functionality to run user-created scripts. This allows functionality to be tuned and changed without needing Firmware updates. The device runs an interpreter which ‘interprets’ byte code that has been compiled from a human readable script. This document describes the language/syntax used for this script.

##### *Byte-Code Characteristics*

| Blocks             | Description                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Script             | Each Script Block can contain unlimited Trigger Blocks (limited only by memory reserved for byte code on device itself).                                                                                                                                                                                                                                                                      |
| Trigger            | Each Trigger Block has one Trigger Block Test. A test is usually made of one comparison, but the language also allows to use more than one comparison in which the test is true if ANY of the comparisons are true or if ALL the comparisons are true. A Trigger Block Test may contain up to 2 comparisons.<br><br>NOTE: Each Trigger Block can contain unlimited Conditional Action Blocks. |
| Conditional Action | Each Conditional Action Block may optionally contain one Conditional Action Block Test. A Conditional Action Block Test may contain up to 5 comparisons (Using same “any” or “all” logic as described for Trigger Block Test).<br><br>NOTE: Each Conditional Action Block must contain one Action Block.                                                                                      |
| Action             | Each Action Block can contain 1 – 3 Actions                                                                                                                                                                                                                                                                                                                                                   |

##### *How Trigger Block Tests Work*

Each Trigger Block is entered when the Trigger Block Test becomes true. The Trigger Block is not entered WHILE the test is true, only the moment it becomes true.

*Example: If you want to trigger actions when vehicle speed goes above 80 KPH:*

```
trigger when Gt(GPSSpeed, 800) [Debounce(0, 0)]
...
```

The interpreter will enter the trigger block the moment the vehicle speed increases above 80 KPH. It will not continue to enter the trigger block during subsequent evaluations where the speed remains above 80 KPH. Once the speed drops below 80 (for at least one evaluation), then the trigger block will be entered again next time the speed increases above 80 KPH.



**NOTE:** if the speed oscillates between 80.0 and 80.1 km/h it is possible to cause the actions to be executed as frequently as the speed oscillates. In order to avoid this, make use of the debounce specifiers.

### *How Conditional Action Block Tests Work*

Unlike Trigger Block Tests, Conditional Action Block Tests allow the action to be performed WHILE the test is true. Continuing with the example above, let's say we want to further limit our actions to only execute the moment speed goes above 80 km/h AND the vehicle heading is within 10 degrees of North:

```
trigger when Gt(GPSSpeed, 800) [Debounce(0, 0)]
    conduct any InRange(GPSHeading, 3500, 3600) [Debounce(0, 0)]
                InRange(GPSHeading,    0, 100) [Debounce(0, 0)]
    actions
        ...
```

### 8.1.2. Compiling scripts with ILC

1. Type the script (as noted above) with your text editor and save as a text file with .txt file extension.
2. *Recommended: Put both ilc.exe and your script <name>.txt in the same folder.*
3. Start your preferred command line terminal (cmd.exe or powershell).
4. Change directory to the folder where your script is located.

*Example command prompt:*

```
cd USERPROFILE\Documents\XT6300\Scripts for cmd.exe or cd
env:USERPROFILE\Documents\XT6300\Scripts for powershell
```

5. Run ilc.exe from the command line: ilc.exe <name>.txt (If "Interpreter script format OK" appears at the end, your script was successfully compiled).

*Example Command Prompt*

```
0x40 SMALL_CONST_VALUE (value: 0)
TOK_NUMBER: "22"
0x56 SMALL_CONST_VALUE (value: 22)
TOK_NUMBER: "0"
0x40 SMALL_CONST_VALUE (value: 0)
```

```
TOK_NUMBER: "2"
0x42 SMALL_CONST_VALUE (value: 2)
0xe0 INTERP_END

binary script size: 134
file size: 142
file name: network_testing_script.bin
Interpreter script format OK
ilc v2.16
```



**NOTE:** Using Windows to drag the .txt file onto the ilc.exe as a means of execution will always result in a .bin file being generated, even if the compiler failed. It is recommended instead to always run ilc.exe from a command line interface.

### 8.1.3. Upload and Run Scripts

1. Connect to the device using standard USB-to-Serial or USB-to-RS232 cabling.
2. Open the terminal emulator program (ZOC or similar) and connect to active COM port.
3. Ensure connectivity by issuing the command :qti.
4. Issue command to start script upload: :grscr x <port\_index> where *port\_index* is one of the following:

| Index | Description |
|-------|-------------|
| 0     | USB Port    |
| 1     | RS232 1     |
| 2     | RS232 2     |

5. Upload your script file (<name>.bin) using your terminal emulator program via Xmodem.



**NOTE:** your compiled script must be less than 16 KB in order to be loaded onto the device.

```
:OK
:grscr x 0
:OK
Erasing FLASH memory
Waiting for Xmodem Start (Ctrl-D twice to cancel)

Starting xmodem transfer. Press Ctrl+C to cancel.
Transferring V_Script_Nov_102015_JB.bin...
  100%    572 bytes  572 bytes/sec 00:00:01      0 Errors

Interpreter Script Download Successful
Interpreter Script Stored in ChipFlash
```

#### 8.1.4. Interpreter Commands

All language elements presented in this section are case sensitive.

##### Definitions

| Keyword          | Definition                                                                                                                                                                                                                                                                                                                     |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comments         | Comments start with the pound (#) character and continue until the end of the line.                                                                                                                                                                                                                                            |
| Numbers          | Numbers can be specified in decimal (e.g., 0, 1, 100, 256, -359) or in hex when the value is non-negative (e.g., 0x0, 0x1, 0x64, 0x100)                                                                                                                                                                                        |
| Debounce Specify | Debounce(<hi>, <lo>) - where hi and lo are specified in seconds (max 15). The 'Debounce Specify' element is only used following certain tests (see below). When a debounce is specified, it means that a test is true only AFTER the comparison is true for hi seconds and false AFTER the comparison is false for lo seconds. |



**NOTE:** NOTE: A test debounce MUST be specified any time the first argument in the test is either a system value or a special function; it's the script designer's responsibility to input appropriate values for hi and lo.

##### Keywords

| Keyword | Description                                                                                  |
|---------|----------------------------------------------------------------------------------------------|
| trigger | Denotes the start of a Trigger Block                                                         |
| conduct | Denotes the start of a conditional Action Block                                              |
| when    | Denotes the start of a test when only one comparison is used                                 |
| any     | Use when grouping multiple comparisons; test is true when ANY of the comparisons are true    |
| all     | Use when grouping multiple comparisons; ALL comparisons must be true for test to be true     |
| always  | Use when there are no tests for a Conditional Action Block. The actions inside a Conditional |

| Keyword | Description                                                             |
|---------|-------------------------------------------------------------------------|
|         | Action Block will ALWAYS run when the Trigger Block's test(s) are true. |
| actions | Denotes the start of an Action Block                                    |
| run     | Denotes the start of a single Action                                    |

### Transforms

| Script Language    | Description                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| BitNot(<a>)        | Bitwise NOT (one's compliment) of argument a                                                                                                   |
| BitAnd(<a>, <b>)   | Bitwise AND of arguments a and b                                                                                                               |
| BitOr(<a>, <b>)    | Bitwise OR of arguments a and b                                                                                                                |
| BitXor(<a>, <b>)   | Bitwise XOR of arguments a and b                                                                                                               |
| BitShift(<a>, <b>) | Shift the contents of argument a by the value of argument b; i.e., if b is negative the shift is Left, and if B is positive the shift is Right |
| Add(<a>, <b>)      | Arithmetic addition of arguments a and b                                                                                                       |
| Subtract(<a>, <b>) | Arithmetic subtraction of argument b from a                                                                                                    |
| Multiply(<a>, <b>) | Arithmetic multiplication of arguments a and b                                                                                                 |

### Tests

| Script Language         | Description                                                              |
|-------------------------|--------------------------------------------------------------------------|
| InRange(<a>, <b>, <c>)  | True when argument a is between argument b and argument c (inclusive)    |
| NinRange(<a>, <b>, <c>) | True when a is less than b or a is greater than c; b must be less than a |
| Eq(<a>, <b>)            | True when a equals b                                                     |
| Neq(<a>, <b>)           | True when a is not equal to b                                            |
| Gt(<a>, <b>)            | True when a is greater than b                                            |
| Lt(<a>, <b>)            | True when a is less than b                                               |
| GtEq(<a>, <b>)          | True when a is greater than/equal to b                                   |
| LtEq(<a>, <b>)          | True when a is less than/equal to b                                      |

Test items <a>, <b>, and <c> below should be one of the following:

- System Value
- Event
- Special Function
- Numbers (constants)

## System Values

| Script Language    | Description                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| SystemVal(<index>) | Pass the enumeration index of the desired System Value to be accessed (see <a href="#">Packet Recipe Fields</a> for acceptable range) |
| UnixTime           | Maps directly to UnixTime packet field (ID: 0x06)                                                                                     |
| GPSLat             | Maps directly to Latitude packet field (ID: 0x07)                                                                                     |
| GPSLon             | Maps directly to Longitude packet field (ID: 0x08)                                                                                    |
| GPSAlt             | Maps directly to Altitude packet field (ID: 0x09)                                                                                     |
| GPSHeading         | Maps directly to Heading packet field (ID: 0x0a)                                                                                      |
| GPSSpeed           | Maps directly to GpsSpeed packet field (ID: 0x0b)                                                                                     |
| Inputs             | Maps directly to InputStates packet field (ID: 0x0c)                                                                                  |
| Outputs            | Maps directly to OutputStates packet field (ID: 0x0d)                                                                                 |
| DriverId1          | Maps directly to DriverIdCode1 packet field (ID: 0x0e)                                                                                |
| DriverId2          | Maps directly to DriverIdCode2 packet field (ID: 0x0f)                                                                                |
| GSPTripOdom1       | Maps directly to GpsTripOdom1 packet field (ID: 0x10)                                                                                 |
| OdomDelta          |                                                                                                                                       |
| GPSHDOP            | Maps directly to Hdop packet field (ID: 0x12)                                                                                         |
| GPSNumSats         | Maps directly to NumSats packet field (ID: 0x13)                                                                                      |
| InternVoltage      | Maps directly to InternalBattVolts packet field (ID: 0x16)                                                                            |
| BattVoltage        | Maps directly to VehicleBattVolts_1byte packet field (ID: 0x17)                                                                       |
| GPSLifetimeOdom    | GPSOdom Maps directly to GpsLifetimeOdom packet field (ID: 0x18)                                                                      |
| GPSOdom            |                                                                                                                                       |
| MotionState        | Maps directly to OBDRunStates packet field (ID: 0x2c)                                                                                 |
| EngineState        | Maps directly to OBDCOMMSState packet field (ID: 0x2d)                                                                                |
| OBDLifetimeOdom    | Maps directly to ObdLifetimeOdom packet field (ID: 0x2f)                                                                              |
| OdomDiff           |                                                                                                                                       |
| WakeReason         | Maps directly to WakeReason packet field (ID: 0x53) (see <a href="#">Wake Reason Mask</a> for mask definition)                        |
| ExtADC0            | Maps directly to ExternADC0_1byte packet field (ID: 0x66)                                                                             |

## Events

| Script Language            | Description                                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TimerExpired(<index>)      | Evaluates to 1 when timer is expired; otherwise 0<br><br><i>Range: 0 to 31</i>                                                                                                           |
| UserEventsActive(<index>)  | Evaluates to 1 when a user event has been injected into interpreter; otherwise 0. Use :xrmsg <index> <a href="#">to inject a message into interpreter.</a><br><br><i>Range: 0 to 255</i> |
| AccelEventsActive(<index>) | Evaluates to 1 when an accelerometer event is detected; otherwise 0                                                                                                                      |

| Script Language                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------------------------------------------------------------------------|---|--------------------------------------|---|-------------------------------------|---|---------------------------|---|---------------|---|------------------------------------------------------------------------------|---|----------------------------------|---|--------------------|---|------------------------|---|----------|----|-------------|----|-----------|----|----------------|
|                                 | <i>Range: 0 to 7</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| GarminResponseReceived(<index>) | Evaluates to 1 when a non-blacklisted Garmin response is received (and Garmin is active), otherwise 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|                                 | <i>Range: 0 to 5</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|                                 | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>Ack (or Nak) packet (only triggered when specified in SendGarminMsg())</td></tr> <tr> <td>1</td><td>Unit ID (a.k.a. Garmin ESN) response</td></tr> <tr> <td>2</td><td>Product ID response</td></tr> <tr> <td>3</td><td>Throttle Message response</td></tr> <tr> <td>4</td><td>Ping response</td></tr> <tr> <td>5</td><td>Generic response; any response that isn't listed above and isn't blacklisted</td></tr> </table>                                                                                                                                                                            | Value | Description | 0 | Ack (or Nak) packet (only triggered when specified in SendGarminMsg()) | 1 | Unit ID (a.k.a. Garmin ESN) response | 2 | Product ID response                 | 3 | Throttle Message response | 4 | Ping response | 5 | Generic response; any response that isn't listed above and isn't blacklisted |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| Value                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 0                               | Ack (or Nak) packet (only triggered when specified in SendGarminMsg())                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 1                               | Unit ID (a.k.a. Garmin ESN) response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 2                               | Product ID response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 3                               | Throttle Message response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 4                               | Ping response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 5                               | Generic response; any response that isn't listed above and isn't blacklisted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| GarminUserPayloadReceived(0)    | Evaluates to 1 when a payload (destined for garmin device) has been received; evaluates to 0 otherwise. This signals that a payload has been sent to the device by a user/server. Typically used to trigger a SendGarminMsg() action.                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| DriverIdRead(<index>)           | Evaluates to 1 when driver id is detected on 1-wire channel <index>, otherwise 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|                                 | <i>Range: 0 to 1</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| SystemEventsActive(<index>)     | Evaluates to 1 when system event <index> is active, otherwise 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|                                 | <i>Range: 0 to 20</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
|                                 | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>Reset</td></tr> <tr> <td>1</td><td>Wakeup</td></tr> <tr> <td>2</td><td>BootloaderUpgrade (not implemented)</td></tr> <tr> <td>3</td><td>FWUpgrade</td></tr> <tr> <td>4</td><td>ScriptUpgrade</td></tr> <tr> <td>5</td><td>ParamSetUpgrade</td></tr> <tr> <td>6</td><td>OverlayUpgrade (not implemented)</td></tr> <tr> <td>7</td><td>ManualConfigChange</td></tr> <tr> <td>8</td><td>CellRegistrationChange</td></tr> <tr> <td>9</td><td>IPChange</td></tr> <tr> <td>10</td><td>SMSReceived</td></tr> <tr> <td>11</td><td>SMSSendOK</td></tr> <tr> <td>12</td><td>SMSSendFailure</td></tr> </table> | Value | Description | 0 | Reset                                                                  | 1 | Wakeup                               | 2 | BootloaderUpgrade (not implemented) | 3 | FWUpgrade                 | 4 | ScriptUpgrade | 5 | ParamSetUpgrade                                                              | 6 | OverlayUpgrade (not implemented) | 7 | ManualConfigChange | 8 | CellRegistrationChange | 9 | IPChange | 10 | SMSReceived | 11 | SMSSendOK | 12 | SMSSendFailure |
| Value                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 0                               | Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 1                               | Wakeup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 2                               | BootloaderUpgrade (not implemented)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 3                               | FWUpgrade                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 4                               | ScriptUpgrade                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 5                               | ParamSetUpgrade                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 6                               | OverlayUpgrade (not implemented)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 7                               | ManualConfigChange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 8                               | CellRegistrationChange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 9                               | IPChange                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 10                              | SMSReceived                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 11                              | SMSSendOK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |
| 12                              | SMSSendFailure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |   |                                                                        |   |                                      |   |                                     |   |                           |   |               |   |                                                                              |   |                                  |   |                    |   |                        |   |          |    |             |    |           |    |                |

| Script Language                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|----|-------------|----|---------------|----|----------------|----|--------------------|----|-------------------|----|--------------------------------------|----|----------------|----|------------------------------|
|                                | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>13</td><td>UDPreceived</td></tr> <tr> <td>14</td><td>UDPSendOK</td></tr> <tr> <td>15</td><td>UDPSendFailure</td></tr> <tr> <td>16</td><td>PacketStorageEmpty</td></tr> <tr> <td>17</td><td>PacketStorageFull</td></tr> <tr> <td>18</td><td>PdpConnectionReset (not implemented)</td></tr> <tr> <td>19</td><td>Device Powerup</td></tr> <tr> <td>20</td><td>OTA Reject (not implemented)</td></tr> </table> | Value | Description | 13 | UDPreceived | 14 | UDPSendOK     | 15 | UDPSendFailure | 16 | PacketStorageEmpty | 17 | PacketStorageFull | 18 | PdpConnectionReset (not implemented) | 19 | Device Powerup | 20 | OTA Reject (not implemented) |
| Value                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 13                             | UDPreceived                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 14                             | UDPSendOK                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 15                             | UDPSendFailure                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 16                             | PacketStorageEmpty                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 17                             | PacketStorageFull                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 18                             | PdpConnectionReset (not implemented)                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 19                             | Device Powerup                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 20                             | OTA Reject (not implemented)                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| ObdDtcEventsActive(0)          | Evaluates to 1 when an OBD DTC event is detected, otherwise 0.                                                                                                                                                                                                                                                                                                                                                                                                           |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| AccelCrashEventsActive(0)      | Evaluates to 1 when an accelerometer crash event is detected, otherwise 0.                                                                                                                                                                                                                                                                                                                                                                                               |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| BluetoothResponseReceived(0)   | Evaluates to 1 when a bluetooth message is received, otherwise 0. (Only applicable to target AAb3)                                                                                                                                                                                                                                                                                                                                                                       |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| TpsBlockCompleteEvent(<index>) | Evaluates to 1 when TPS block request on the vehicle bus has completed, otherwise 0.                                                                                                                                                                                                                                                                                                                                                                                     |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
|                                | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>1</td><td>Primary Bus</td></tr> <tr> <td>2</td><td>Secondary Bus</td></tr> </table>                                                                                                                                                                                                                                                                                                                        | Value | Description | 1  | Primary Bus | 2  | Secondary Bus |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| Value                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 1                              | Primary Bus                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| 2                              | Secondary Bus                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |
| AuxPassthruPacketReceived(0)   | Evaluates to 1 when an aux passthru packet has been received, otherwise 0.                                                                                                                                                                                                                                                                                                                                                                                               |       |             |    |             |    |               |    |                |    |                    |    |                   |    |                                      |    |                |    |                              |

### Special Functions

| Script Language              | Description                                                                                                            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------|
| SystemVal(<packet field id>) | Evaluates to value stored in packet field<br><br>Packet field ID: See <a href="#">Packet Recipes</a> for available IDs |
| UserVar8(<index>)            | Evaluates to value stored in 8bit user variable<br><br>Index range: 0 to 31                                            |
| UserVar16(<index>)           | Evaluates to value stored in 16bit user variable<br><br>Index range: 0 to 15                                           |
| UserVar32(<index>)           | Evaluates to value stored in 32bit user variable<br><br>Index Range: 0 to 15                                           |
| FlagsSet(<index>)            | Evaluates to 1 when flag is set, otherwise 0<br><br>Index Range: 0 to 31                                               |

| Script Language        | Description                                                           |                                      |
|------------------------|-----------------------------------------------------------------------|--------------------------------------|
| GeofenceState(<index>) | <b>Index</b>                                                          | <b>Description</b>                   |
|                        | -1                                                                    | <index> is not configured            |
|                        | 0                                                                     | Outside fence                        |
|                        | 1                                                                     | Inside fence                         |
|                        | <i>Index range: 0 to 49</i>                                           |                                      |
| InputState(<index>)    | Evaluates to 1 when input is high/when condition is true, otherwise 0 |                                      |
|                        | Index range 0 to 7:                                                   |                                      |
|                        | <b>Index</b>                                                          | <b>Description</b>                   |
|                        | 0                                                                     | Ignition                             |
|                        | 1                                                                     | Input 1                              |
|                        | 2                                                                     | Input 2                              |
|                        | 3                                                                     | Input 3                              |
|                        | 4                                                                     | Input 4                              |
|                        | 5                                                                     | Vibration Detected (via Accel)       |
|                        | 6                                                                     | Main supply power available          |
|                        | 7                                                                     | Accelerometer reorientation validity |
|                        |                                                                       |                                      |
|                        | Evaluates to 1 when true, otherwise 0                                 |                                      |
|                        | <i>Index range: 0 to 16</i>                                           |                                      |
|                        | <b>Index</b>                                                          | <b>Description</b>                   |
|                        | 0                                                                     | Valid Registration                   |
|                        | 1                                                                     | Valid IP                             |
|                        | 2                                                                     | Valid GPS                            |
|                        | 3                                                                     | Valid Script                         |
|                        | 4                                                                     | DM Session Active                    |
|                        | 5                                                                     | Accel Oriented                       |
|                        | 6                                                                     | Bluetooth Discoverable               |
|                        | 7                                                                     | Bluetooth Paired                     |
|                        | 8                                                                     | (Not implemented)                    |
|                        | 9                                                                     | Bluetooth Connected                  |
|                        | 10                                                                    | Bluetooth Powered                    |
|                        | 11                                                                    | Cellular Powered                     |
|                        | 12                                                                    | GPS Powered                          |
|                        | 13                                                                    | Garmin Powered                       |
|                        | 14                                                                    | Motion Via Accel                     |
|                        | 15                                                                    | Motion Via GPS                       |
|                        | 16                                                                    | External Power                       |

| Script Language                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|---|---------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------|---|-------------------------------------------------------------------|---|-----------------------------------------------------------------------|---|--------------------------------------------------------------------|---|----------------------------------------------------|---|---------------------------------------------------------------------------------------------|---|--------------------------------------------------|---|-----------------------------------------------------------------------------------------|
| GenericConfig(<index>)            | Evaluates to value stored in gcv[<index>] <a href="#">config parameters</a> .<br><i>Index range: 0 to 63</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| PacketsPending(<index>)           | Evaluates to number of unsent packets stored in the log<br><table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Normal Packet Space</td></tr> <tr> <td>1</td><td>UDR Packet Space</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Index      | Description | 0 | Normal Packet Space                                                       | 1 | UDR Packet Space                                                                              |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| Index                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 0                                 | Normal Packet Space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 1                                 | UDR Packet Space                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| NoAckRxRetryCount(0)              | Evaluates to number of retried failed ACK packets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| DeviceResetReason(0)              | Evaluates to most recent device reset reason as defined by the microprocessor<br><i>Resolution range: 0 to 9</i><br><table> <tr> <th>Resolution</th><th>Description</th></tr> <tr> <td>0</td><td><b>ResetCause_PowerApplied</b><br/>Main supply voltage connected to device</td></tr> <tr> <td>1</td><td><b>ResetCause_LowPowerMode</b><br/>Reset caused by the micro Hibernation module (not utilized)</td></tr> <tr> <td>2</td><td><b>ResetCause_Watchdog</b><br/>Reset caused by the micro Watchdog module</td></tr> <tr> <td>3</td><td><b>ResetCause_Software</b><br/>Reset caused by our device firmware</td></tr> <tr> <td>4</td><td><b>ResetCause_User</b><br/>Main micro reset pin toggled (not utilized)</td></tr> <tr> <td>5</td><td><b>ResetCause_BrownOut</b><br/>Reset caused by the micro BOR module</td></tr> <tr> <td>6</td><td><b>ResetCause_SupplyMonitor</b><br/>Not implemented</td></tr> <tr> <td>7</td><td><b>ResetCause_FactoryReset</b><br/>Reset caused by the micro Hardware System Service Request</td></tr> <tr> <td>8</td><td><b>ResetCause_SystemError</b><br/>Not implemented</td></tr> <tr> <td>9</td><td><b>ResetCause_Unknown</b><br/>Catch for any other micro reset source we have not defined</td></tr> </table> | Resolution | Description | 0 | <b>ResetCause_PowerApplied</b><br>Main supply voltage connected to device | 1 | <b>ResetCause_LowPowerMode</b><br>Reset caused by the micro Hibernation module (not utilized) | 2 | <b>ResetCause_Watchdog</b><br>Reset caused by the micro Watchdog module | 3 | <b>ResetCause_Software</b><br>Reset caused by our device firmware | 4 | <b>ResetCause_User</b><br>Main micro reset pin toggled (not utilized) | 5 | <b>ResetCause_BrownOut</b><br>Reset caused by the micro BOR module | 6 | <b>ResetCause_SupplyMonitor</b><br>Not implemented | 7 | <b>ResetCause_FactoryReset</b><br>Reset caused by the micro Hardware System Service Request | 8 | <b>ResetCause_SystemError</b><br>Not implemented | 9 | <b>ResetCause_Unknown</b><br>Catch for any other micro reset source we have not defined |
| Resolution                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 0                                 | <b>ResetCause_PowerApplied</b><br>Main supply voltage connected to device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 1                                 | <b>ResetCause_LowPowerMode</b><br>Reset caused by the micro Hibernation module (not utilized)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 2                                 | <b>ResetCause_Watchdog</b><br>Reset caused by the micro Watchdog module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 3                                 | <b>ResetCause_Software</b><br>Reset caused by our device firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 4                                 | <b>ResetCause_User</b><br>Main micro reset pin toggled (not utilized)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 5                                 | <b>ResetCause_BrownOut</b><br>Reset caused by the micro BOR module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 6                                 | <b>ResetCause_SupplyMonitor</b><br>Not implemented                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 7                                 | <b>ResetCause_FactoryReset</b><br>Reset caused by the micro Hardware System Service Request                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 8                                 | <b>ResetCause_SystemError</b><br>Not implemented                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| 9                                 | <b>ResetCause_Unknown</b><br>Catch for any other micro reset source we have not defined                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |
| TpsEcusRemaining(<default value>) | Evaluates to TPS number of ECUs yet to be queried for the current Block ID<br><i>Default value: 0</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |             |   |                                                                           |   |                                                                                               |   |                                                                         |   |                                                                   |   |                                                                       |   |                                                                    |   |                                                    |   |                                                                                             |   |                                                  |   |                                                                                         |

| Script Language                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|------|---------------|------|---------------------|------|--------------|------|------------------------|------|--------------------------|------|------------------------|------|-------------|
| GetVarPktSize(<default value>)     | Evaluates to generated variable packet byte count, otherwise 0.                                                                                                                                                                                                                                                                                                                                                                 |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
|                                    | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0x26</td><td>Garmin Packet</td></tr> <tr> <td>0xca</td><td>Aux Passthru Packet</td></tr> <tr> <td>0x6f</td><td>Crash Packet</td></tr> <tr> <td>0x6b</td><td>Vehicle Bus DTC Packet</td></tr> <tr> <td>0x28</td><td>Bluetooth Payload Packet</td></tr> <tr> <td>0x2a</td><td>Command Payload Packet</td></tr> <tr> <td>0xc5</td><td>TPS Payload</td></tr> </table> | Index | Description | 0x26 | Garmin Packet | 0xca | Aux Passthru Packet | 0x6f | Crash Packet | 0x6b | Vehicle Bus DTC Packet | 0x28 | Bluetooth Payload Packet | 0x2a | Command Payload Packet | 0xc5 | TPS Payload |
| Index                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0x26                               | Garmin Packet                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0xca                               | Aux Passthru Packet                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0x6f                               | Crash Packet                                                                                                                                                                                                                                                                                                                                                                                                                    |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0x6b                               | Vehicle Bus DTC Packet                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0x28                               | Bluetooth Payload Packet                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0x2a                               | Command Payload Packet                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| 0xc5                               | TPS Payload                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| AuxPassthruScratchpadSize(0)       | Evaluates to aux passthru scratchpad size (in bytes).                                                                                                                                                                                                                                                                                                                                                                           |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| AuxPassthruScratchpadByte(<index>) | Evaluates to the byte value at index of the aux passthru scratchpad.                                                                                                                                                                                                                                                                                                                                                            |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |
| IPAddress(0)                       | Device IP Address                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |      |               |      |                     |      |              |      |                        |      |                          |      |                        |      |             |

### Actions

| Script Language                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|---|----------------|---|-----------------|---|-----------------|-------|-------------|---------|-----------------|---------|------------------|---------|------------------|-------|-------------|-------------|-----------------|
| ResetDevice()                        | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| ResetModem()                         | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| ResetGPS()                           | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| TurnOffGPS()                         | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| TurnOnGPS()                          | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| SetUserVar(<type>, <index>, <value>) | <p>Type range: 0 to 2</p> <table> <tr> <th>Type</th><th>Description</th></tr> <tr> <td>0</td><td>8-bit variable</td></tr> <tr> <td>1</td><td>16-bit variable</td></tr> <tr> <td>2</td><td>32-bit variable</td></tr> </table> <p>Index range:</p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0 to 31</td><td>8-bit variables</td></tr> <tr> <td>0 to 15</td><td>16-bit variables</td></tr> <tr> <td>0 to 15</td><td>32-bit variables</td></tr> </table> <p>Value range:</p> <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>-128 to 127</td><td>8-bit variables</td></tr> </table> | Type | Description | 0 | 8-bit variable | 1 | 16-bit variable | 2 | 32-bit variable | Index | Description | 0 to 31 | 8-bit variables | 0 to 15 | 16-bit variables | 0 to 15 | 32-bit variables | Value | Description | -128 to 127 | 8-bit variables |
| Type                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 0                                    | 8-bit variable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 1                                    | 16-bit variable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 2                                    | 32-bit variable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| Index                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 0 to 31                              | 8-bit variables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 0 to 15                              | 16-bit variables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| 0 to 15                              | 32-bit variables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| Value                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |
| -128 to 127                          | 8-bit variables                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |             |   |                |   |                 |   |                 |       |             |         |                 |         |                  |         |                  |       |             |             |                 |

| Script Language                                                                   | Description                                                                                                                                                                                    |                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <b>Value</b>                                                                                                                                                                                   | <b>Description</b>                                                                                                                                              |
|                                                                                   | -32768 to 32767                                                                                                                                                                                | 16-bit variables                                                                                                                                                |
|                                                                                   | -2147483648 to 2147483647                                                                                                                                                                      | 32-bit variables                                                                                                                                                |
| AdjustUserVar<br>(<type>, <index>,<br><adjust_amount>)                            | Type range: 0 to 2                                                                                                                                                                             |                                                                                                                                                                 |
|                                                                                   | <b>Type</b>                                                                                                                                                                                    | <b>Description</b>                                                                                                                                              |
|                                                                                   | 0                                                                                                                                                                                              | 8bit variable                                                                                                                                                   |
|                                                                                   | 1                                                                                                                                                                                              | 16bit variable                                                                                                                                                  |
|                                                                                   | 2                                                                                                                                                                                              | 32bit variable                                                                                                                                                  |
|                                                                                   | Index range:                                                                                                                                                                                   |                                                                                                                                                                 |
|                                                                                   | <b>Index</b>                                                                                                                                                                                   | <b>Description</b>                                                                                                                                              |
|                                                                                   | 0 to 31                                                                                                                                                                                        | 8bit variables                                                                                                                                                  |
|                                                                                   | 0 to 15                                                                                                                                                                                        | 16bit variables                                                                                                                                                 |
|                                                                                   | 0 to 15                                                                                                                                                                                        | 32bit variables                                                                                                                                                 |
|                                                                                   | Adjust_amount range:                                                                                                                                                                           |                                                                                                                                                                 |
|                                                                                   | <b>Adjust Amount</b>                                                                                                                                                                           | <b>Description</b>                                                                                                                                              |
|                                                                                   | -128 to 127                                                                                                                                                                                    | 8bit variables                                                                                                                                                  |
|                                                                                   | -32768 to 32767                                                                                                                                                                                | 16bit variables                                                                                                                                                 |
|                                                                                   | -2147483648 to 2147483647                                                                                                                                                                      | 32bit variables                                                                                                                                                 |
|                                                                                   | NOTE: user variables are 'clamped' at min and max. Meaning no matter the size of adjustment the value will never go lower than the minimum or higher than the maximum (it will not roll over). |                                                                                                                                                                 |
| SetFlag(<flag_<br>index>)                                                         | Index range: 0 to 31                                                                                                                                                                           |                                                                                                                                                                 |
| ClearFlag(<flag_<br>index>)                                                       | Index range: 0 to 31                                                                                                                                                                           |                                                                                                                                                                 |
| StartTimer(<timer_<br>index>)                                                     | Index range: 0 to 31                                                                                                                                                                           |                                                                                                                                                                 |
| StopTimer(<timer_<br>index>)                                                      | Index range: 0 to 31                                                                                                                                                                           |                                                                                                                                                                 |
| ResetTimer(<timer_<br>index>)                                                     | Index range: 0 to 31                                                                                                                                                                           |                                                                                                                                                                 |
| BuildAndSendMsg<br>(<packet_id>,<br><reason_code>,<br><destination_id>,<br><ack>) | <b>Parameter</b>                                                                                                                                                                               | <b>Range</b>                                                                                                                                                    |
|                                                                                   | Packet_id                                                                                                                                                                                      | 0 to 254                                                                                                                                                        |
|                                                                                   | reason_code                                                                                                                                                                                    | 0 to 255                                                                                                                                                        |
|                                                                                   | range                                                                                                                                                                                          | Should be an ID configured with :wycfg pcr[x]<br>Assigns the reason_code to the index in the script. Any reason_code less than 0 or greater than 255 will wrap. |

| Script Language                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------|-------------|--------------------------------------|--------|---------------------------------------------------------------------|-----------|-------------------------------------------------|---------------------|---------------------------|--------|---------------------------|--------|----------------------------------|--------|----------------------------------|--------|--------------------------------------------------------|--------|----------------------------------------------------------|--------|----------------------------------------------------------|
|                                             | <table><tr><th>Parameter</th><th>Range</th><th>Description</th></tr><tr><td>destination_id range</td><td>0 to 9</td><td>Should be one of the destinations configured with :wycfg dst[x] ...</td></tr><tr><td>Ack range</td><td>0 to 2</td><td>See Ack table below</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Parameter                                                           | Range       | Description | destination_id range                 | 0 to 9 | Should be one of the destinations configured with :wycfg dst[x] ... | Ack range | 0 to 2                                          | See Ack table below |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| Parameter                                   | Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Description                                                         |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| destination_id range                        | 0 to 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Should be one of the destinations configured with :wycfg dst[x] ... |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| Ack range                                   | 0 to 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | See Ack table below                                                 |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
|                                             | Ack table: <table><tr><th>Range</th><th>Description</th></tr><tr><td>0</td><td>No acknowledgement needed</td></tr><tr><td>1</td><td>Resend until acknowledged</td></tr><tr><td>2</td><td>Priority packet: no storage, no acknowledgement</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Range                                                               | Description | 0           | No acknowledgement needed            | 1      | Resend until acknowledged                                           | 2         | Priority packet: no storage, no acknowledgement |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| Range                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0                                           | No acknowledgement needed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 1                                           | Resend until acknowledged                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 2                                           | Priority packet: no storage, no acknowledgement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
|                                             | See footnotes 1-3 below table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| ClearLog()                                  | Erases any messages/packets stored in flash                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| EnterDeepSleep(<wake_mask>, <wake_minutes>) | Set the wake reason mask <table><tr><th>Value (Hex)</th><th>Wake Reason</th></tr><tr><td>0x0001</td><td>Input 0 (Ignition) transitioned high</td></tr><tr><td>0x0002</td><td>Input 1 transitioned high</td></tr><tr><td>0x0004</td><td>Input 2 transitioned high</td></tr><tr><td>0x0008</td><td>Input 3 transitioned high</td></tr><tr><td>0x0010</td><td>Input 4 transitioned high</td></tr><tr><td>0x0020</td><td>Configured sleep timeout expired</td></tr><tr><td>0x0040</td><td>Vibration detected</td></tr><tr><td>0x0080</td><td>Main supply voltage exceeds configured threshold value</td></tr><tr><td>0x0100</td><td>Main supply voltage fell below 6.0VDC (device unplugged)</td></tr></table>                                                             | Value (Hex)                                                         | Wake Reason | 0x0001      | Input 0 (Ignition) transitioned high | 0x0002 | Input 1 transitioned high                                           | 0x0004    | Input 2 transitioned high                       | 0x0008              | Input 3 transitioned high | 0x0010 | Input 4 transitioned high | 0x0020 | Configured sleep timeout expired | 0x0040 | Vibration detected               | 0x0080 | Main supply voltage exceeds configured threshold value | 0x0100 | Main supply voltage fell below 6.0VDC (device unplugged) |        |                                                          |
| Value (Hex)                                 | Wake Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0001                                      | Input 0 (Ignition) transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0002                                      | Input 1 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0004                                      | Input 2 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0008                                      | Input 3 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0010                                      | Input 4 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0020                                      | Configured sleep timeout expired                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0040                                      | Vibration detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0080                                      | Main supply voltage exceeds configured threshold value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0100                                      | Main supply voltage fell below 6.0VDC (device unplugged)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| EnterSleep(<wake_mask>, <wake_minutes>)     | Set the wake reason mask <table><tr><th>Value (Hex)</th><th>Wake Reason</th></tr><tr><td>0x0000</td><td>SMS or UDP command received</td></tr><tr><td>0x0001</td><td>Input 0 (Ignition) transitioned high</td></tr><tr><td>0x0002</td><td>Input 1 transitioned high</td></tr><tr><td>0x0004</td><td>Input 2 transitioned high</td></tr><tr><td>0x0008</td><td>Input 3 transitioned high</td></tr><tr><td>0x0010</td><td>Input 4 transitioned high</td></tr><tr><td>0x0020</td><td>Configured sleep timeout expired</td></tr><tr><td>0x0040</td><td>Vibration detected</td></tr><tr><td>0x0080</td><td>Main supply voltage exceeds configured threshold value</td></tr><tr><td>0x0100</td><td>Main supply voltage fell below 6.0VDC (device unplugged)</td></tr></table> | Value (Hex)                                                         | Wake Reason | 0x0000      | SMS or UDP command received          | 0x0001 | Input 0 (Ignition) transitioned high                                | 0x0002    | Input 1 transitioned high                       | 0x0004              | Input 2 transitioned high | 0x0008 | Input 3 transitioned high | 0x0010 | Input 4 transitioned high        | 0x0020 | Configured sleep timeout expired | 0x0040 | Vibration detected                                     | 0x0080 | Main supply voltage exceeds configured threshold value   | 0x0100 | Main supply voltage fell below 6.0VDC (device unplugged) |
| Value (Hex)                                 | Wake Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0000                                      | SMS or UDP command received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0001                                      | Input 0 (Ignition) transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0002                                      | Input 1 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0004                                      | Input 2 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0008                                      | Input 3 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0010                                      | Input 4 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0020                                      | Configured sleep timeout expired                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0040                                      | Vibration detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0080                                      | Main supply voltage exceeds configured threshold value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0100                                      | Main supply voltage fell below 6.0VDC (device unplugged)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| SetGarminPower(<power_state>)               | power_state range: 0 – 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                     |             |             |                                      |        |                                                                     |           |                                                 |                     |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |

| Script Language                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|--------------------------------------|---|--------------------|---|--------------------|---|------------|---|---------------------------------------------------|---|------------------------|---|---------------------|---|--------------------------------------------------------------------------------------|-------|-------------|---|--------------|
|                                               | <table> <tr> <th>Range</th><th>Description</th></tr> <tr> <td>0</td><td>Off</td></tr> <tr> <td>1</td><td>On</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Range | Description | 0 | Off                                  | 1 | On                 |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| Range                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 0                                             | Off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 1                                             | On                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| SendGarminMsg<br>(<msg_id>, <flags>)          | <table> <tr> <th>Range</th><th>Description</th></tr> <tr> <td>1</td><td>Unit ID Request (Garmin ESN Request)</td></tr> <tr> <td>2</td><td>Product ID Request</td></tr> <tr> <td>4</td><td>Ping</td></tr> <tr> <td>5</td><td>FMI Enable</td></tr> <tr> <td>6</td><td>Set Auto Arrival to defaults (30 sec, 100 meters)</td></tr> <tr> <td>7</td><td>Disable Status Message</td></tr> <tr> <td>8</td><td>Disable ETA Message</td></tr> <tr> <td>9</td><td>Send user-defined payload (should be triggered with<br/>GarminUserPayloadReceived(0))</td></tr> </table> <p><i>Flags range: 0 to 1</i></p> <table> <tr> <th>Range</th><th>Description</th></tr> <tr> <td>1</td><td>Save ACK/NAK</td></tr> </table> | Range | Description | 1 | Unit ID Request (Garmin ESN Request) | 2 | Product ID Request | 4 | Ping               | 5 | FMI Enable | 6 | Set Auto Arrival to defaults (30 sec, 100 meters) | 7 | Disable Status Message | 8 | Disable ETA Message | 9 | Send user-defined payload (should be triggered with<br>GarminUserPayloadReceived(0)) | Range | Description | 1 | Save ACK/NAK |
| Range                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 1                                             | Unit ID Request (Garmin ESN Request)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 2                                             | Product ID Request                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 4                                             | Ping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 5                                             | FMI Enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 6                                             | Set Auto Arrival to defaults (30 sec, 100 meters)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 7                                             | Disable Status Message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 8                                             | Disable ETA Message                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 9                                             | Send user-defined payload (should be triggered with<br>GarminUserPayloadReceived(0))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| Range                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 1                                             | Save ACK/NAK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| ClearTripOdom<br>(<odom_index>)               | <p><i>Index range: 0 to 2</i></p> <table> <tr> <th>Range</th><th>Description</th></tr> <tr> <td>0</td><td>GPSTripOdom1</td></tr> <tr> <td>1</td><td>GPSTripOdom2</td></tr> <tr> <td>2</td><td>ObdDerivedTripOdom</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Range | Description | 0 | GPSTripOdom1                         | 1 | GPSTripOdom2       | 2 | ObdDerivedTripOdom |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| Range                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 0                                             | GPSTripOdom1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 1                                             | GPSTripOdom2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| 2                                             | ObdDerivedTripOdom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| SetOutput(<output_index>)                     | <i>Index range: 0 to 2</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| ClearOutput<br>(<output_index>)               | <i>Index range: 0 to 2</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| PulseOutput<br>(<output_index>, <seconds_on>) | <i>Index range: 0 to 2</i><br><i>seconds_on range: 1 to 65535</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |
| FlashOutput<br>(<output_index>, <blink_rate>) | <i>Index range: 0 to 2</i><br><i>Blink_rate range: 1 to 100 Hz</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |   |                                      |   |                    |   |                    |   |            |   |                                                   |   |                        |   |                     |   |                                                                                      |       |             |   |              |

| Script Language                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|----------|-----------------------------------------|----------|------------------------------------------------|----------|-----------------------------------------------|----------|-----------------------------------------|----------|-------------------------------------------------------|----------|----------------------------------------------------------------|----------|------------------------------------|----------|------------------------------------------------|----------|---------------------|----------|---------------------|----------|------------|
| ClearDriverIds()                                 | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| ClearDriverID<br>(<index>)                       | <index> of 0 or 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| CheckInNow()                                     | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| SetInput(<input_<br>index>)                      | <i>Input_index range: 0 to 3</i><br><br>If input state source is not configured to “script”, it is ignored                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| ClearInput(<input_<br>index>)                    | <i>Input_index range: 0 to 3</i><br><br>If input state source is not configured to “script”, it is ignored                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| BuzzerPlay(<song_<br>index> <volume><br><loops>) | <i>Song_index range: 0 to 9</i><br><br><i>Volume range: 0 to 100</i><br><br><i>Loops clamped to range: 0 to 255; 0 is continuous play</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| BuzzerStop()                                     | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| ResetObdHarshAccel<br>Cnt()                      | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| ResetObdHarshBrak<br>eCnt()                      | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| BluetoothSendOk()                                | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| TempSenseScan()                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| TempSenseRead()                                  | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| ClearObdData<br>(<mask>)                         | Mask range: 0x00000000 to 0x0001FFFF<br><table><tr><th>Range</th><th>Description</th></tr><tr><td>0x000001</td><td>Clear engine run data (e.g. rpm, speed)</td></tr><tr><td>0x000002</td><td>Clear time data (e.g. engine hours, idle time)</td></tr><tr><td>0x000004</td><td>Clear level data (e.g. fuel level, fuel used)</td></tr><tr><td>0x000008</td><td>Clear distance data (e.g. ecu odometer)</td></tr><tr><td>0x000010</td><td>Clear temperature data (e.g. coolant temp, fuel temp)</td></tr><tr><td>0x000020</td><td>Clear pressure &amp; load data (e.g. coolant pressure, eng torque)</td></tr><tr><td>0x000040</td><td>Clear fuel economy data (e.g. mpg)</td></tr><tr><td>0x000080</td><td>Clear violations data (e.g. harsh accel count)</td></tr><tr><td>0x00FFFF</td><td>Clear all the above</td></tr><tr><td>0x010000</td><td>Clear persisted VIN</td></tr><tr><td>0x020000</td><td>Clear DTCs</td></tr></table> | Range | Description | 0x000001 | Clear engine run data (e.g. rpm, speed) | 0x000002 | Clear time data (e.g. engine hours, idle time) | 0x000004 | Clear level data (e.g. fuel level, fuel used) | 0x000008 | Clear distance data (e.g. ecu odometer) | 0x000010 | Clear temperature data (e.g. coolant temp, fuel temp) | 0x000020 | Clear pressure & load data (e.g. coolant pressure, eng torque) | 0x000040 | Clear fuel economy data (e.g. mpg) | 0x000080 | Clear violations data (e.g. harsh accel count) | 0x00FFFF | Clear all the above | 0x010000 | Clear persisted VIN | 0x020000 | Clear DTCs |
| Range                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000001                                         | Clear engine run data (e.g. rpm, speed)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000002                                         | Clear time data (e.g. engine hours, idle time)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000004                                         | Clear level data (e.g. fuel level, fuel used)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000008                                         | Clear distance data (e.g. ecu odometer)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000010                                         | Clear temperature data (e.g. coolant temp, fuel temp)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000020                                         | Clear pressure & load data (e.g. coolant pressure, eng torque)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000040                                         | Clear fuel economy data (e.g. mpg)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x000080                                         | Clear violations data (e.g. harsh accel count)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x00FFFF                                         | Clear all the above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x010000                                         | Clear persisted VIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| 0x020000                                         | Clear DTCs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| SaveDataToFlash()                                | Force a save of persistent data to NVM.<br><br><b>See footnote 4 below table.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |
| TpsLoadScratchpad<br>(<tag>)                     | Load TPS scratchpad with the requested Tag data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |             |          |                                         |          |                                                |          |                                               |          |                                         |          |                                                       |          |                                                                |          |                                    |          |                                                |          |                     |          |                     |          |            |

| Script Language                                                                                                                                                     | Description                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| VehicleBusListen<br>(<timeout_s>)                                                                                                                                   | Listen for traffic on vehicle bus for <timeout_s>                       |
| TpsRequestBlock<br>(<block_id>)                                                                                                                                     | Request the given TPS block on the vehicle bus                          |
| AuxPassthruScratchpadLoad()                                                                                                                                         | Load the Aux Passthru scratchpad with the most recently-received packet |
| GsmSleep()                                                                                                                                                          | Put the cellular module to sleep                                        |
| GsmListen()                                                                                                                                                         | Put the cellular module into listen mode                                |
| GsmWake()                                                                                                                                                           | Wake the cellular module up                                             |
| BluetoothSleep()                                                                                                                                                    | Put the bluetooth module to sleep                                       |
| BluetoothWake()                                                                                                                                                     | Wake the bluetooth module                                               |
| <div>  <b>NOTE:</b> Cannot be called if Bluetooth is already awake.         </div> |                                                                         |
| TpsSync()                                                                                                                                                           | Trigger a TPS server sync                                               |
| ResetGpsHarshAccelCnt()                                                                                                                                             | Resets the harsh accel count on the GPS.                                |
| ResetGpsHarshBrakeCnt()                                                                                                                                             | Resets the harsh brake count on the GPS.                                |

#### Actions Table Footnotes

1. *BuildAndSendMsg* example: using command `:wycfg pcr[0] "01050104030708"`. The item index 0 in `pcr[0]` is NOT the `packet_id`. This should be considered the `slot_id` (of which there are only 128). The `packet_id` in this example is the first hex byte of the hex string "01", meaning `packet_id` = 1. The parameter set may be coordinated so the recipe for `packet_id` x is stored at `slot_id` x. However, this limits your `packet_id` range to 0 - 127.
2. *BuildAndSendMsg* Coordinated `slot_id` and `packet_id` examples:
  - `:wycfg pcr[0] "00050104020708"`
  - `:wycfg pcr[1] "01050104020708"`
  - ...
  - `:wycfg pcr[127] "7f050104020708"`
3. *BuildAndSendMsg* recommendation: Due to the design of the entire XT6300 system, it is recommended customers do not exceed a message generation rate of one every five seconds for long durations (one every ten seconds for CATm devices). The throughput of the cellular design is the bottleneck. Messages will always be stored to flash and sent out eventually, unless the duration at such a rate causes the message storage space to be filled completely. If a customer is looking for continuous real time data, these are the limitations they should be made aware of.
4. *SaveDataToFlash()* Note: Persist data saves normally happen automatically every 60 seconds. This command is intended to augment that. This command has a progressive spam filter that does not allow

the command to be executed in quick procession. The required time to wait between saves is one second, doubling with every proceeding save; it will not extend above 60 seconds. 60 seconds after the last successful save this is reduced back to 1 second. Calling this function while the spam filter is active does not perform the save.

### 8.1.5. Wake Reason Masks

| Script Language                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|--------|--------------------------------------|--------|--------------------------------------|--------|---------------------------|--------|---------------------------|--------|---------------------------|--------|----------------------------------|--------|----------------------------------|--------|--------------------------------------------------------|--------|----------------------------------------------------------|--------|----------------------------------------------------------|
| EnterDeepSleep<br>(<wake_mask>,<br><wake_minutes>) | Set the wake reason mask <table> <tr> <th>Value (Hex)</th><th>Wake Reason</th></tr> <tr> <td>0x0001</td><td>Input 0 (Ignition) transitioned high</td></tr> <tr> <td>0x0002</td><td>Input 1 transitioned high</td></tr> <tr> <td>0x0004</td><td>Input 2 transitioned high</td></tr> <tr> <td>0x0008</td><td>Input 3 transitioned high</td></tr> <tr> <td>0x0010</td><td>Input 4 transitioned high</td></tr> <tr> <td>0x0020</td><td>Configured sleep timeout expired</td></tr> <tr> <td>0x0040</td><td>Vibration detected</td></tr> <tr> <td>0x0080</td><td>Main supply voltage exceeds configured threshold value</td></tr> <tr> <td>0x0100</td><td>Main supply voltage fell below 6.0VDC (device unplugged)</td></tr> </table>                                                               | Value (Hex) | Wake Reason | 0x0001 | Input 0 (Ignition) transitioned high | 0x0002 | Input 1 transitioned high            | 0x0004 | Input 2 transitioned high | 0x0008 | Input 3 transitioned high | 0x0010 | Input 4 transitioned high | 0x0020 | Configured sleep timeout expired | 0x0040 | Vibration detected               | 0x0080 | Main supply voltage exceeds configured threshold value | 0x0100 | Main supply voltage fell below 6.0VDC (device unplugged) |        |                                                          |
| Value (Hex)                                        | Wake Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0001                                             | Input 0 (Ignition) transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0002                                             | Input 1 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0004                                             | Input 2 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0008                                             | Input 3 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0010                                             | Input 4 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0020                                             | Configured sleep timeout expired                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0040                                             | Vibration detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0080                                             | Main supply voltage exceeds configured threshold value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0100                                             | Main supply voltage fell below 6.0VDC (device unplugged)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| EnterSleep(<wake_mask>,<wake_minutes>)             | Set the wake reason mask <table> <tr> <th>Value (Hex)</th><th>Wake Reason</th></tr> <tr> <td>0x0000</td><td>SMS or UDP command received</td></tr> <tr> <td>0x0001</td><td>Input 0 (Ignition) transitioned high</td></tr> <tr> <td>0x0002</td><td>Input 1 transitioned high</td></tr> <tr> <td>0x0004</td><td>Input 2 transitioned high</td></tr> <tr> <td>0x0008</td><td>Input 3 transitioned high</td></tr> <tr> <td>0x0010</td><td>Input 4 transitioned high</td></tr> <tr> <td>0x0020</td><td>Configured sleep timeout expired</td></tr> <tr> <td>0x0040</td><td>Vibration detected</td></tr> <tr> <td>0x0080</td><td>Main supply voltage exceeds configured threshold value</td></tr> <tr> <td>0x0100</td><td>Main supply voltage fell below 6.0VDC (device unplugged)</td></tr> </table> | Value (Hex) | Wake Reason | 0x0000 | SMS or UDP command received          | 0x0001 | Input 0 (Ignition) transitioned high | 0x0002 | Input 1 transitioned high | 0x0004 | Input 2 transitioned high | 0x0008 | Input 3 transitioned high | 0x0010 | Input 4 transitioned high        | 0x0020 | Configured sleep timeout expired | 0x0040 | Vibration detected                                     | 0x0080 | Main supply voltage exceeds configured threshold value   | 0x0100 | Main supply voltage fell below 6.0VDC (device unplugged) |
| Value (Hex)                                        | Wake Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0000                                             | SMS or UDP command received                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0001                                             | Input 0 (Ignition) transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0002                                             | Input 1 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0004                                             | Input 2 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0008                                             | Input 3 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0010                                             | Input 4 transitioned high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0020                                             | Configured sleep timeout expired                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0040                                             | Vibration detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0080                                             | Main supply voltage exceeds configured threshold value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |
| 0x0100                                             | Main supply voltage fell below 6.0VDC (device unplugged)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |             |        |                                      |        |                                      |        |                           |        |                           |        |                           |        |                                  |        |                                  |        |                                                        |        |                                                          |        |                                                          |

## 8.2. INTERPRETER SCRIPTING TRIGGER BLOCK EXAMPLES

### 8.2.1. Packet Send Example

This example shows an alternate message being sent every two minutes. If flag[0] is set, then send packet 1, otherwise, send packet 0. Always reset the timer and toggle the flag.

```
trigger when Eq(TimerExpired(0), 1)
    conduct when Eq(FlagIsSet(0), 1) [Debounce(0, 0)]
```

```

    actions
        run BuildAndSendMsg(1, 0, 1, 0)
        run ClearFlag(0)
    conduct when Neq(FlagIsSet(0), 1) [Debounce(5, 0)]
    # NOTE: debounce Hi for 5 seconds, to keep these actions from executing
    due to
    # the previous CondAct block clearing the flag.
    actions
        run BuildAndSendMsg(0, 0, 1, 0)
        run SetFlag(0)
    conduct always
    actions
        run ResetTimer(0)

```

### 8.2.2. Build and Send Message

A message is created and sent when you send a *user event* to the interpreter. The *user event* can be sent via :xrmsg <index>.



**NOTE:** see actions[] array in src/interpreter/interpreter.c to find valid action indices and number of arguments each action should take.

```

trigger when Eq(UserEventIsActive(0xff), 1)
    conduct always
        actions
            run BuildAndSendMsg(4, 32, 1, 0)

```

### 8.2.3. Set User Flag 3 if OBD Reports PTO On

PTO status resides in the bit 1 position of Fld\_ObdRunStatus (0x2c). The example below uses the BitAnd() operator with a hex mask isolating the desired bit, comparing it to 0 for rising edge trigger.

This operation works from the inside out, parenthetically. SystemVal (0x2c) grabs the value stored in Fld\_ObdRunStatus. BitAnd() then takes that value “ANDed” with its second argument of 0x02, which isolates the bit 1 position.

When bit 1 of Fld\_ObdRunStatus (PTO state) is high, the BitAnd() resolves to a 1. Neq() then takes that and compares it with its second argument of 0. When they don’t equal each other, the trigger is executed. The Debounce in this example is disabled.

```
trigger when Neq(BitAnd(SystemVal(0x2c), 0x02), 0) [Debounce(0, 0)]
    conduct always
        actions
            run SetFlag(3)
```

### 8.2.4. Boot Status Values

| Value | Boot Status                                                                                                       |
|-------|-------------------------------------------------------------------------------------------------------------------|
| 0     | Device can't boot (FW won't run; all 3 LEDs illuminated)                                                          |
| 1     | FW Invalid/Faulty (FW reverted by loading Backup FW)                                                              |
| 2     | Backup Image Invalid/Missing (current FW stored to Backup FW)                                                     |
| 3     | Normal Boot                                                                                                       |
| 4     | FW Upgrade with Invalid/Faulty current FW and Invalid/Missing Backup FW(New FW loaded, New FW stored to BackupFW) |
| 5     | FW Upgrade with Invalid/Faulty current FW (New FW loaded)                                                         |
| 6     | FW Upgrade with Invalid/Missing Backup (current FW stored to Backup FW, New FW loaded)                            |
| 7     | Normal FW Upgrade (current FW stored to Backup FW, New FW loaded)                                                 |

### 8.2.5. Third Party Proprietary PID Recipe Slots

| Field           | Assigned Data    |
|-----------------|------------------|
| OBDPidReserved1 | Odometer         |
| OBDPidReserved2 | Oil Life Percent |
| OBDPidReserved3 | LF Tire Pressure |
| OBDPidReserved4 | RF Tire Pressure |
| OBDPidReserved5 | LR Tire Pressure |

| Field            | Assigned Data              |
|------------------|----------------------------|
| OBDPidReserved6  | RR Tire Pressure           |
| OBDPidReserved7  | LR Tire Pressure           |
| OBDPidReserved8  | RRI Tire Pressure          |
| OBDPidReserved9  | SPARE Tire Pressure        |
| OBDPidReserved10 | Driver Seatbelt Status     |
| OBDPidReserved11 | Passenger Seatbelt Status  |
| OBDPidReserved12 | Airbag Lamp                |
| OBDPidReserved13 | PRNDL                      |
| OBDPidReserved14 | Parking Brake State        |
| OBDPidReserved15 | Parking Brake Warning Lamp |

## 8.3. PACKET RECIPE

### 8.3.1. Fields

| ID    | Name            | Description                                                                                                                                                    |                        |       |            |       |   |         |
|-------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|------------|-------|---|---------|
| 0x01  | PacketID        | Packet recipes can be labeled from 0-255, but there are only 128 recipe slots                                                                                  |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 255</td></tr></table>                | Bytes                  | Units | Resolution | Range | 1 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 1     | N/A             | 1                                                                                                                                                              | 0 to 255               |       |            |       |   |         |
| 0x02  | FmCustomHeader  | value TBD (currently zero)                                                                                                                                     |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 255</td></tr></table>                | Bytes                  | Units | Resolution | Range | 1 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 1     | N/A             | 1                                                                                                                                                              | 0 to 255               |       |            |       |   |         |
| 0x03  | DeviceId        | Unsigned integer representing numeric ESN                                                                                                                      |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>1</td><td>100000000 to 999999999</td></tr></table>  | Bytes                  | Units | Resolution | Range | 4 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 4     | N/A             | 1                                                                                                                                                              | 100000000 to 999999999 |       |            |       |   |         |
| 0x04  | ReasonCode      | Unsigned integer (any reason code < 0 or > 255 will wrap)                                                                                                      |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 255</td></tr></table>                | Bytes                  | Units | Resolution | Range | 1 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 1     | N/A             | 1                                                                                                                                                              | 0 to 255               |       |            |       |   |         |
| 0x05  | PacketSerialNum | Unsigned integer                                                                                                                                               |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>N/A</td><td>1</td><td>0 to 65535</td></tr></table>              | Bytes                  | Units | Resolution | Range | 2 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 2     | N/A             | 1                                                                                                                                                              | 0 to 65535             |       |            |       |   |         |
| 0x06  | UnixTime        | Unsigned integer representing number of seconds since Unix Epoch                                                                                               |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>1</td><td>0x0 to 0xffffffff</td></tr></table>       | Bytes                  | Units | Resolution | Range | 4 | N/A     |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 4     | N/A             | 1                                                                                                                                                              | 0x0 to 0xffffffff      |       |            |       |   |         |
| 0x07  | Latitude        | Signed integer decimal value of 4byte hex string divided by 1000000 (useful range -90.0 to 90.0)                                                               |                        |       |            |       |   |         |
|       |                 | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>Degrees</td><td>1.00E-06</td><td>-2147.483648</td></tr></table> | Bytes                  | Units | Resolution | Range | 4 | Degrees |
| Bytes | Units           | Resolution                                                                                                                                                     | Range                  |       |            |       |   |         |
| 4     | Degrees         | 1.00E-06                                                                                                                                                       | -2147.483648           |       |            |       |   |         |

| ID   | Name          | Description                                                                                         |         |            |                             |
|------|---------------|-----------------------------------------------------------------------------------------------------|---------|------------|-----------------------------|
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               |                                                                                                     |         |            | to 2147.483647              |
| 0x08 | Longitude     | Signed integer decimal value of 4-byte hex string divided by 1000000 (useful range -180.0 to 180.0) |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 4                                                                                                   | Degrees | 1.00E-06   | -2147.483648 to 2147.483647 |
| 0x09 | Altitude      | Signed integer                                                                                      |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 2                                                                                                   | m       | 0.1        | -3276.8 to 3276.7           |
| 0x0a | Heading       | Signed integer (useful range 0.0 to 360.0)                                                          |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 2                                                                                                   | Degrees | 1.00E-01   | -3276.8 to 3276.7           |
| 0x0b | GpsSpeed      | Unsigned integer                                                                                    |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 1                                                                                                   | km/h    | 1          | 0 to 255                    |
| 0x0c | InputStates   | See <a href="#">Input State Bits</a> table.                                                         |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 1                                                                                                   | N/A     | 1          | 0x00 to 0xff                |
| 0x0d | OutputStates  | Bitfield: see <a href="#">Output State bits</a> table.                                              |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 1                                                                                                   | N/A     | 1          | 0x00 to 0x1f                |
| 0x0e | DriverIdCode1 | Unsigned integer representing unique iButton ID                                                     |         |            |                             |
|      |               | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |               | 4                                                                                                   | N/A     | 1          | 0 to 4294967295             |

| ID   | Name                   | Description                                                           |       |            |                 |
|------|------------------------|-----------------------------------------------------------------------|-------|------------|-----------------|
| 0x0f | DriverIdCode2          | Unsigned integer representing unique iButton ID                       |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 4                                                                     | N/A   | 1          | 0 to 4294967295 |
| 0x10 | GSPTripOdom1           | See <a href="#">Odometer Details</a> Table.                           |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 4                                                                     | m     | 1          | 0 to 4294967295 |
| 0x11 | Flags                  | Bitfield                                                              |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 4                                                                     | N/A   | 1          | 0 to 4294967295 |
| 0x12 | Hdop                   | Unsigned integer                                                      |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 1                                                                     | DOP   | 0.1        | 0.0 to 25.5     |
| 0x13 | NumSats                | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 1                                                                     | N/A   | 1          | 0 to 255        |
|      |                        |                                                                       |       |            |                 |
| 0x14 | ReceiverSigStr         | See <a href="#">Signal Quality Measure</a> Table.                     |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 2                                                                     | dBm   | 1.23       | -113 to -75     |
| 0x15 | CellularCarrierId      | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 2                                                                     | N/A   | 1          | 0x0 to 0xffff   |
|      |                        |                                                                       |       |            |                 |
| 0x16 | InternalBattVolts      | Possibly using a 2-byte unsigned integer representing mV (0 to 65535) |       |            |                 |
|      |                        | Bytes                                                                 | Units | Resolution | Range           |
|      |                        | 1                                                                     | V     | 0.1        | 0.0 to 25.5     |
| 0x17 | VehicleBattVolts_1byte | If value is greater than 25.5v, it will cap at 25.5v                  |       |            |                 |

| ID   | Name               | Description                                                                                         |         |            |                             |
|------|--------------------|-----------------------------------------------------------------------------------------------------|---------|------------|-----------------------------|
|      |                    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 1                                                                                                   | V       | 0.1        | 0.0 to 25.5                 |
| 0x18 | GpsLifetimeOdom    | Unsigned integer; see <a href="#">Odometer Details</a> Table.                                       |         |            |                             |
|      |                    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 4                                                                                                   | m       | 1          | 0 to 4294967295             |
| 0x19 | AccelStartDateTime | Unsigned integer representing time from Unix Epoch (s)                                              |         |            |                             |
|      |                    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 4                                                                                                   | N/A     | 1          | 0x0 to 0xffffffff           |
| 0x1a | AccelStartLat      | Signed integer decimal value of 4-byte hex string divided by 1000000 (useful range -90.0 to 90.0)   |         |            |                             |
|      |                    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 4                                                                                                   | Degrees | 1.00E-06   | -2147.483648 to 2147.483647 |
| 0x1b | AccelStartLong     | Signed integer decimal value of 4-byte hex string divided by 1000000 (useful range -180.0 to 180.0) |         |            |                             |
|      |                    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 4                                                                                                   | Degrees | 1.00E-06   | -2147.483648 to 2147.483647 |
| 0x1c | AccelStartSpeed    | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 1                                                                                                   | km/h    | 1          | 0 to 255                    |
| 0x1d | AccelStartHeading  | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 2                                                                                                   | Degrees | 0.1        | 0 to 3599                   |
| 0x1e | MaxAccel           | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 2                                                                                                   | mG      | 1          | 0 to 32767                  |
| 0x1f | AccelEventDuration | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                    | 1                                                                                                   | Seconds | 0.1        | 0 to 255                    |

| ID   | Name                   | Description                                                                                         |         |            |                             |
|------|------------------------|-----------------------------------------------------------------------------------------------------|---------|------------|-----------------------------|
| 0x20 | AccelEndDateTime       | Unsigned integer representing time from Unix Epoch (s)                                              |         |            |                             |
|      |                        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 4                                                                                                   | N/A     | 1          | 0x0 to 0xffffffff           |
| 0x21 | AccelEndLat            | Signed integer decimal value of 4-byte hex string divided by 1000000 (useful range -90.0 to 90.0)   |         |            |                             |
|      |                        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 4                                                                                                   | Degrees | 1.00E-06   | -2147.483648 to 2147.483647 |
| 0x22 | AccelEndLong           | Signed integer decimal value of 4-byte hex string divided by 1000000 (useful range -180.0 to 180.0) |         |            |                             |
|      |                        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 4                                                                                                   | Degrees | 1.00E-06   | -2147.483648 to 2147.483647 |
| 0x23 | AccelEndSpeed          | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 1                                                                                                   | km/h    | 1          | 0 to 255                    |
| 0x24 | AccelEndHeading        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 2                                                                                                   | Degrees | 0.1        | 0 to 3599                   |
|      |                        |                                                                                                     |         |            |                             |
| 0x25 | Not implemented        | Available for future use                                                                            |         |            |                             |
| 0x26 | GarminPacketSize       | Size of entire Garmin packet (includes <DLE><pid><size><payload><sum><DLE><ETX> and DLE stuffing)   |         |            |                             |
|      |                        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | 2                                                                                                   | N/A     | N/A        | 6 to 516                    |
| 0x27 | GarminPacket           | Garmin Packet bytes:<br><DLE><pid><size><payload><sum><DLE><ETX> and DLE stuffing                   |         |            |                             |
|      |                        | Bytes                                                                                               | Units   | Resolution | Range                       |
|      |                        | Variable                                                                                            | N/A     | N/A        | N/A                         |
| 0x28 | BluetoothPayloadSize * | Unsigned integer                                                                                    |         |            |                             |

| ID   | Name                 | Description                                                  |       |            |                 |
|------|----------------------|--------------------------------------------------------------|-------|------------|-----------------|
|      |                      | Bytes                                                        | Units | Resolution | Range           |
|      |                      | 2                                                            | N/A   | N/A        | N/A             |
| 0x29 | BluetoothPayload *   | Bytes                                                        |       |            |                 |
|      |                      | Variable                                                     | N/A   | N/A        | N/A             |
| 0x2a | CommandPayloadSize * | Bytes                                                        |       |            |                 |
|      |                      | 2                                                            | N/A   | N/A        | N/A             |
| 0x2b | CommandPayload *     | Bytes                                                        |       |            |                 |
|      |                      | Variable                                                     | N/A   | N/A        | N/A             |
| 0x2c | OBDRunStates         | Bitfield; see <a href="#">OBD Run States Bits</a> Table      |       |            |                 |
|      |                      | 1                                                            | N/A   | N/A        | 0 to 7          |
| 0x2d | OBDCommsState        | See <a href="#">OBD Comms State</a> Table                    |       |            |                 |
|      |                      | 1                                                            | N/A   | N/A        | 0 to 3          |
| 0x2e | ObdDerivedTripOdom   | Unsigned integer; see <a href="#">Odometer Details</a> Table |       |            |                 |
|      |                      | 4                                                            | m     | 1          | 0 to 4294967295 |
| 0x2f | ObdLifetimeOdom      | Unsigned integer; see <a href="#">Odometer Details</a> Table |       |            |                 |
|      |                      | 4                                                            | m     | 1          | 0 to 4294967295 |
| 0x30 | TempSensor0          | Bytes                                                        |       |            |                 |
|      |                      | 1                                                            | N/A   | N/A        | N/A             |

| ID   | Name        | Description          |
|------|-------------|----------------------|
| 0x31 | TempSensor1 | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | N/A                  |
|      |             | <b>Range</b>         |
|      |             | N/A                  |
| 0x32 | UserVar8[0] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x33 | UserVar8[1] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x34 | UserVar8[2] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x35 | UserVar8[3] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x36 | UserVar8[4] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x37 | UserVar8[5] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x38 | UserVar8[6] | 8-bit signed integer |
|      |             |                      |
|      |             | <b>Bytes</b>         |
|      |             | 1                    |
|      |             | <b>Units</b>         |
|      |             | N/A                  |
|      |             | <b>Resolution</b>    |
|      |             | 1                    |
|      |             | <b>Range</b>         |
|      |             | -128 to 127          |
| 0x39 | UserVar8[7] | 8-bit signed integer |

| ID   | Name         | Description          |       |            |             |
|------|--------------|----------------------|-------|------------|-------------|
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3a | UserVar8[8]  | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3b | UserVar8[9]  | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3c | UserVar8[10] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3d | UserVar8[11] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3e | UserVar8[12] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x3f | UserVar8[13] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x40 | UserVar8[14] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0x41 | UserVar8[15] | 8-bit signed integer |       |            |             |

| ID   | Name         | Description           |       |            |                 |
|------|--------------|-----------------------|-------|------------|-----------------|
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 1                     | N/A   | 1          | -128 to 127     |
| 0x42 | UserVar16[0] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x43 | UserVar16[1] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x44 | UserVar16[2] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x45 | UserVar16[3] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x46 | UserVar16[4] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x47 | UserVar16[5] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x48 | UserVar16[6] | 16-bit signed integer |       |            |                 |
|      |              | Bytes                 | Units | Resolution | Range           |
|      |              | 2                     | N/A   | 1          | -32768 to 32767 |
| 0x49 | UserVar16[7] | 16-bit signed integer |       |            |                 |

| ID   | Name         | Description           |       |            |                           |
|------|--------------|-----------------------|-------|------------|---------------------------|
|      |              | Bytes                 | Units | Resolution | Range                     |
|      |              | 2                     | N/A   | 1          | -32768 to 32767           |
| 0x4a | UserVar32[0] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x4b | UserVar32[1] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x4c | UserVar32[2] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x4d | UserVar32[3] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x4e | UserVar32[4] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x4f | UserVar32[5] | 32-bit signed integer |       |            |                           |
|      |              | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0x50 | UserVar32[6] | 32-bit signed integer |       |            |                           |

| ID   | Name            | Description                                                         |        |            |                           |
|------|-----------------|---------------------------------------------------------------------|--------|------------|---------------------------|
|      |                 | Bytes                                                               | Units  | Resolution | Range                     |
|      |                 | 4                                                                   | N/A    | 1          | -2147483648 to 2147483647 |
| 0x51 | UserVar32[7]    | 32-bit signed integer                                               |        |            |                           |
|      |                 | 4                                                                   | N/A    | 1          | -2147483648 to 2147483647 |
| 0x52 | SystemStates    | Bitfield; see <a href="#">System State Bits</a> Table               |        |            |                           |
|      |                 | 4                                                                   | N/A    | 1          | 0 to 4294967295           |
| 0x53 | WakeReason      | Hex byte value; see <a href="#">Wake Reason Values</a> Table        |        |            |                           |
|      |                 | 1                                                                   | N/A    | 1          | 0 to 255                  |
| 0x54 | ObdTrueOdometer | 32-bit unsigned integer; see <a href="#">Odometer Details Table</a> |        |            |                           |
|      |                 | 4                                                                   | m      | 1          | 0 to 858993459            |
| 0x55 | ObdTotFuelUsed  | 32-bit unsigned integer                                             |        |            |                           |
|      |                 | 4                                                                   | liters | 1          | 0 to 4294967295           |
| 0x56 | ObdTotEngHours  | 32-bit unsigned integer                                             |        |            |                           |
|      |                 | 4                                                                   | hours  | 1          | 0 to 4294967295           |
| 0x57 | ObdVehicleSpeed | 16-bit unsigned integer                                             |        |            |                           |
|      |                 | 2                                                                   | km/h   | 0.1        | 0 to 2550                 |

| ID   | Name                | Description             |         |            |                 |
|------|---------------------|-------------------------|---------|------------|-----------------|
| 0x58 | ObdEngRpm           | 16-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 2                       | rpm     | 1          | 0 to 65535      |
| 0x59 | ObdEngCoolantTemp   | 16-bit signed integer   |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 2                       | Celsius | 1          | -40 to 215      |
| 0x5a | ObdFuelLevelPct     | 16-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 2                       | %       | 0.1        | 0 to 1000       |
| 0x5b | ObdTotDrivingSec    | 32-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 4                       | s       | 1          | 0 to 4294967295 |
| 0x5c | ObdTotCruiseSec     | 32-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 4                       | s       | 1          | 0 to 4294967295 |
| 0x5d | ObdTotIdleSec       | 32-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 4                       | s       | 1          | 0 to 4294967295 |
| 0x5e | ObdTotIdleFuel      | 32-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 4                       | liters  | 1          | 0 to 4294967295 |
| 0x5f | ObdHarshBreakTotCnt | 32-bit unsigned integer |         |            |                 |
|      |                     | Bytes                   | Units   | Resolution | Range           |
|      |                     | 4                       |         | 1          | 0 to 4294967295 |

| ID    | Name                 | Description                                                                                                                                               |                  |            |            |       |     |       |     |                  |
|-------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------|------------|-------|-----|-------|-----|------------------|
| 0x60  | ObdSpeedExceedTotCnt | 32-bit unsigned integer                                                                                                                                   |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td></td><td>1</td><td>0 to 4294967295</td></tr></table>       | Bytes            | Units      | Resolution | Range | 4   |       | 1   | 0 to 4294967295  |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 4     |                      | 1                                                                                                                                                         | 0 to 4294967295  |            |            |       |     |       |     |                  |
| 0x61  | ObdRPMExceedTotCnt   | 32-bit unsigned integer                                                                                                                                   |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td></td><td>1</td><td>0 to 4294967295</td></tr></table>       | Bytes            | Units      | Resolution | Range | 4   |       | 1   | 0 to 4294967295  |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 4     |                      | 1                                                                                                                                                         | 0 to 4294967295  |            |            |       |     |       |     |                  |
| 0x62  | ObdHarshAccelTotCnt  | 32-bit unsigned integer                                                                                                                                   |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td></td><td>1</td><td>0 to 4294967295</td></tr></table>       | Bytes            | Units      | Resolution | Range | 4   |       | 1   | 0 to 4294967295  |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 4     |                      | 1                                                                                                                                                         | 0 to 4294967295  |            |            |       |     |       |     |                  |
| 0x63  | IgnSource            | See Ignition Sense (ign) on p. 61                                                                                                                         |                  |            |            |       |     |       |     |                  |
|       |                      | <div> <b>NOTE:</b> Does not include 0x8000 (ANDMODE bit)</div>           |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>N/A</td><td>N/A</td><td>0x0000 to 0xffff</td></tr></table> | Bytes            | Units      | Resolution | Range | 2   | N/A   | N/A | 0x0000 to 0xffff |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 2     | N/A                  | N/A                                                                                                                                                       | 0x0000 to 0xffff |            |            |       |     |       |     |                  |
| 0x64  | BluetoothName *      |                                                                                                                                                           |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>              | Bytes            | Units      | Resolution | Range | 1   | N/A   | N/A | N/A              |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 1     | N/A                  | N/A                                                                                                                                                       | N/A              |            |            |       |     |       |     |                  |
| 0x65  | ObdVIN               | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>17</td><td>ascii</td><td>N/A</td><td>N/A</td></tr></table>           | Bytes            | Units      | Resolution | Range | 17  | ascii | N/A | N/A              |
|       |                      | Bytes                                                                                                                                                     | Units            | Resolution | Range      |       |     |       |     |                  |
| 17    | ascii                | N/A                                                                                                                                                       | N/A              |            |            |       |     |       |     |                  |
| 0x66  | ExternADC0_1byte     | Value caps at 25.5v                                                                                                                                       |                  |            |            |       |     |       |     |                  |
|       |                      | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>v</td><td>0.1</td><td>0.0 to 25.5</td></tr></table>        | Bytes            | Units      | Resolution | Range | 1   | v     | 0.1 | 0.0 to 25.5      |
| Bytes | Units                | Resolution                                                                                                                                                | Range            |            |            |       |     |       |     |                  |
| 1     | v                    | 0.1                                                                                                                                                       | 0.0 to 25.5      |            |            |       |     |       |     |                  |
| 0x67  | Reserved *           | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>            | Bytes            | Units      | Resolution | Range | N/A | N/A   | N/A | N/A              |
|       |                      | Bytes                                                                                                                                                     | Units            | Resolution | Range      |       |     |       |     |                  |
| N/A   | N/A                  | N/A                                                                                                                                                       | N/A              |            |            |       |     |       |     |                  |

| ID       | Name             | Description                                                                                                                                              |        |       |            |       |          |     |
|----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|------------|-------|----------|-----|
| 0x68     | Accel Metrics    | Rounded to nearest whole number                                                                                                                          |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>             | Bytes  | Units | Resolution | Range | 4        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 4        | N/A              | N/A                                                                                                                                                      | N/A    |       |            |       |          |     |
| 0x69     | Boot Status      | 8-bit unsigned integer; see <a href="#">Boot Status Values Table</a>                                                                                     |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 7</td></tr></table>            | Bytes  | Units | Resolution | Range | 1        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 1        | N/A              | 1                                                                                                                                                        | 0 to 7 |       |            |       |          |     |
| 0x6a     | Apn Index        | 8-bit unsigned integer                                                                                                                                   |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 3</td></tr></table>            | Bytes  | Units | Resolution | Range | 1        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 1        | N/A              | 1                                                                                                                                                        | 0 to 3 |       |            |       |          |     |
| 0x6b     | ObdDtcPacketSize | See DTC Packet Parsing on p. 156 for more information.                                                                                                   |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>             | Bytes  | Units | Resolution | Range | 2        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 2        | N/A              | N/A                                                                                                                                                      | N/A    |       |            |       |          |     |
| 0x6c     | ObdDtcPacket     | See DTC Packet Parsing on p. 156 for more information.                                                                                                   |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>Variable</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>      | Bytes  | Units | Resolution | Range | Variable | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| Variable | N/A              | N/A                                                                                                                                                      | N/A    |       |            |       |          |     |
| 0x6d     | ObdBackoff       | See <a href="#">OBD Backoff Mode</a> Table                                                                                                               |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>N/A</td><td>0 to 3</td></tr></table>          | Bytes  | Units | Resolution | Range | 1        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 1        | N/A              | N/A                                                                                                                                                      | 0 to 3 |       |            |       |          |     |
| 0x6e     | ObdProtocols     | See <a href="#">OBD Protocol Table</a> , Secondary protocol in MS word, Primary protocol in LS word. e.g. secondary J1708 + primary J1939 = (0x00400100) |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>Hex</td><td>N/A</td><td>N/A</td></tr></table>             | Bytes  | Units | Resolution | Range | 4        | Hex |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 4        | Hex              | N/A                                                                                                                                                      | N/A    |       |            |       |          |     |
| 0x6f     | CrashPacketSize  | Unsigned integer                                                                                                                                         |        |       |            |       |          |     |
|          |                  | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>             | Bytes  | Units | Resolution | Range | 2        | N/A |
| Bytes    | Units            | Resolution                                                                                                                                               | Range  |       |            |       |          |     |
| 2        | N/A              | N/A                                                                                                                                                      | N/A    |       |            |       |          |     |

| ID       | Name            | Description                                                                                                                                                                                                                                                                                                     |                           |       |            |       |          |         |     |                           |
|----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------|------------|-------|----------|---------|-----|---------------------------|
| 0x70     | CrashPacket     | <div>A collection of configurable historical reoriented basic accelerometer vectors structured in little Endian 2 byte values as x, y, z in milli-G's</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>Variable</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table> | Bytes                     | Units | Resolution | Range | Variable | N/A     | N/A | N/A                       |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| Variable | N/A             | N/A                                                                                                                                                                                                                                                                                                             | N/A                       |       |            |       |          |         |     |                           |
| 0x71     | ObdTotPTOTime   | <div>32-bit unsigned integer</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>seconds</td><td>1</td><td>0 to 4294967295</td></tr></table>                                                                                                                   | Bytes                     | Units | Resolution | Range | 4        | seconds | 1   | 0 to 4294967295           |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| 4        | seconds         | 1                                                                                                                                                                                                                                                                                                               | 0 to 4294967295           |       |            |       |          |         |     |                           |
| 0x72     | ObdTotPTOFuel   | <div>32-bit unsigned integer</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>liters</td><td>1</td><td>0 to 4294967295</td></tr></table>                                                                                                                    | Bytes                     | Units | Resolution | Range | 4        | liters  | 1   | 0 to 4294967295           |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| 4        | liters          | 1                                                                                                                                                                                                                                                                                                               | 0 to 4294967295           |       |            |       |          |         |     |                           |
| 0x73     | FwRev           | <div>16-byte null-terminated ascii string. Version string cuts off the first 9 bytes, so "AAb1-1133KB1.1-3c74751" would report as "KB1.1-3c74751".</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>16</td><td>ascii</td><td>N/A</td><td>N/A</td></tr></table>        | Bytes                     | Units | Resolution | Range | 16       | ascii   | N/A | N/A                       |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| 16       | ascii           | N/A                                                                                                                                                                                                                                                                                                             | N/A                       |       |            |       |          |         |     |                           |
| 0x74     | OBDPidReserved1 | <div>Signed integer decimal value of 4-byte hex string divided by 10</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>0.1</td><td>-2147483648 to 2147483647</td></tr></table>                                                                   | Bytes                     | Units | Resolution | Range | 4        | N/A     | 0.1 | -2147483648 to 2147483647 |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| 4        | N/A             | 0.1                                                                                                                                                                                                                                                                                                             | -2147483648 to 2147483647 |       |            |       |          |         |     |                           |
| 0x75     | OBDPidReserved2 | <div>Signed integer decimal value of 4byte hex string divided by 10</div> <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>0.1</td><td>-2147483648 to 2147483647</td></tr></table>                                                                    | Bytes                     | Units | Resolution | Range | 4        | N/A     | 0.1 | -2147483648 to 2147483647 |
| Bytes    | Units           | Resolution                                                                                                                                                                                                                                                                                                      | Range                     |       |            |       |          |         |     |                           |
| 4        | N/A             | 0.1                                                                                                                                                                                                                                                                                                             | -2147483648 to 2147483647 |       |            |       |          |         |     |                           |
| 0x76     | OBDPidReserved3 | <div>Signed integer decimal value of 4byte hex string divided by 10</div>                                                                                                                                                                                                                                       |                           |       |            |       |          |         |     |                           |

| ID   | Name            | Description                                                    |         |            |                                               |
|------|-----------------|----------------------------------------------------------------|---------|------------|-----------------------------------------------|
|      |                 | Bytes                                                          | Units   | Resolution | Range                                         |
|      |                 | 4                                                              | N/A     | 0.1        | -2147483648 to 2147483647                     |
| 0x77 | OBDPidReserved4 | Signed integer decimal value of 4byte hex string divided by 10 |         |            |                                               |
|      |                 | 4                                                              | N/A     | 0.1        | -2147483648 to 2147483647                     |
| 0x78 | OBDPidReserved5 | Signed integer decimal value of 4byte hex string divided by 10 |         |            |                                               |
|      |                 | 4                                                              | N/A     | 0.1        | -2147483648 to 2147483647                     |
| 0x79 | ObdTransGear    | 16-bit unsigned integer                                        |         |            |                                               |
|      |                 | 2                                                              | 0,1,2,3 | 1          | 0=neutral<br>1=forward<br>2=reverse<br>3=park |
| 0x7A | ObdFuelTemp     | 16-bit signed integer                                          |         |            |                                               |
|      |                 | 2                                                              | Celsius | 1          | -40 to 215                                    |
| 0x7B | ObdOilTemp      | 16-bit signed integer                                          |         |            |                                               |
|      |                 | 2                                                              | Celsius | 1          | -40 to 215                                    |
| 0x7C | ObdThottlePos   | 16-bit unsigned integer                                        |         |            |                                               |
|      |                 | 2                                                              | %       | 1          | 0 to 100                                      |
| 0x7D | ObdMPG          | 16-bit unsigned integer                                        |         |            |                                               |

| ID   | Name               | Description             |         |            |              |
|------|--------------------|-------------------------|---------|------------|--------------|
|      |                    | Bytes                   | Units   | Resolution | Range        |
|      |                    | 2                       | mpg     | 0.1        | 0.0 to 256.0 |
| 0x7E | ObdAccelPos        | 16-bit unsigned integer |         |            |              |
|      |                    | 2                       | %       | 1          | 0 to 100     |
| 0x7F | ObdEngLoad         | 16-bit unsigned integer |         |            |              |
|      |                    | 2                       | %       | 1          | 0 to 250     |
| 0x80 | ObdEngTorque       | 16-bit signed integer   |         |            |              |
|      |                    | 2                       | %       | 1          | -125 to 125  |
| 0x81 | ObdOilLevel        | 16-bit unsigned integer |         |            |              |
|      |                    | 2                       | %       | 1          | 0 to 100     |
| 0x82 | ObdOilPressure     | 16-bit unsigned integer |         |            |              |
|      |                    | 2                       | kPa     | 1          | 0 to 100     |
| 0x83 | ObdCoolantPressure | 16-bit unsigned integer |         |            |              |
|      |                    | 2                       | kPa     | 1          | 0 to 100     |
| 0x84 | ObdIntakeAirTemp   | 16-bit signed integer   |         |            |              |
|      |                    | 2                       | Celsius | 1          | -40 to 215   |
| 0x85 | ObdManifoldTemp    | 16-bit signed integer   |         |            |              |

| ID   | Name            | Description                                                        |         |            |                   |
|------|-----------------|--------------------------------------------------------------------|---------|------------|-------------------|
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 2                                                                  | Celsius | 1          | -40 to 215        |
| 0x86 | ObdCoolantLevel | 16-bit unsigned integer                                            |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 2                                                                  | %       | 1          | 0 to 100          |
| 0x87 | LinkageVer      | 32-bit unsigned integer; see <a href="#">Linkage Version</a> Table |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | N/A     | 1          | 0x0 to 0xffffffff |
| 0x88 | GSPTripOdom2    | See <a href="#">Odometer Details</a> Table                         |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | m       | 1          | 0 to 4294967295   |
| 0x89 | GenCfgVal0      | Generic Configuration Value set via paramset                       |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | N/A     | 1          | 0 to 4294967295   |
| 0x8a | GenCfgVal1      | Generic Configuration Value set via paramset                       |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | N/A     | 1          | 0 to 4294967295   |
| 0x8b | GenCfgVal2      | Generic Configuration Value set via paramset                       |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | N/A     | 1          | 0 to 4294967295   |
| 0x8c | GenCfgVal3      | Generic Configuration Value set via paramset                       |         |            |                   |
|      |                 | Bytes                                                              | Units   | Resolution | Range             |
|      |                 | 4                                                                  | N/A     | 1          | 0 to 4294967295   |
| 0x8d | GenCfgVal4      | Generic Configuration Value set via paramset                       |         |            |                   |

| ID   | Name                | Description                                                     |       |            |                           |
|------|---------------------|-----------------------------------------------------------------|-------|------------|---------------------------|
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 1          | 0 to 4294967295           |
| 0x8e | OBDPidReserved6     | Signed integer decimal value of 4-byte hex string divided by 10 |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 0.1        | -2147483648 to 2147483647 |
| 0x8f | OBDPidReserved7     | Signed integer decimal value of 4-byte hex string divided by 10 |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 0.1        | -2147483648 to 2147483647 |
| 0x90 | OBDPidReserved8     | Signed integer decimal value of 4-byte hex string divided by 10 |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 0.1        | -2147483648 to 2147483647 |
| 0x91 | OBDPidReserved9     | Signed integer decimal value of 4-byte hex string divided by 10 |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 0.1        | -2147483648 to 2147483647 |
| 0x92 | OBDPidReserved10    | Signed integer decimal value of 4-byte hex string divided by 10 |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 4                                                               | N/A   | 0.1        | -2147483648 to 2147483647 |
| 0x93 | OBDDHarshAccelValue | Unsigned integer decimal value of acceleration in mph/second    |       |            |                           |
|      |                     | Bytes                                                           | Units | Resolution | Range                     |
|      |                     | 1                                                               | Mph/s | 1          | 0 to 255                  |
| 0x94 | OBDDHarshBrakeValue | Unsigned integer decimal value of deceleration in mph/second    |       |            |                           |

| ID   | Name         | Description                                                                                                             |          |       |            |          |
|------|--------------|-------------------------------------------------------------------------------------------------------------------------|----------|-------|------------|----------|
|      |              |                                                                                                                         | Bytes    | Units | Resolution | Range    |
|      |              |                                                                                                                         | 1        | Mph/s | 1          | 0 to 255 |
| 0x95 | CellSerialId | 24-byte null-terminated ascii string                                                                                    |          |       |            |          |
|      |              |                                                                                                                         | 24       | ascii | N/A        | N/A      |
| 0x96 | PktChkSum    | Check sum for the packet, calculated so all bytes sum to 0x00                                                           |          |       |            |          |
|      |              |                                                                                                                         | 1        | N/A   | N/A        | N/A      |
| 0x97 | TPSFields0   | Inclusion of a configured length variable content section defined by the corresponding <a href="#">pct config</a> entry |          |       |            |          |
|      |              |                                                                                                                         | variable | N/A   | N/A        | N/A      |
| 0x98 | TPSFields1   | Inclusion of a configured length variable content section defined by the corresponding <a href="#">pct config</a> entry |          |       |            |          |
|      |              |                                                                                                                         | variable | N/A   | N/A        | N/A      |
| 0x99 | TPSFields2   | Inclusion of a configured length variable content section defined by the corresponding <a href="#">pct config</a> entry |          |       |            |          |
|      |              |                                                                                                                         | variable | N/A   | N/A        | N/A      |
| 0x9a | TPSFields3   | Inclusion of a configured length variable content section defined by the corresponding <a href="#">pct config</a> entry |          |       |            |          |
|      |              |                                                                                                                         | variable | N/A   | N/A        | N/A      |
| 0x9b | TPSFields4   | Inclusion of a configured length variable content section defined by the corresponding <a href="#">pct config</a> entry |          |       |            |          |

| ID   | Name             | Description                                        |          |       |            |       |
|------|------------------|----------------------------------------------------|----------|-------|------------|-------|
|      |                  |                                                    | Bytes    | Units | Resolution | Range |
|      |                  |                                                    | variable | N/A   | N/A        | N/A   |
| 0x9c | OBDPidReserved11 | 4-byte ascii normalization of the vehicle response |          |       |            |       |
|      |                  |                                                    | 4        | ascii | N/A        | N/A   |
| 0x9d | OBDPidReserved12 | 4-byte ascii normalization of the vehicle response |          |       |            |       |
|      |                  |                                                    | 4        | ascii | N/A        | N/A   |
| 0x9e | OBDPidReserved13 | 4-byte ascii normalization of the vehicle response |          |       |            |       |
|      |                  |                                                    | 4        | ascii | N/A        | N/A   |
| 0x9f | OBDPidReserved14 | 4-byte ascii normalization of the vehicle response |          |       |            |       |
|      |                  |                                                    | 4        | ascii | N/A        | N/A   |
| 0xa0 | OBDPidReserved15 | 4-byte ascii normalization of the vehicle response |          |       |            |       |
|      |                  |                                                    | 4        | ascii | N/A        | N/A   |
| 0xa1 | Debug-PacketSize | Unsigned integer                                   |          |       |            |       |
|      |                  |                                                    | 2        | N/A   | N/A        | N/A   |
| 0xa2 | DebugPacket      | Payload                                            |          |       |            |       |
|      |                  |                                                    | variable | N/A   | N/A        | N/A   |
| 0xa3 | UserVar8[16]     | 8-bit signed integer                               |          |       |            |       |

| ID   | Name         | Description          |       |            |             |
|------|--------------|----------------------|-------|------------|-------------|
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa4 | UserVar8[17] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa5 | UserVar8[18] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa6 | UserVar8[19] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa7 | UserVar8[20] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa8 | UserVar8[21] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xa9 | UserVar8[22] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xaa | UserVar8[23] | 8-bit signed integer |       |            |             |
|      |              | Bytes                | Units | Resolution | Range       |
|      |              | 1                    | N/A   | 1          | -128 to 127 |
| 0xab | UserVar8[24] | 8-bit signed integer |       |            |             |

| ID   | Name         | Description           |       |            |             |
|------|--------------|-----------------------|-------|------------|-------------|
|      |              | Bytes                 | Units | Resolution | Range       |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xac | UserVar8[25] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xad | UserVar8[26] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xae | UserVar8[27] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xaf | UserVar8[28] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xb0 | UserVar8[29] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xb1 | UserVar8[30] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xb2 | UserVar8[31] | 8-bit signed integer  |       |            |             |
|      |              | 1                     | N/A   | 1          | -128 to 127 |
| 0xb3 | UserVar16[8] | 16-bit signed integer |       |            |             |

| ID   | Name          | Description           |       |            |                 |
|------|---------------|-----------------------|-------|------------|-----------------|
|      |               | Bytes                 | Units | Resolution | Range           |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb4 | UserVar16[9]  | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb5 | UserVar16[10] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb6 | UserVar16[11] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb7 | UserVar16[12] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb8 | UserVar16[13] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xb9 | UserVar16[14] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xba | UserVar16[15] | 16-bit signed integer |       |            |                 |
|      |               | 2                     | N/A   | 1          | -32768 to 32767 |
| 0xbb | UserVar32[8]  | 32-bit signed integer |       |            |                 |

| ID   | Name          | Description           |       |            |                           |
|------|---------------|-----------------------|-------|------------|---------------------------|
|      |               | Bytes                 | Units | Resolution | Range                     |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xbc | UserVar32[9]  | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xbd | UserVar32[10] | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xbe | UserVar32[11] | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xbf | UserVar32[12] | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xc0 | UserVar32[13] | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |
| 0xc1 | UserVar32[14] | 32-bit signed integer |       |            |                           |
|      |               | 4                     | N/A   | 1          | -2147483648 to 2147483647 |

| ID       | Name                 | Description                                                                                                                                                                                                                                              |                           |       |            |       |          |     |     |                           |
|----------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------|------------|-------|----------|-----|-----|---------------------------|
| 0xc2     | UserVar32[15]        | 32-bit signed integer <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>1</td><td>-2147483648 to 2147483647</td></tr></table>                                                                   | Bytes                     | Units | Resolution | Range | 4        | N/A | 1   | -2147483648 to 2147483647 |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 4        | N/A                  | 1                                                                                                                                                                                                                                                        | -2147483648 to 2147483647 |       |            |       |          |     |     |                           |
| 0xc3     | OBD Start Reason     | 16-bit signed integer; see <a href="#">OBD Trip Start Reason</a> (bit mask) table below <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>1</td><td>-2147483648 to 2147483647</td></tr></table> | Bytes                     | Units | Resolution | Range | 4        | N/A | 1   | -2147483648 to 2147483647 |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 4        | N/A                  | 1                                                                                                                                                                                                                                                        | -2147483648 to 2147483647 |       |            |       |          |     |     |                           |
| 0xc4     | OBD End Reason       | 32-bit signed integer; see <a href="#">OBD Trip End Reason</a> (bit mask) table below <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>N/A</td><td>1</td><td>-2147483648 to 2147483647</td></tr></table>   | Bytes                     | Units | Resolution | Range | 4        | N/A | 1   | -2147483648 to 2147483647 |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 4        | N/A                  | 1                                                                                                                                                                                                                                                        | -2147483648 to 2147483647 |       |            |       |          |     |     |                           |
| 0xc5     | TpsTagPayloadSize    | Unsigned integer <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>N/A</td><td>1</td><td>N/A</td></tr></table>                                                                                              | Bytes                     | Units | Resolution | Range | 2        | N/A | 1   | N/A                       |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 2        | N/A                  | 1                                                                                                                                                                                                                                                        | N/A                       |       |            |       |          |     |     |                           |
| 0xc6     | TpsTagPayload        | Payload <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>variable</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>                                                                                              | Bytes                     | Units | Resolution | Range | variable | N/A | N/A | N/A                       |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| variable | N/A                  | N/A                                                                                                                                                                                                                                                      | N/A                       |       |            |       |          |     |     |                           |
| 0xc7     | OBD Seat Belt Status | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>N/A</td><td>N/A</td></tr></table>                                                                                                             | Bytes                     | Units | Resolution | Range | 1        | N/A | N/A | N/A                       |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 1        | N/A                  | N/A                                                                                                                                                                                                                                                      | N/A                       |       |            |       |          |     |     |                           |
| 0xc8     | VehicleBattery_2byte | 2-byte representation of vehicle battery voltage <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>V</td><td>0.1</td><td>0.0 to 6553.5</td></tr></table>                                                    | Bytes                     | Units | Resolution | Range | 2        | V   | 0.1 | 0.0 to 6553.5             |
| Bytes    | Units                | Resolution                                                                                                                                                                                                                                               | Range                     |       |            |       |          |     |     |                           |
| 2        | V                    | 0.1                                                                                                                                                                                                                                                      | 0.0 to 6553.5             |       |            |       |          |     |     |                           |
| 0xc9     | ExtAdc[0]_2byte      | 2-byte representation of external ADC[0] voltage                                                                                                                                                                                                         |                           |       |            |       |          |     |     |                           |

| ID   | Name                       | Description                                                                                                        |       |            |                 |
|------|----------------------------|--------------------------------------------------------------------------------------------------------------------|-------|------------|-----------------|
|      |                            | Bytes                                                                                                              | Units | Resolution | Range           |
|      |                            | 2                                                                                                                  | V     | 0.1        | 0.0 to 6553.5   |
| 0xca | AuxPassthruPacketSize      | Size of entire aux passthru packet                                                                                 |       |            |                 |
|      |                            | 2                                                                                                                  | N/A   | 1          | 1 to 256        |
| 0xcb | AuxPassthruPacket          |                                                                                                                    |       |            |                 |
|      |                            | variable                                                                                                           | N/A   | N/A        | N/A             |
| 0xcc | Geofence States Bitfield 1 | Bitfield representing current state of active geofences 0 to 31, where 1 is inside, and 0 is outside or inactive.  |       |            |                 |
|      |                            | 4                                                                                                                  | N/A   | 1          | 0 to 4294967295 |
| 0xcd | Geofence States Bitfield 2 | Bitfield representing current state of active geofences 32 to 49, where 1 is inside, and 0 is outside or inactive. |       |            |                 |
|      |                            | 4                                                                                                                  | N/A   | 1          | 0 to 4294967295 |
| 0xce | Script version             | Version number of currently loaded script                                                                          |       |            |                 |
|      |                            | 4                                                                                                                  | N/A   | 1          | 0 to 4294967295 |
| 0xcf | Paramset version           | Version number of currently loaded paramset                                                                        |       |            |                 |
|      |                            | 4                                                                                                                  | N/A   | 1          | 0 to 4294967295 |
| 0xd0 | Cell ICCID                 | Cellular ICCID string                                                                                              |       |            |                 |
|      |                            | 21                                                                                                                 | ascii | N/A        | N/A             |
| 0xd1 | Cell MDN                   | Cellular MDN string                                                                                                |       |            |                 |

| ID   | Name                    | Description                                                                                                                                        |               |            |                 |
|------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|-----------------|
|      |                         | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | 20                                                                                                                                                 | ascii         | N/A        | N/A             |
|      |                         |                                                                                                                                                    |               |            |                 |
| 0xd2 | OBD debug packet size   | Unsigned integer                                                                                                                                   |               |            |                 |
|      |                         | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | 2                                                                                                                                                  | N/A           | 1          | N/A             |
| 0xd3 | OBD debug packet        | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | variable                                                                                                                                           | N/A           | N/A        | N/A             |
|      |                         |                                                                                                                                                    |               |            |                 |
| 0xd4 | Cell Access Technology  | Cell Access Technology values                                                                                                                      |               |            |                 |
|      |                         | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | 1                                                                                                                                                  | N/A           | N/A        | 0 to 7,255      |
|      |                         | Value                                                                                                                                              |               |            |                 |
|      |                         | 0                                                                                                                                                  | GSM           |            |                 |
|      |                         | 1                                                                                                                                                  | GSM Compact   |            |                 |
|      |                         | 2                                                                                                                                                  | UTRAN         |            |                 |
|      |                         | 3                                                                                                                                                  | GSM w/EGPRS   |            |                 |
|      |                         | 4                                                                                                                                                  | UTRAN w/HSDPA |            |                 |
|      |                         | 5                                                                                                                                                  | UTRAN w/HSUPA |            |                 |
| 6    | UTRAN w/HSDPA and HSUPA |                                                                                                                                                    |               |            |                 |
| 7    | E-UTRAN                 |                                                                                                                                                    |               |            |                 |
| 255  | Invalid                 |                                                                                                                                                    |               |            |                 |
| 0xd5 | Derived Engine Seconds  | Derived engine seconds                                                                                                                             |               |            |                 |
|      |                         | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | 4                                                                                                                                                  | seconds       | 1          | 0 to 4294967295 |
| 0xd6 | ECU Engine Seconds      | ECU engine seconds                                                                                                                                 |               |            |                 |
|      |                         | Bytes                                                                                                                                              | Units         | Resolution | Range           |
|      |                         | 4                                                                                                                                                  | seconds       | 1          | 0 to 4294967295 |
| 0xd7 | InputActiveStates       | Same as the Input States bitfield, only the reported states are determined by the IDP config settings (see <a href="#">Input State Bits</a> table) |               |            |                 |

| ID   | Name                        | Description                                                          |        |            |                              |
|------|-----------------------------|----------------------------------------------------------------------|--------|------------|------------------------------|
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 1                                                                    | N/A    | 1          | 0x0 to 0xff                  |
| 0xd8 | CellularEnvironment         | Each byte represents a different value                               |        |            |                              |
|      |                             | MSB                                                                  |        | LSB        |                              |
|      |                             | [CSQ]                                                                | [RSRP] | [RSRQ]     | [CINR]                       |
|      |                             | CINR is not currently implemented (always 0xFF).                     |        |            |                              |
|      |                             | RSRP & RSRQ are always 0xFF for modules that do not support AT+CESQ. |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 4                                                                    | Varies | 1          | 0 to 0xff (within each byte) |
| 0xd9 | OBDDHarshAccelValue         | Unsigned integer decimal value of acceleration in km/second          |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 2                                                                    | km/s   | 0.1        | 0.0 to 6553.5                |
| 0xda | OBDDHarshBrakeValue         | Unsigned integer decimal value of deceleration in km/second          |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 2                                                                    | km/s   | 0.1        | 0.0 to 6553.5                |
| 0xdb | Cell Mobile Country Code    | Cell module country-dependent code                                   |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 2                                                                    |        | 1          | 0.0 to 65535                 |
| 0xdc | Cell model/version strings  | Cell model string concatenated with cell module fw version string    |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 58                                                                   | ascii  |            |                              |
| 0xdd | GPS Speed (high-resolution) | Unsigned integer. Greater range equals higher accuracy.              |        |            |                              |
|      |                             | Bytes                                                                | Units  | Resolution | Range                        |
|      |                             | 2                                                                    | kph    | 0.01       | 0.00 to 655.35               |

| ID    | Name                           | Description                                                                                                                                                                       |                 |            |            |       |   |            |      |                 |
|-------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|------------|-------|---|------------|------|-----------------|
| 0xde  | OBD MPG 5 second average       | Averaging synchronized with OBD derived lifetime odometer timing.                                                                                                                 |                 |            |            |       |   |            |      |                 |
|       |                                | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>mpg</td><td>0.1</td><td>0.0 to 256.0</td></tr></table>                             | Bytes           | Units      | Resolution | Range | 2 | mpg        | 0.1  | 0.0 to 256.0    |
| Bytes | Units                          | Resolution                                                                                                                                                                        | Range           |            |            |       |   |            |      |                 |
| 2     | mpg                            | 0.1                                                                                                                                                                               | 0.0 to 256.0    |            |            |       |   |            |      |                 |
| 0xdf  | GPS Harsh Accel Violations Cnt | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td></td><td>1</td><td>0 to 4294967295</td></tr></table>                               | Bytes           | Units      | Resolution | Range | 4 |            | 1    | 0 to 4294967295 |
|       |                                | Bytes                                                                                                                                                                             | Units           | Resolution | Range      |       |   |            |      |                 |
| 4     |                                | 1                                                                                                                                                                                 | 0 to 4294967295 |            |            |       |   |            |      |                 |
| 0xe0  | GPS Harsh Accel Value          | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>kph/s</td><td>0.01</td><td>0.00 to 655.35</td></tr></table>                        | Bytes           | Units      | Resolution | Range | 2 | kph/s      | 0.01 | 0.00 to 655.35  |
|       |                                | Bytes                                                                                                                                                                             | Units           | Resolution | Range      |       |   |            |      |                 |
| 2     | kph/s                          | 0.01                                                                                                                                                                              | 0.00 to 655.35  |            |            |       |   |            |      |                 |
| 0xe1  | GPS Harsh Decel Violations Cnt | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td></td><td>1</td><td>0 to 4294967295</td></tr></table>                               | Bytes           | Units      | Resolution | Range | 4 |            | 1    | 0 to 4294967295 |
|       |                                | Bytes                                                                                                                                                                             | Units           | Resolution | Range      |       |   |            |      |                 |
| 4     |                                | 1                                                                                                                                                                                 | 0 to 4294967295 |            |            |       |   |            |      |                 |
| 0xe2  | GPS Harsh Decel Value          | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>2</td><td>kph/s</td><td>0.01</td><td>0.00 to 655.35</td></tr></table>                        | Bytes           | Units      | Resolution | Range | 2 | kph/s      | 0.01 | 0.00 to 655.35  |
|       |                                | Bytes                                                                                                                                                                             | Units           | Resolution | Range      |       |   |            |      |                 |
| 2     | kph/s                          | 0.01                                                                                                                                                                              | 0.00 to 655.35  |            |            |       |   |            |      |                 |
| 0xe3  | OBD to Fuel Used HR            | High resolution total fuel used.                                                                                                                                                  |                 |            |            |       |   |            |      |                 |
|       |                                | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>4</td><td>liters/bit</td><td>0.5</td><td>0 to 4294967295</td></tr></table>                   | Bytes           | Units      | Resolution | Range | 4 | liters/bit | 0.5  | 0 to 4294967295 |
| Bytes | Units                          | Resolution                                                                                                                                                                        | Range           |            |            |       |   |            |      |                 |
| 4     | liters/bit                     | 0.5                                                                                                                                                                               | 0 to 4294967295 |            |            |       |   |            |      |                 |
| 0xe8  | ObdDieselExhaustVolume         | Ratio of volume of diesel exhaust fluid to the total volume of diesel exhaust fluid storage container for aftertreatment system 1 (exhaust bank 1). 0% is empty and 100% is full. |                 |            |            |       |   |            |      |                 |
|       |                                | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>%</td><td>0.4</td><td>0 to 100</td></tr></table>                                   | Bytes           | Units      | Resolution | Range | 1 | %          | 0.4  | 0 to 100        |
| Bytes | Units                          | Resolution                                                                                                                                                                        | Range           |            |            |       |   |            |      |                 |
| 1     | %                              | 0.4                                                                                                                                                                               | 0 to 100        |            |            |       |   |            |      |                 |
| 0xe9  | ObdDieselExhaustLow            | Least Significant Bit is not used. See "Diesel Exhaust Fluid Tank Low Level States" below.                                                                                        |                 |            |            |       |   |            |      |                 |
|       |                                | <table><tr><th>Bytes</th><th>Units</th><th>Resolution</th><th>Range</th></tr><tr><td>1</td><td>N/A</td><td>1</td><td>0 to 7</td></tr></table>                                     | Bytes           | Units      | Resolution | Range | 1 | N/A        | 1    | 0 to 7          |
| Bytes | Units                          | Resolution                                                                                                                                                                        | Range           |            |            |       |   |            |      |                 |
| 1     | N/A                            | 1                                                                                                                                                                                 | 0 to 7          |            |            |       |   |            |      |                 |
| 0xea  | Upper bytes of DriverId2       | Unsigned integer represent of the upper two bytes of unique six byte iButton ID.                                                                                                  |                 |            |            |       |   |            |      |                 |

| ID   | Name                     | Description                                                                      |       |            |            |
|------|--------------------------|----------------------------------------------------------------------------------|-------|------------|------------|
|      |                          | Bytes                                                                            | Units | Resolution | Range      |
|      |                          | 2                                                                                | N/A   | 1          | 0 to 65535 |
| 0xeb | Upper bytes of DriverId2 | Unsigned integer represent of the upper two bytes of unique six byte iButton ID. |       |            |            |
|      |                          | 2                                                                                | N/A   | 1          | 0 to 65535 |

## 8.4. DTC PACKET PARSING

DTC data is reported via two PCR fields: ObdDtcPacketSize (0x6b) and ObdDtcPacket (0x6c). DTC data can be included in any of the messages sent to the backend and it must include both fields.

ObdDtcPacketSize is a two byte field containing the size of the DTC data packet. The size is the total number of bytes of DTC data in ObdDtcPacket.

ObdDtcPacket is a variable size packet containing the DTC data.

The DTC data format is as follows:

```
<mil_status><num_ecu_dtc><ecu_id_0><num_dtc_0><ascii_0><dtc_code_0><fmi_0>...<ascii_n><dtc_code_n><fmi_n>... <ecu_id_m><num_dtc_0><ascii_0><dtc_code_0><fmi_0>...<ascii_n><dtc_code_n><fmi_n>
```

| Field         | Size | Description                                                                                                         |
|---------------|------|---------------------------------------------------------------------------------------------------------------------|
| <mil_status>  | 1    | MIL/Lamp status data                                                                                                |
| <num_ecu_dtc> | 1    | Number of ECUs reporting DTCs                                                                                       |
| <ecu_id_x>    | 1    | ECU ID                                                                                                              |
| <num_dtc_x>   | 1    | Number of DTCs reported by ECU                                                                                      |
| <ascii_x>     | 1    | DTC ASCII code. One character code indicating the type of system that experienced the failure (e.g. 'P', 'U', etc.) |
| <dtc_code_x>  | 4    | DTC code                                                                                                            |
| <fmi_0>       | 1    | Failure mode information                                                                                            |

### 8.4.1. OBDII

| Field        | Description               |
|--------------|---------------------------|
| <ascii_x>    | 'P', 'C', 'B', 'U' or ' ' |
| <dtc_code_x> | DTC                       |
| <fmi_0>      | 0                         |

### 8.4.2. J1939

| Field        | Description         |
|--------------|---------------------|
| <ascii_x>    | '0'                 |
| <dtc_code_x> | DTC                 |
| <fmi_0>      | FMI reported by ECU |

## 8.4.3. J1708

| Field        | Description         |
|--------------|---------------------|
| <ascii_x>    | 'S' or 'O'          |
| <dtc_code_x> | DTC                 |
| <fmi_0>      | FMI reported by ECU |

## 8.4.4. Examples

**Vehicle reporting no DTCs, MIL off:**

```
ObdDtcPacketSize: 0002

ObdDtcPacket: 0000
  <mil_status> - MIL off
  <num_ecu_dtc> - 0 ECUs reporting DTCs
```

**Vehicle reporting two DTCs on ECU 7E8 and one DTC on ECU 7E9, MIL on:**

```
ObdDtcPacketSize: 0018 (24 bytes)

ObdDtcPacket: 8002E802500000010100500000010200E901550000100000
  <mil_status> - 80 (MIL on)
  <num_ecu_dtc> - 2 (2 ECUs reporting DTCs)
  <ecu_id_0> - E8 (ECU 7E8)
  <num_dtc_0> - 2 (2 DTCs)
    <ascii_0> - 50 ('P')
    <dtc_code_0> - 00000101 (code P0101)
    <fmi_0> - 00
    <ascii_1> - 50 ('P')
    <dtc_code_1> - 00000102 (code P0102)
    <fmi_1> - 00
  <ecu_id_1> - E9 (ECU 7E9)
  <num_dtc_1> - 1 (1 DTCs)
    <ascii_0> - 55 ('U')
    <dtc_code_0> - 00001000 (code U1000)
    <fmi_0> - 00
```

**Heavy-duty Vehicle reporting one DTC (J1939), Amber Warning Lamp on**

```

ObdDtcPacketSize: 000A (10 bytes)

ObdDtcPacket: 2001330130000003A10C
  <mil_status> - 20 (Amber Warning Lamp on)
  <num_ecu_dtc> - 1 (1 ECU reporting DTC)
  <ecu_id_0> - 33 (ECU 33)
  <num_dtc_0> - 1 (1 DTC)
    <ascii_0> - 30 ('0')
    <dtc_code_0> - 000003A1 (SPN 929 - Tire location)
    <fmi_0> - 0C (Bad Intelligent Device Or Component)

```

**8.4.5. Input/Output State Bits***Input*

| Bit  | Input State                       |
|------|-----------------------------------|
| 0x01 | Ignition                          |
| 0x02 | Input 1                           |
| 0x04 | Input 2                           |
| 0x08 | Input 3                           |
| 0x10 | Input 4                           |
| 0x20 | Device In Motion (Accel)          |
| 0x40 | Main supply voltage available     |
| 0x80 | Accelerometer Reorientation Valid |

*output*

| Bit  | Output State   |
|------|----------------|
| 0x01 | Output 0       |
| 0x02 | Output 1       |
| 0x04 | Output 2       |
| 0x08 | Onboard Buzzer |
| 0x10 | Garmin Power   |

#### 8.4.6. OBD Run States Bits

| Bit | State          |
|-----|----------------|
| 0   | Engine Running |
| 1   | PTO On         |
| 2   | Moving         |
| 3   | Ignition On    |

#### 8.4.7. OBD Comms State

| Value | Description                                                    |
|-------|----------------------------------------------------------------|
| 0     | OBD comms off                                                  |
| 1     | OBD comms pending (ECU detected, initiating connection)        |
| 2     | OBD comms connected (waiting for RPM change or vehicle motion) |
| 3     | OBD comms active                                               |

#### 8.4.8. OBD Backoff Mode

| Value | Description                                    |
|-------|------------------------------------------------|
| 0     | OBD not in Backoff                             |
| 1     | OBD Backoff Scantool Detect                    |
| 2     | OBD Backoff MIL Detect                         |
| 3     | OBD Backoff MIL Persisted                      |
| 4     | OBD Backoff Protocol Fail Detect               |
| 5     | OBD Backoff Scantool Detect until Ignition Off |

#### 8.4.9. OBD Protocol Table

| Value (Hex) | Description                                                                |
|-------------|----------------------------------------------------------------------------|
| 0x0001      | ISO 9141-2 (Keyword Byte 08 08)                                            |
| 0x0002      | ISO 9141-2 (Keyword Byte 94 94)                                            |
| 0x0004      | ISO14230 (KWP2000) (5-Baud init)                                           |
| 0x0008      | ISO14230 (KWP2000) (Fast init)                                             |
| 0x0010      | J1850 PWM (typically older Ford vehicles)                                  |
| 0x0020      | J1850 VPW (typically older GM vehicles and some older Chrysler and Toyota) |
| 0x0040      | J1708/J1587                                                                |
| 0x0080      | CAN protocol 11-bit CAN ids                                                |
| 0x0100      | J1939                                                                      |
| 0x0200      | CAN protocol 29-bit CAN ids                                                |

#### 8.4.10. OBD Trip Start Reason (Bit Mask)

| Value (Hex) | Description                                       |
|-------------|---------------------------------------------------|
| 0x0001      | Detected Alternator On or Switched Ignition Input |
| 0x0002      | Detected GPS Movement                             |
| 0x0004      | Detected Vehicle Bus Traffic                      |
| 0x0008      | Detected Changing Vehicle Speed                   |
| 0x0010      | Detected Changing RPM                             |

#### 8.4.11. OBD Trip End Reason (Bit Mask)

| Value      | Description                                                                                                  |
|------------|--------------------------------------------------------------------------------------------------------------|
| 0x00000001 | Start Trip Detect Failed                                                                                     |
| 0x00000002 | Protocol detected, but no start trip conditions met                                                          |
| 0x00000004 | Failed to enable and configure OBD communications to a previous known protocol                               |
| 0x00000008 | Failed all attempts at vehicle protocol communications                                                       |
| 0x00000010 | Trip was active; failed to monitor any valid messages for x seconds or failed all requests for mode 1, pid 0 |
| 0x00000020 | Master Vehicle Speed ECU has stopped responding                                                              |
| 0x00000040 | Master RPM ECU has stopped responding                                                                        |
| 0x00000080 | Three-Minute Timer expired with no changing RPM.                                                             |
| 0x00000100 | ECO mode not enabled and RPM of 0 detected                                                                   |
| 0x00000200 | TPS Filed upload request                                                                                     |
| 0x00000400 | CAN Transport is not configured                                                                              |
| 0x00000800 | J1939 No Valid Claim Address                                                                                 |
| 0x00001000 | CAN Transport - transmit not ready                                                                           |
| 0x00002000 | CAN Send - CAN Controller not Active                                                                         |
| 0x00004000 | CAN Bus Off                                                                                                  |
| 0x00008000 | CAN Transmit Timeout                                                                                         |
| 0x00010000 | CAN hardware Off                                                                                             |
| 0x00020000 | CAN Invalid Transmit Length                                                                                  |

#### 8.4.12. Odometer Details

| Odometer              | Reset                          | Description                                                                                     |
|-----------------------|--------------------------------|-------------------------------------------------------------------------------------------------|
| GPS Trip Odom 1       | Reset by script                | Great-circle distance between subsequent sets of GPS latitude and longitude                     |
| GPS Trip Odom 2       | Reset by script                | Great-circle distance between subsequent sets of GPS latitude and longitude                     |
| OBD Derived Trip Odom | Reset by script                | Distance calculated based on averaged subsequent OBD speed readings                             |
| GPS Lifetime Odom     | Never resets                   | Great-circle distance between subsequent sets of GPS latitude and longitude                     |
| OBD Lifetime Odom     | Never resets                   | Accumulated odometer since install, based either on ECU odometer or averaged OBD speed readings |
| OBD True Odom         | Cannot modify vehicle odometer | Distance acquired directly from ECU, 1m per bit                                                 |

#### 8.4.13. Linkage Version

| Developer Revision | Number of Defined Fields | Sum of Defined Field sizes |
|--------------------|--------------------------|----------------------------|
| 4                  | 208                      | > 645bytes                 |
| 5                  | 151                      | > 588bytes                 |

#### 8.4.14. BuildAndSend Message ACK

| Byte(s) | Value           | Type                                                    | Description                                                                      |
|---------|-----------------|---------------------------------------------------------|----------------------------------------------------------------------------------|
| 0-1     | 0x8888          | N/A                                                     | The first 2 bytes of the ACK must be set to 0x8888.                              |
| 2-3     | PacketSerialNum | 16-bit<br>unsigned int,<br><br>big-endian<br>byte order | This value is the unique packet serial/sequence number (Packet recipe ID: 0x05). |

#### 8.4.15. Packet Creation Characteristics

- A message is created from a single packet recipe and may be appended with fields from a separate append recipe.
- The device can store 128 packet recipes (each containing up to 40 fields) and 16 append recipes (each containing up to 16 fields).
- Each packet/append recipe is assigned a packet ID (0-254; 0x0 to 0xfe).
- Each append recipe is assigned a range of reason codes.

*Example: It's possible to create an append recipe adding fields [x, y, z] to the end of the message. The designer can assign a range, e.g. 4 to 7, to this append recipe. Any time the script calls BuildAndSendMsg() with reason code 4, 5, 6, or 7, [x, y, z] fields are appended to the message. It is up to the customer to design and group reason codes and use them in the script to append desired data in certain situations.*

#### 8.4.16. Packet Creation Recipe Configuration

**Command Structure:**

```
:wycfg pcr[<slot_index>] "<recipe_hex_string>"
```

<slot\_index> is in range of 0 to 127

"<recipe\_hex\_string>" is a quoted string of hexadecimal bytes (represented by two ASCII characters)

**String Structure:**

```
<packet_id><num_fields><field_0><field_1>...<field_N>
```

#### 8.4.17. Packet Creation Append

**Command Structure:**

```
:wycfg pca[<slot_index>] "<append_hex_string>"
```

<slot\_index> is in range of 0 to 15

<recipe\_hex\_string> is a quoted string of hex bytes (represented by two ASCII characters)

#### String Structure:

<reason\_lo><reason\_hi><flags><num\_fields><field\_0><field\_1>...<field\_N>

<reason\_lo> to <reason\_hi> is the reason code range



**NOTE:** A single reason code assignment is possible when <reason\_lo> = <reason\_hi>

<flags> is in range of 0 to 1. See <flags> range table below:

<flags> range table:

| Range | Description                                                                                                                  |
|-------|------------------------------------------------------------------------------------------------------------------------------|
| 0     | Store the appended fields with the message in non-volatile memory but do NOT send the appended fields to the backend server. |
| 1     | Store the appended fields with the message in non-volatile memory AND send the appended fields to the backend server.        |

#### 8.4.18. Examples

##### Packet Recipe Creation

The table below represents three example packet recipe configurations (one on each row). The recipes are stored in the first three recipe slots (out of 128).

| Packet ID | Fields                                            | Command                        |
|-----------|---------------------------------------------------|--------------------------------|
| 0x0       | PacketID, DeviceID, UnixTime                      | :wycfg pcr[0] "0003010306"     |
| 0x14      | PacketID, DeviceID, Latitude, Longitude, Altitude | :wycfg pcr[1] "14050103070809" |
| 0xfe      | PacketID, DeviceID, Hdop,andNumSats               | :wycfg pcr[2] "fe0401031213"   |

##### Append Recipe Creation

| Reason Code Range | Fields and description                                                                         | Command                           |
|-------------------|------------------------------------------------------------------------------------------------|-----------------------------------|
| 0 to 13           | Do NOT Send appended fields to backend server<br>Field: GarminPktResp                          | :wycfg pca[0]<br>"000d000127"     |
| 30 to 38          | Send appended fields to backend server;<br>Fields: MotionStatus, EngineStatus, DerivedOdometer | :wycfg pca[1]<br>"1e2601032c2d2e" |

#### 8.4.19. Signal Quality Measure (SQM) Table

| SQM Value | dBm                       |
|-----------|---------------------------|
| 0         | -113.0                    |
| 1         | -111.8                    |
| 2         | -110.5                    |
| 3         | -109.3                    |
| 4         | -108.1                    |
| 5         | -106.8                    |
| 6         | -105.6                    |
| 7         | -104.4                    |
| 8         | -103.1                    |
| 9         | -101.9                    |
| 10        | -100.7                    |
| 11        | -99.4                     |
| 12        | -98.2                     |
| 13        | -97.0                     |
| 14        | -95.7                     |
| 15        | -94.5                     |
| 16        | -93.3                     |
| 17        | -92.0                     |
| 18        | -90.8                     |
| 19        | -89.6                     |
| 20        | -88.3                     |
| 21        | -87.1                     |
| 22        | -85.9                     |
| 23        | -84.6                     |
| 24        | -83.4                     |
| 25        | -82.2                     |
| 26        | -80.9                     |
| 27        | -79.7                     |
| 28        | -78.5                     |
| 29        | -77.2                     |
| 30        | -76.0                     |
| 31        | -75 or better             |
| 99        | not known/ not detectable |

#### 8.4.20. System State Bits

| Bit | State                         |
|-----|-------------------------------|
| 0   | Valid Registration            |
| 1   | Valid IP                      |
| 2   | Valid GPS                     |
| 3   | Valid Script                  |
| 4   | DM Session Active             |
| 5   | Accel Oriented                |
| 6   | Bluetooth Discoverable (TBD)  |
| 7   | Bluetooth Paired (TBD)        |
| 8   | Bluetooth Authenticated (TBD) |
| 9   | Bluetooth Connected (TBD)     |
| 10  | Bluetooth Powered (TBD)       |
| 11  | Cellular Powered              |
| 12  | GPS Powered                   |
| 13  | Garmin Powered                |
| 14  | Motion Via Accel              |
| 15  | Motion Via GPS                |
| 16  | External Power                |

## 9. COMMAND LANGUAGE

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### 9.1. OVERVIEW

The XT6384-1 device utilizes commands that can be sent over various methods such as USB, RS232, and SMS. This command language can be utilized to configure nearly all the device's parameters and morph its functionality to fit the requirements of a client. The implemented command language has been designed to be easy to learn/remember, human readable, and flexible. Each command is sent to the device in ascii format, and the device responds through the same medium that the command was sent with.

*The syntax for a command is shown below:*

```
:<verb><module><object> [<arg1>, <arg2>, ...<argN>]
```

*Valid characters for verb/module and objects are as follows:*

```
"_abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789"
```

The subsequent sections illustrate the various components that comprise a command. Each of these components has a set of rules that dictate how it should be formatted and what it represents.

### 9.2. VERB AND MODULE

The following are rules regarding the syntax of verb and module codes:

- Always single character codes
- Characters MAY be separated by one valid separator: "[space],()[tab]"

### 9.3. OBJECT

The following are rules regarding the syntax of object codes:

- Must be followed by a valid separator: "[space],()[tab]"
- Unquoted strings of undefined length
- First character must NOT be a numerical digit

## 9.4. ARGUMENTS

The following are rules regarding the syntax of arguments:

- Arguments have multiple valid formats:
  - Strings
  - Strings representing enumerated values of valid chars
  - Hexadecimal or decimal values
- Arguments must be separated by a single valid separator: "[space],()[tab]"
- Arguments must not contain the characters: ":[ ]#<>"
- Anything following the symbol '#' is considered a comment and ignored by the interpreter
- Decimal values have an optional prefix of '+' or '-' to designate their sign
- Hex values can be denoted by prefixing '0x' or '0X'
- Octal values can be denoted by prefixing '0'

### 9.4.1. Verb Codes

| Verb    | Code |
|---------|------|
| Clear   | c    |
| Create  | a    |
| Enable  | e    |
| Disable | d    |
| Query   | q    |
| Run     | u    |
| Read    | r    |
| Restore | o    |
| Save    | v    |
| Send    | x    |
| Set     | s    |
| Toggle  | t    |
| Upgrade | g    |
| Write   | w    |

### 9.4.2. Module Codes

| Module | Code |
|--------|------|
| ADC    | a    |

| Module          | Code |
|-----------------|------|
| Bluetooth       | b    |
| TPS             | c    |
| Device          | d    |
| Geofence        | e    |
| Flash           | f    |
| GPS             | g    |
| Watchdog        | h    |
| GPIO            | i    |
| Third Party     | j    |
| Backend         | k    |
| CMDLang         | l    |
| Motion          | m    |
| Garmin          | n    |
| OBD             | o    |
| Processor Flash | p    |
| Interpreter     | r    |
| Buzzer          | s    |
| Telematics/Cell | t    |
| USB             | u    |
| Aux Passthru    | v    |
| One-Wire-Bus    | w    |
| Accelerometer   | x    |
| System          | y    |
| Zigbee          | z    |
| Main Processor  | 1    |
| 2nd Processor   | 2    |
| available       | q3-0 |

#### 9.4.3. Object Codes

| Object     | Code   |
|------------|--------|
| Bootloader | bl     |
| Chipflash  | chip   |
| Config     | cfg    |
| Command    | cmd    |
| Debug      | dbg    |
| Debug Mask | dm     |
| DM Msg     | dmmmsg |
| Eeprom     | ee     |
| Feature    | f      |

| Object      | Code            |
|-------------|-----------------|
| Firmware    | fw              |
| Heap        | hp (OR) heap    |
| Info        | i (OR) info     |
| Monitor     | m               |
| Memory      | mem             |
| Mode        | md (OR) mode    |
| Message     | msg             |
| Option      | opt             |
| OTA         | ota             |
| Override    | ovrd            |
| Properties  | p (OR) prop     |
| RAM Console | rc              |
| Record      | rec             |
| Script      | scr (OR) script |
| Simulation  | sim             |
| Stack       | stk (OR) stack  |
| State       | st (OR) state   |
| Table       | tab             |
| Task        | tsk (OR) task   |
| Test        | t (OR) test     |
| Truststore  | trst            |
| Value       | val             |

## 9.5. DEVICE COMMANDS

### 9.5.1. ADC

| Command | Function        |
|---------|-----------------|
| :raval  | Read ADC values |

### 9.5.2. Bluetooth®

| Command                              | Function                                        |
|--------------------------------------|-------------------------------------------------|
| :qbi                                 | Query Bluetooth information                     |
| :ubcmd sleep                         |                                                 |
| :ubcmd wake                          |                                                 |
| :ubcmd rest                          |                                                 |
| :ubcmd ble_start                     | RF calibration procedure start                  |
| :ubcmd ble_end                       | RF calibration procedure end                    |
| :ubcmd <mod> <pat> <freq><br><power> | Puts the device into single frequency test mode |

| Command           | Function                                                                                                                                                                                                                                                                                                                                                                                                               |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|------|-----------------------------------|-------|----------------------------|------|------------------------------|------|---------------|------|---------|------|------------------------------|------|------------------------------|
|                   | <table> <tr> <th>&lt;mod&gt; Val</th><th>Definition</th></tr> <tr> <td>0x00</td><td>CW (Pattern must be 0x03 or 0x04)</td></tr> <tr> <td>0x01</td><td>GFSK (BR)</td></tr> <tr> <td>0x02</td><td>(pi)/4-DQPSK (2-EDR)</td></tr> <tr> <td>0x03</td><td>8DPSK (3-EDR)</td></tr> <tr> <td>0x04</td><td>BLE</td></tr> </table>                                                                                              | <mod> Val   | Definition | 0x00 | CW (Pattern must be 0x03 or 0x04) | 0x01  | GFSK (BR)                  | 0x02 | (pi)/4-DQPSK (2-EDR)         | 0x03 | 8DPSK (3-EDR) | 0x04 | BLE     |      |                              |      |                              |
| <mod> Val         | Definition                                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x00              | CW (Pattern must be 0x03 or 0x04)                                                                                                                                                                                                                                                                                                                                                                                      |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x01              | GFSK (BR)                                                                                                                                                                                                                                                                                                                                                                                                              |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x02              | (pi)/4-DQPSK (2-EDR)                                                                                                                                                                                                                                                                                                                                                                                                   |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x03              | 8DPSK (3-EDR)                                                                                                                                                                                                                                                                                                                                                                                                          |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x04              | BLE                                                                                                                                                                                                                                                                                                                                                                                                                    |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
|                   | <table> <tr> <th>&lt;pat&gt; Val</th><th>Definition</th></tr> <tr> <td>0x00</td><td>PN9</td></tr> <tr> <td>0x01</td><td>PN15</td></tr> <tr> <td>0x02</td><td>0x5555 (0101 0101 0101 0101)</td></tr> <tr> <td>0x03</td><td>All 1's</td></tr> <tr> <td>0x04</td><td>All 0's</td></tr> <tr> <td>0x05</td><td>0xF0F0 (1111 0000 1111 0000)</td></tr> <tr> <td>0x06</td><td>0xFF00 (1111 1111 0000 0000)</td></tr> </table> | <pat> Val   | Definition | 0x00 | PN9                               | 0x01  | PN15                       | 0x02 | 0x5555 (0101 0101 0101 0101) | 0x03 | All 1's       | 0x04 | All 0's | 0x05 | 0xF0F0 (1111 0000 1111 0000) | 0x06 | 0xFF00 (1111 1111 0000 0000) |
| <pat> Val         | Definition                                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x00              | PN9                                                                                                                                                                                                                                                                                                                                                                                                                    |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x01              | PN15                                                                                                                                                                                                                                                                                                                                                                                                                   |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x02              | 0x5555 (0101 0101 0101 0101)                                                                                                                                                                                                                                                                                                                                                                                           |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x03              | All 1's                                                                                                                                                                                                                                                                                                                                                                                                                |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x04              | All 0's                                                                                                                                                                                                                                                                                                                                                                                                                |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x05              | 0xF0F0 (1111 0000 1111 0000)                                                                                                                                                                                                                                                                                                                                                                                           |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x06              | 0xFF00 (1111 1111 0000 0000)                                                                                                                                                                                                                                                                                                                                                                                           |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
|                   | <table> <tr> <th>&lt;freq&gt; Val</th><th>Definition</th></tr> <tr> <td>0-39</td><td>Freq = 2402 + 2*val</td></tr> <tr> <td>40-78</td><td>Freq = 2403 + 2*(val - 40)</td></tr> </table>                                                                                                                                                                                                                                | <freq> Val  | Definition | 0-39 | Freq = 2402 + 2*val               | 40-78 | Freq = 2403 + 2*(val - 40) |      |                              |      |               |      |         |      |                              |      |                              |
| <freq> Val        | Definition                                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0-39              | Freq = 2402 + 2*val                                                                                                                                                                                                                                                                                                                                                                                                    |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 40-78             | Freq = 2403 + 2*(val - 40)                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
|                   | <table> <tr> <th>&lt;power&gt; Val</th><th>Definition</th></tr> <tr> <td>0x01</td><td>BLE Output Power</td></tr> <tr> <td>0x08</td><td>Min Output Power (non-BLE)</td></tr> <tr> <td>0x0F</td><td>Max Output Power (BLE)</td></tr> </table>                                                                                                                                                                            | <power> Val | Definition | 0x01 | BLE Output Power                  | 0x08  | Min Output Power (non-BLE) | 0x0F | Max Output Power (BLE)       |      |               |      |         |      |                              |      |                              |
| <power> Val       | Definition                                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x01              | BLE Output Power                                                                                                                                                                                                                                                                                                                                                                                                       |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x08              | Min Output Power (non-BLE)                                                                                                                                                                                                                                                                                                                                                                                             |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| 0x0F              | Max Output Power (BLE)                                                                                                                                                                                                                                                                                                                                                                                                 |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| :ubcmd adv        |                                                                                                                                                                                                                                                                                                                                                                                                                        |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| :ubcmd unadv      |                                                                                                                                                                                                                                                                                                                                                                                                                        |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
| :ubcmd authbypass |                                                                                                                                                                                                                                                                                                                                                                                                                        |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |
|                   |  <b>NOTE:</b> Command cannot be sent via SMS or UDP                                                                                                                                                                                                                                                                                 |             |            |      |                                   |       |                            |      |                              |      |               |      |         |      |                              |      |                              |

### 9.5.3. Accelerometer

| Command                   | Function                                                      |
|---------------------------|---------------------------------------------------------------|
| :rxval                    | Read current X, Y, and Z accelerations                        |
| :rxval coefs              | Read current filter coefficients                              |
| :rxval rot                | Read current reorientation angles (radians)                   |
| :wxval coefs <num_stages> | Write the number of filter stages and all filter coefficients |

| Command                            | Function                                         |
|------------------------------------|--------------------------------------------------|
| <coef1> <coef2> ... <coefX>        |                                                  |
| :wxval coef <coef_index><br><coef> | Write filter coefficient at index X              |
| :qxi                               | Query accelerometer info                         |
| :exm                               | Enable accelerometer debug channel monitoring    |
| :dxm                               | Disable accelerometer debug channel monitoring   |
| :ext                               | Enable accelerometer motion test                 |
| :dxt                               | Disable accelerometer motion test                |
| :uxcmd findz                       | Force reorientation to z-axis                    |
| :uxcmd findxa                      | Force reorientation to x-axis using acceleration |
| :uxcmd findxd                      | Force reorientation to x-axis using deceleration |
| :uxcmd voidrot                     | Force void of current reorientation              |

#### 9.5.4. Buzzer

| Command                                      | Function                                     |
|----------------------------------------------|----------------------------------------------|
| :uscmd play <song_index><br><volume> <loops> | Play a buzzer song out of the config         |
| :uscmd stop                                  | Stop a buzzer song that is currently playing |

#### 9.5.5. Backend

| Command                             | Function                                               |
|-------------------------------------|--------------------------------------------------------|
| :ekm                                | Enable Backend debug channel monitoring                |
| :dkm                                | Disable Backend debug channel monitoring               |
| :rkval ack_timeout                  | Read what the current ACK timeout value is set to (ms) |
| :wkval ack_timeout<br><timeout_val> | Set the ACK timeout value (ms)                         |

#### 9.5.6. Command Language

| Command           | Function                                 |
|-------------------|------------------------------------------|
| :wlopt echo <0 1> | Write cmdlang option "echo" to on or off |

### 9.5.7. Third Party

| Command                                    | Function                                                                                                                             |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| :ejm                                       | Enable Third Party debug channel monitoring                                                                                          |
| :djm                                       | Disable Third Party debug channel monitoring                                                                                         |
| :djdbg                                     | Disable Third Party XVBMG debug trace                                                                                                |
| :ejdbg                                     | Enable Third Party XVBMG debug trace                                                                                                 |
| :qji                                       | Print out parameter tag information                                                                                                  |
| :qji diag                                  | Print out tag transaction diagnostic info                                                                                            |
| :gjfw x <serial_port_id>                   | Upgrade Third Party via xmodem                                                                                                       |
|                                            |  <b>NOTE:</b> Command cannot be sent via SMS or UDP |
| :gjscr x <serial_port_id> <flag -optional> | Upload VIS file via xmodem (flag = 1; erases all VIS's first)                                                                        |
|                                            |  <b>NOTE:</b> Command cannot be sent via SMS or UDP |
| :ujcmd tag <tag id> <ip_dst>               | Run XVBMG on tag id; if no VIS file found, downloads VIS first (:edm & :ekm)                                                         |
| :ujcmd init                                | Initialize Third Party functions (:edm)                                                                                              |
| :ujcmd exec                                | Displays Third Party FW version (:edm)                                                                                               |

### 9.5.8. Device

| Command      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------|-------------|---|---------------|-----------------------------------------|---|-----------|-------------------------------------------------------------|---|----------|--------------------------------------------|---|----------|--------------------------------------|---|------|---------------------------------------------|---|----------|--------------------------------------|---|----------------|------------------|---|---------------|------------------------------------------------------------|---|--------------|------------------|---|---------|-------------------------------------------------------------|
| :rdval reset | Read device reset reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                             |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
|              | Reason codes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                             |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
|              | <table><tr><th>Code</th><th>Reason</th><th>Description</th></tr><tr><td>0</td><td>Power applied</td><td>Main supply voltage connected to device</td></tr><tr><td>1</td><td>Low Power</td><td>Reset caused by the micro Hibernation module (not utilized)</td></tr><tr><td>2</td><td>Watchdog</td><td>Reset caused by the micro Watchdog module.</td></tr><tr><td>3</td><td>Software</td><td>Reset caused by our device firmware.</td></tr><tr><td>4</td><td>User</td><td>Main micro reset pin toggled (not utilized)</td></tr><tr><td>5</td><td>Brownout</td><td>Reset caused by the micro BOR module</td></tr><tr><td>6</td><td>Supply Monitor</td><td>Not implemented.</td></tr><tr><td>7</td><td>Factory Reset</td><td>Reset caused by the micro Hardware System Service Request.</td></tr><tr><td>8</td><td>System Error</td><td>Not implemented.</td></tr><tr><td>9</td><td>Unknown</td><td>Catch for any other micro reset source we have not defined.</td></tr></table> | Code                                                        | Reason | Description | 0 | Power applied | Main supply voltage connected to device | 1 | Low Power | Reset caused by the micro Hibernation module (not utilized) | 2 | Watchdog | Reset caused by the micro Watchdog module. | 3 | Software | Reset caused by our device firmware. | 4 | User | Main micro reset pin toggled (not utilized) | 5 | Brownout | Reset caused by the micro BOR module | 6 | Supply Monitor | Not implemented. | 7 | Factory Reset | Reset caused by the micro Hardware System Service Request. | 8 | System Error | Not implemented. | 9 | Unknown | Catch for any other micro reset source we have not defined. |
| Code         | Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Description                                                 |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 0            | Power applied                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Main supply voltage connected to device                     |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 1            | Low Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reset caused by the micro Hibernation module (not utilized) |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 2            | Watchdog                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reset caused by the micro Watchdog module.                  |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 3            | Software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reset caused by our device firmware.                        |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 4            | User                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Main micro reset pin toggled (not utilized)                 |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 5            | Brownout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reset caused by the micro BOR module                        |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 6            | Supply Monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Not implemented.                                            |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 7            | Factory Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reset caused by the micro Hardware System Service Request.  |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 8            | System Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Not implemented.                                            |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |
| 9            | Unknown                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Catch for any other micro reset source we have not defined. |        |             |   |               |                                         |   |           |                                                             |   |          |                                            |   |          |                                      |   |      |                                             |   |          |                                      |   |                |                  |   |               |                                                            |   |              |                  |   |         |                                                             |

| Command                     | Function                                                                                                                          |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| :rdval serial               | Read device serial number                                                                                                         |
| :rdval uptime               | Read device uptime (seconds since reset)                                                                                          |
| :rdval wake                 | Read device wake reason (only accurate if device has slept)                                                                       |
| :wdval serial "<serial_no>" | Write the device serial number                                                                                                    |
| :qdi                        | Query device info ("vtu query")                                                                                                   |
| :qdi cell                   | Query cellular device info ("vtu query modem")                                                                                    |
| :qdi gps                    | Query GPS device info ("vtu query gps")                                                                                           |
| :udcmd checkin              | Send a Device Manager Check-In message to dst[9]                                                                                  |
| :udcmd factory              | Reset device to factory state                                                                                                     |
| :udcmd factory keys         | Reset device to factory state plus revert AES keys to defaults. This is the only command available outside the AES console login. |



**NOTE:** Cannot be sent via SMS or UDP

:udcmd dslp <mask>  
<minutes>

Enter deep sleep with <mask> wake setting

Mask Values:

| Hex    | Description                                           |
|--------|-------------------------------------------------------|
| 0x0000 | Ring (Not applicable)                                 |
| 0x0001 | Wired Ignition/IN0                                    |
| 0x0002 | Input 1                                               |
| 0x0004 | Input 2                                               |
| 0x0008 | Input 3                                               |
| 0x0010 | Input 4                                               |
| 0x0020 | Time                                                  |
| 0x0040 | Motion                                                |
| 0x0080 | External Battery (configured by <a href="#">wbv</a> ) |
| 0x0100 | Unplug                                                |

:udcmd slp <mask>  
<minutes>

Enter sleep with <mask> wake setting

Mask Values:

| Hex    | Description                                           |
|--------|-------------------------------------------------------|
| 0x0000 | Ring                                                  |
| 0x0001 | Wired Ignition/IN0                                    |
| 0x0002 | Input 1                                               |
| 0x0004 | Input 2                                               |
| 0x0008 | Input 3                                               |
| 0x0010 | Input 4                                               |
| 0x0020 | Time                                                  |
| 0x0040 | Motion                                                |
| 0x0080 | External Battery (configured by <a href="#">wbv</a> ) |
| 0x0100 | Unplug                                                |

| Command | Function                                |
|---------|-----------------------------------------|
| :edm    | Enable device debug channel monitoring  |
| :ddm    | Disable device debug channel monitoring |

### 9.5.9. Flash

| Command                                  | Function                                                                                              |
|------------------------------------------|-------------------------------------------------------------------------------------------------------|
| :efm                                     | Enable Flash debug channel monitoring                                                                 |
| :dfm                                     | Disable Flash debug channel monitoring                                                                |
| :cfmem [all   <addr> <size>]             | all = erase entire flash chip, <addr>,<size><br><br>NOTE: Must be multiples of 0x1000                 |
| :rfmem <addr> <size>                     | Read <size> bytes of flash memory at address <addr><br><br>NOTE: <addr> is in decimal                 |
| :wfmem <addr> "<hex_string>"             | Write "<hex_string>" to address <addr>                                                                |
| :qfmem                                   | Query flash memory layout<br><br>NOTE: Only available on debug devices                                |
| :qfi                                     | Query flash info (device type)                                                                        |
| :qfrec                                   | Query number of pending messages (records)                                                            |
| :rfrec                                   | Read pending messages (records)                                                                       |
| :wfrec "<hex_string>"                    | Write flash message (record)                                                                          |
| :qftab <x>                               | Query flash table (x = 2 for packet log)                                                              |
| :sftab <x> <sz>                          | Fill flash table x leaving only sz bytes available<br><br>NOTE: Only available on engineering devices |
| :ufcmd reset                             | Erase pending messages                                                                                |
| :ufcmd search <match><br><size> <offset> | Search flash for a match                                                                              |

### 9.5.10. Garmin

| Command                               | Function                                                                |
|---------------------------------------|-------------------------------------------------------------------------|
| :enm                                  | Enable Garmin debug channel monitoring                                  |
| :dnm                                  | Disable Garmin debug channel monitoring                                 |
| :xnmsg <pid> "<ascii_hex>"<br><flags> | Send a payload destined for Garmin device (needs script trigger/action) |

### 9.5.11. Geofence

| Command      | Function                                  |
|--------------|-------------------------------------------|
| :eem         | Enable Geofence debug channel monitoring  |
| :dem         | Disable Geofence debug channel monitoring |
| :redm        | Read GPS debug mask                       |
| :wedm <mask> | Write the GPS debug mask                  |

### 9.5.12. GPIO

| Command                 | Function                                                       |
|-------------------------|----------------------------------------------------------------|
| :qii                    | Query GPIO info (GPIO pin IDs and default states)              |
| :rival <pin_id>         | Read state of GPIO pin                                         |
| :wival <pin_id> <0 1 x> | Control the state of GPIO pin (x = give control back to micro) |

### 9.5.13. GPS

| Command      | Function                             |
|--------------|--------------------------------------|
| :rgdm        | Read GPS debug mask                  |
| :wgdm <mask> | Write the GPS debug mask             |
| :egm         | Enable GPS debug channel monitoring  |
| :dgm         | Disable GPS debug channel monitoring |
| :egt         | Enable GPS production test           |
| :dgt         | Disable GPS production test          |
| :egcmd       | Start GPS                            |
| :dgcmd       | Stop GPS                             |
| :qgi         | Query GPS info                       |
| :ugcmd reset | GPS module reset                     |

### 9.5.14. GPS Simulator

| Command                                         | Function                                                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------|---|----------|---|--------|---|-------|---|------------|
| :sgsim config <lat> <long><br><heading> <speed> | GPS simulator initialize/enable:                                                                                                                                                                                                                     |       |             |   |      |   |          |   |        |   |       |   |            |
|                                                 | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>None</td></tr> <tr> <td>1</td><td>Unlocked</td></tr> <tr> <td>2</td><td>Locked</td></tr> <tr> <td>3</td><td>Sleep</td></tr> <tr> <td>4</td><td>LockedGood</td></tr> </table> | Value | Description | 0 | None | 1 | Unlocked | 2 | Locked | 3 | Sleep | 4 | LockedGood |
| Value                                           | Description                                                                                                                                                                                                                                          |       |             |   |      |   |          |   |        |   |       |   |            |
| 0                                               | None                                                                                                                                                                                                                                                 |       |             |   |      |   |          |   |        |   |       |   |            |
| 1                                               | Unlocked                                                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
| 2                                               | Locked                                                                                                                                                                                                                                               |       |             |   |      |   |          |   |        |   |       |   |            |
| 3                                               | Sleep                                                                                                                                                                                                                                                |       |             |   |      |   |          |   |        |   |       |   |            |
| 4                                               | LockedGood                                                                                                                                                                                                                                           |       |             |   |      |   |          |   |        |   |       |   |            |

| Command                   | Function                                                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------|---|----------|---|--------|---|-------|---|------------|
| :sgsim coord <lat> <long> | GPS simulator force coordinates                                                                                                                                                                                                                      |       |             |   |      |   |          |   |        |   |       |   |            |
| :sgsim speed <speed>      | GPS simulator force speed                                                                                                                                                                                                                            |       |             |   |      |   |          |   |        |   |       |   |            |
|                           | Values are in tenths (e.g. 300 = 30 mph)                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
| :sgsim head <heading>     | GPS simulator force heading                                                                                                                                                                                                                          |       |             |   |      |   |          |   |        |   |       |   |            |
|                           | Values are in tenths (e.g. 900 = 90 degrees)                                                                                                                                                                                                         |       |             |   |      |   |          |   |        |   |       |   |            |
| :sgsim lock <lock>        | GPS simulator force lock state:                                                                                                                                                                                                                      |       |             |   |      |   |          |   |        |   |       |   |            |
|                           | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>None</td></tr> <tr> <td>1</td><td>Unlocked</td></tr> <tr> <td>2</td><td>Locked</td></tr> <tr> <td>3</td><td>Sleep</td></tr> <tr> <td>4</td><td>LockedGood</td></tr> </table> | Value | Description | 0 | None | 1 | Unlocked | 2 | Locked | 3 | Sleep | 4 | LockedGood |
| Value                     | Description                                                                                                                                                                                                                                          |       |             |   |      |   |          |   |        |   |       |   |            |
| 0                         | None                                                                                                                                                                                                                                                 |       |             |   |      |   |          |   |        |   |       |   |            |
| 1                         | Unlocked                                                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
| 2                         | Locked                                                                                                                                                                                                                                               |       |             |   |      |   |          |   |        |   |       |   |            |
| 3                         | Sleep                                                                                                                                                                                                                                                |       |             |   |      |   |          |   |        |   |       |   |            |
| 4                         | LockedGood                                                                                                                                                                                                                                           |       |             |   |      |   |          |   |        |   |       |   |            |
| :sgsim hdop <hdop>        | GPS simulator force hdop                                                                                                                                                                                                                             |       |             |   |      |   |          |   |        |   |       |   |            |
| :sgsim clear              | Disable GPS simulator                                                                                                                                                                                                                                |       |             |   |      |   |          |   |        |   |       |   |            |

#### 9.5.15. Cellular

| Command      | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|-------|----------------|-------|-----------------|-------|-------------------|-------|--------------------|-------|-----------------|-------|-----------------------|-------|---------------|-------|-------------------|-------|---------------|-------|---------------|-------|---------------|
| :rtdm        | Read transport debug mask                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| :wtdm <mask> | Write the transport debug mask                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
|              | mask Values:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
|              | <table> <tr> <th>Hex</th><th>Description</th></tr> <tr> <td>0x000</td><td>GSMDDebug_None</td></tr> <tr> <td>0x001</td><td>GSMDDebug_State</td></tr> <tr> <td>0x002</td><td>GSMDDebug_Command</td></tr> <tr> <td>0x004</td><td>GSMDDebug_Response</td></tr> <tr> <td>0x008</td><td>GSMDDebug_Parse</td></tr> <tr> <td>0x010</td><td>GSMDDebug_ResponseHex</td></tr> <tr> <td>0x020</td><td>GSMDDebug_Mux</td></tr> <tr> <td>0x040</td><td>GSMDDebug_Backend</td></tr> <tr> <td>0x080</td><td>GSMDDebug_Mno</td></tr> <tr> <td>0x100</td><td>GSMDDebug_URC</td></tr> <tr> <td>0x200</td><td>GSMDDebug_PDU</td></tr> </table> | Hex | Description | 0x000 | GSMDDebug_None | 0x001 | GSMDDebug_State | 0x002 | GSMDDebug_Command | 0x004 | GSMDDebug_Response | 0x008 | GSMDDebug_Parse | 0x010 | GSMDDebug_ResponseHex | 0x020 | GSMDDebug_Mux | 0x040 | GSMDDebug_Backend | 0x080 | GSMDDebug_Mno | 0x100 | GSMDDebug_URC | 0x200 | GSMDDebug_PDU |
| Hex          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x000        | GSMDDebug_None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x001        | GSMDDebug_State                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x002        | GSMDDebug_Command                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x004        | GSMDDebug_Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x008        | GSMDDebug_Parse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x010        | GSMDDebug_ResponseHex                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x020        | GSMDDebug_Mux                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x040        | GSMDDebug_Backend                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x080        | GSMDDebug_Mno                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x100        | GSMDDebug_URC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |
| 0x200        | GSMDDebug_PDU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |             |       |                |       |                 |       |                   |       |                    |       |                 |       |                       |       |               |       |                   |       |               |       |               |       |               |

| Command                                                                    | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|----|----------------------|---|----------------------|---|------------------------|---|---------------------|---|-----|---|-------------------|----|------------------|----|------------------|
| :wtovrd apn ["<apn_override>"]                                             | <apn_override> Override class 3 APN Only applicable to: <ul style="list-style-type: none"> <li>• XT6372, XT6374</li> <li>• XT6369</li> <li>• XT6383</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :etm                                                                       | Enable transport debug channel monitoring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :dtm                                                                       | Disable transport debug channel monitoring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :ett                                                                       | Enable transport test mode ('ct' mode)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :ett direct                                                                | Connect serial console directly to cellular port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :dtt                                                                       | Disable transport test mode ('ct')                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :qti                                                                       | Query transport info                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :qti ip                                                                    | Query cellular mobile IP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :qti certmask                                                              | Query cellular certification mask<br><br>(0x0: no security certificates loaded; 0x7: all 3 security certificates loaded successfully)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utcmd factory                                                             | Set cellular module to factory default state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utcmd reset                                                               | Queue a reset for the cellular module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utcmd sleep                                                               | Stop cellular module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utcmd wake                                                                | Start cellular module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utota ftp "<filename with extension>" <type>                              | Request FTP file transfer (only XT6369, XT6379, XT6376) <table border="1"> <thead> <tr> <th>Type</th><th>Description</th></tr> </thead> <tbody> <tr> <td>12</td><td>Cell Module Firmware</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Type | Description | 12 | Cell Module Firmware |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| Type                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 12                                                                         | Cell Module Firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| :utota https "<host>" "<path>" <port> <type>[[<index>] "<filename>"] <rev> | Request HTTPS file transfer (only on AAb6 currently)<br><br>"<host>" is an https server string<br><br>"<path>" is an https path to file including file extension<br><br><port> is an https server port<br><br><type> is an enumerated value: <table border="1"> <thead> <tr> <th>Type</th><th>Description</th></tr> </thead> <tbody> <tr> <td>0</td><td>Bootloader firmware</td></tr> <tr> <td>1</td><td>Application firmware</td></tr> <tr> <td>2</td><td>Script binary firmware</td></tr> <tr> <td>3</td><td>Parameter text file</td></tr> <tr> <td>6</td><td>TPS</td></tr> <tr> <td>8</td><td>Overlay text file</td></tr> <tr> <td>10</td><td>Third party code</td></tr> <tr> <td>11</td><td>Third party data</td></tr> </tbody> </table><br><index> only applies to overlays | Type | Description | 0  | Bootloader firmware  | 1 | Application firmware | 2 | Script binary firmware | 3 | Parameter text file | 6 | TPS | 8 | Overlay text file | 10 | Third party code | 11 | Third party data |
| Type                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 0                                                                          | Bootloader firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 1                                                                          | Application firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 2                                                                          | Script binary firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 3                                                                          | Parameter text file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 6                                                                          | TPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 8                                                                          | Overlay text file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 10                                                                         | Third party code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |
| 11                                                                         | Third party data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |             |    |                      |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |

| Command                                                                          | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|---|---------------------|---|----------------------|---|------------------------|---|---------------------|---|-----|---|-------------------|----|------------------|----|------------------|----|---------------------------------------|
|                                                                                  | "<filename>" is arbitrary and optional name reported in :q1i response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
|                                                                                  | <rev> is the user determined revision value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| :utota s3 "<full S3 presigned link>" <port> <type>[[<index>] "<filename>"]<rev>] | Request HTTPS file transfer (only on AAb6 currently).<br><br>"<full S3 presigned link>" https server string and path including file extension<br><br><port> is an https server port<br><br><type> is an enumerated value: <table> <tr> <th>Type</th><th>Description</th></tr> <tr> <td>0</td><td>Bootloader firmware</td></tr> <tr> <td>1</td><td>Application firmware</td></tr> <tr> <td>2</td><td>Script binary firmware</td></tr> <tr> <td>3</td><td>Parameter text file</td></tr> <tr> <td>6</td><td>TPS</td></tr> <tr> <td>8</td><td>Overlay text file</td></tr> <tr> <td>10</td><td>Third party code</td></tr> <tr> <td>11</td><td>Third party data</td></tr> <tr> <td>12</td><td>Cell Module Firmware (KB1.3 or later)</td></tr> </table><br><index> only applies to overlays<br><br>"<filename>" is arbitrary and optional name reported in :q1i response<br><br><rev> is the user determined revision value | Type | Description | 0 | Bootloader firmware | 1 | Application firmware | 2 | Script binary firmware | 3 | Parameter text file | 6 | TPS | 8 | Overlay text file | 10 | Third party code | 11 | Third party data | 12 | Cell Module Firmware (KB1.3 or later) |
| Type                                                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 0                                                                                | Bootloader firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 1                                                                                | Application firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 2                                                                                | Script binary firmware                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 3                                                                                | Parameter text file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 6                                                                                | TPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 8                                                                                | Overlay text file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 10                                                                               | Third party code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 11                                                                               | Third party data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| 12                                                                               | Cell Module Firmware (KB1.3 or later)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| :rtval mno                                                                       | See Hardware ID and MNO select                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |
| :wtval mno <profile>                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |             |   |                     |   |                      |   |                        |   |                     |   |     |   |                   |    |                  |    |                  |    |                                       |

### 9.5.16. Interpreter

| Command                            | Function                                                                                                                               |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| :erm [<trigger_index>]             | Enable interpreter debug channel monitoring [monitor only <trigger_id>]                                                                |
| :drm                               | Disable interpreter debug channel monitoring                                                                                           |
| :xrmsg <user_event_id>             | Send a user_event to the interpreter                                                                                                   |
| :grscr x <serial_port_id> "<name>" | Upgrade interpreter script via xmodem (See TBD; formerly Load a Compiled Script to a Device)                                           |
|                                    |  <b>NOTE:</b> Command cannot be sent via SMS or UDP |
| :rrscr                             | Read interpreter script                                                                                                                |

| Command                                                           | Function                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------------|---|------------|---|----------|---|----------|---|----------|
| :rrval odom <index>                                               | Read an odometer                                                                                                                                                                                                                                                |       |             |   |            |   |            |   |          |   |          |   |          |
|                                                                   | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>GPS Trip 1</td></tr> <tr> <td>1</td><td>GPS Trip 2</td></tr> <tr> <td>2</td><td>OBD Trip</td></tr> <tr> <td>3</td><td>GPS Life</td></tr> <tr> <td>4</td><td>OBD Life</td></tr> </table> | Index | Description | 0 | GPS Trip 1 | 1 | GPS Trip 2 | 2 | OBD Trip | 3 | GPS Life | 4 | OBD Life |
| Index                                                             | Description                                                                                                                                                                                                                                                     |       |             |   |            |   |            |   |          |   |          |   |          |
| 0                                                                 | GPS Trip 1                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 1                                                                 | GPS Trip 2                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 2                                                                 | OBD Trip                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| 3                                                                 | GPS Life                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| 4                                                                 | OBD Life                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval flags                                                      | Read user script flags                                                                                                                                                                                                                                          |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval uservar <type> <index>                                     | Read a uservar                                                                                                                                                                                                                                                  |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval timer <index>                                              | Read remaining time                                                                                                                                                                                                                                             |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval gfnstat                                                    | Read geofence active & inside status bitfields                                                                                                                                                                                                                  |       |             |   |            |   |            |   |          |   |          |   |          |
| :wrval odom <index> <value>                                       | <value> must be larger than current value:                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
|                                                                   | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>GPS Trip 1</td></tr> <tr> <td>1</td><td>GPS Trip 2</td></tr> <tr> <td>2</td><td>OBD Trip</td></tr> <tr> <td>3</td><td>GPS Life</td></tr> <tr> <td>4</td><td>OBD Life</td></tr> </table> | Index | Description | 0 | GPS Trip 1 | 1 | GPS Trip 2 | 2 | OBD Trip | 3 | GPS Life | 4 | OBD Life |
| Index                                                             | Description                                                                                                                                                                                                                                                     |       |             |   |            |   |            |   |          |   |          |   |          |
| 0                                                                 | GPS Trip 1                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 1                                                                 | GPS Trip 2                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 2                                                                 | OBD Trip                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| 3                                                                 | GPS Life                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| 4                                                                 | OBD Life                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| :crval tripodom <index>                                           | Clear a trip odometer:                                                                                                                                                                                                                                          |       |             |   |            |   |            |   |          |   |          |   |          |
|                                                                   | <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>GPS Trip 1</td></tr> <tr> <td>1</td><td>GPS Trip 2</td></tr> <tr> <td>2</td><td>OBD Trip</td></tr> </table>                                                                             | Index | Description | 0 | GPS Trip 1 | 1 | GPS Trip 2 | 2 | OBD Trip |   |          |   |          |
| Index                                                             | Description                                                                                                                                                                                                                                                     |       |             |   |            |   |            |   |          |   |          |   |          |
| 0                                                                 | GPS Trip 1                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 1                                                                 | GPS Trip 2                                                                                                                                                                                                                                                      |       |             |   |            |   |            |   |          |   |          |   |          |
| 2                                                                 | OBD Trip                                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| :wrval flags <value>                                              | Write user script flags                                                                                                                                                                                                                                         |       |             |   |            |   |            |   |          |   |          |   |          |
| :wrval uservar <type><br><index> <value>                          | Write a uservar                                                                                                                                                                                                                                                 |       |             |   |            |   |            |   |          |   |          |   |          |
| :drtask                                                           | Suspend interpreter task                                                                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
| :ertask                                                           | Resume interpreter task                                                                                                                                                                                                                                         |       |             |   |            |   |            |   |          |   |          |   |          |
| :urcmd bs <packet id><br><reason code> <dst index><br><ack> <qty> | Force a build and send of a packet (any reason code less than 0 or greater than 255 will wrap)                                                                                                                                                                  |       |             |   |            |   |            |   |          |   |          |   |          |
|                                                                   | NOTE: <qty> only available on engineering devices                                                                                                                                                                                                               |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval linkver                                                    | Read linkage version information (See TBD; formerly Linkage Version)                                                                                                                                                                                            |       |             |   |            |   |            |   |          |   |          |   |          |
| :rrval sysval                                                     | Read system value (in decimal if signed value; in hex if unsigned value)                                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |
|                                                                   | NOTE: Only values 4 bytes or less are functional; greater than 4 bytes returns a 0 value                                                                                                                                                                        |       |             |   |            |   |            |   |          |   |          |   |          |

### 9.5.17. Main Processor

| Command                  | Function                                                                                                                                                                                   |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| :d1dbg [<lock_code>]     | Lock-out JTAG (disable debug); two stage command: <ol style="list-style-type: none"> <li>1. Issue :d1dbg (returns &lt;lock_code&gt;)</li> <li>2. Issue :d1dbg &lt;lock_code&gt;</li> </ol> |
| :g1bl x <serial_port_id> | Upgrade main bootloader via xmodem                                                                                                                                                         |
|                          |  <b>NOTE:</b> Command cannot be sent via SMS or UDP                                                       |
| :g1fw x <serial_port_id> | Upgrade main firmware via xmodem                                                                                                                                                           |
|                          |  <b>NOTE:</b> Command cannot be sent via SMS or UDP                                                       |
| :q1fw/:q1i               | Query main firmware                                                                                                                                                                        |
| :u1cmd reset             | Reset main processor                                                                                                                                                                       |

### 9.5.18. One-Wire Bus

| Command              | Function                                      |
|----------------------|-----------------------------------------------|
| :wwdm <mask>         | Sets one-wire bus debug mask                  |
| :wwdm ts <mask>      | Sets one-wire bus temp sensor debug mask      |
| :wwdm drv <mask>     | Sets one-wire bus driver id debug mask        |
| :ewm                 | Enable one-wire bus debug channel monitoring  |
| :dwm                 | Disable one-wire bus debug channel monitoring |
| :rwi <channel 0/1>   | Read one-wire bus info                        |
| :rwval <channel 0/1> | Read one-wire bus temp sensor value           |

### 9.5.19. OBD

| Command      | Function                                                                                                                 |
|--------------|--------------------------------------------------------------------------------------------------------------------------|
| :qoi info    | Query OBD vehicle information                                                                                            |
| :qoi status  | Query OBD status information                                                                                             |
| :qoi persist | Query OBD persisted information                                                                                          |
| :qoi trip    | Query OBD trip information                                                                                               |
| :qoi ss      | Query OBD snapshot parameter information                                                                                 |
|              |  <b>NOTE:</b> For each printed value: |

| Command  | Function                                                                                                                                                                                                                                                                                |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | <ul style="list-style-type: none"> <li>• The first number is the raw value from the ECU (units vary by protocol)</li> <li>• The second number is the converted value our device calculated</li> <li>• The third number is the "lowest ECU" (address) that reported the value</li> </ul> |
| vss      | Trip current speed 1 KPH/bit                                                                                                                                                                                                                                                            |
| rpm      | 0.125 RPM/bit                                                                                                                                                                                                                                                                           |
| ect      | <ul style="list-style-type: none"> <li>• OBDII and J1939: -40 + 1°C x bits</li> <li>• J1708: 1°F/bit</li> </ul>                                                                                                                                                                         |
| fl       | <ul style="list-style-type: none"> <li>• OBDII: (100/225%)/bit</li> <li>• J1708 and J1939: 0.1%/bit</li> </ul>                                                                                                                                                                          |
| crztime  | 1 second/bit                                                                                                                                                                                                                                                                            |
| vehtime  | 1 second/bit                                                                                                                                                                                                                                                                            |
| enghr    | 1 hour/bit                                                                                                                                                                                                                                                                              |
| engsec   | 1 second/bit                                                                                                                                                                                                                                                                            |
| idle     | <ul style="list-style-type: none"> <li>• J1939: 0.05L/bit</li> <li>• J1708: 0.125Gal/bit (0.473L/bit)</li> </ul>                                                                                                                                                                        |
| pto      | 0.05L/bit                                                                                                                                                                                                                                                                               |
| used     | <ul style="list-style-type: none"> <li>• J1939: 0.05L/bit</li> <li>• J1708: 0.125Gal/bit (0.473L/bit)</li> </ul>                                                                                                                                                                        |
| used_hr  | <ul style="list-style-type: none"> <li>• J1939: 0.05L/bit</li> <li>• J1708: 0.125Gal/bit (0.473L/bit)</li> </ul>                                                                                                                                                                        |
| true_odo | <ul style="list-style-type: none"> <li>• J1939: Supporting pid 917: 5 meters/bit<br/>Not supporting pid 917: 0.125km/bit</li> <li>• J1708: Not supporting pid 917: 0.1 mile/bit (0.161km/bit)</li> </ul>                                                                                |
| idletime | 1 second/bit                                                                                                                                                                                                                                                                            |
| ptotime  | 1 second/bit                                                                                                                                                                                                                                                                            |
| :qoi ss2 | Query OBD snapshot additional parameter information                                                                                                                                                                                                                                     |
|          | <p> <b>NOTE:</b> For each printed value:</p> <ul style="list-style-type: none"> <li>• The first number is the raw value from the ECU</li> </ul>                                                      |

| Command   | Function                                                                                                                                                                                                                                                                                                                          |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <div>(units vary by protocol)</div> <div><ul style="list-style-type: none"><li>• The second number is the converted value our device calculated</li><li>• The third number is the "lowest ECU" (address) that reported the value</li></ul></div> |
| gear      | <div>0 = neutral</div> <div>1 = forward</div> <div>2 = reverse</div> <div>3 = park</div>                                                                                                                                                                                                                                          |
| fueltemp  | <ul style="list-style-type: none"><li>• J1939: -40 + 1°C x bits</li></ul>                                                                                                                                                                                                                                                         |
| oiltemp   | <ul style="list-style-type: none"><li>• J1708: 0.25°F/bit</li><li>• OBDII: -40 + 1°C x bits</li></ul>                                                                                                                                                                                                                             |
| throttle  | <ul style="list-style-type: none"><li>• J1939: -273 + 0.03125°C x bits</li><li>• J1708: 0.25°F/bit</li><li>• OBDII: (100/255%)/bit</li></ul>                                                                                                                                                                                      |
| fuelco    | <ul style="list-style-type: none"><li>• J1939 and J1708: 0.4%/bit</li><li>• J1939: 1/512km/l/bit</li></ul>                                                                                                                                                                                                                        |
| accelpos  | <ul style="list-style-type: none"><li>• J1708: 1/256mpg/bit</li><li>• OBDII: (100/255%)/bit</li></ul>                                                                                                                                                                                                                             |
| load      | <ul style="list-style-type: none"><li>• J1939 and J1708: 0.4%/bit</li><li>• OBDII: (100/255%)/bit</li></ul>                                                                                                                                                                                                                       |
| torque    | <ul style="list-style-type: none"><li>• J1939: 1%/bit</li><li>• J1708: 0.5%/bit</li></ul>                                                                                                                                                                                                                                         |
| oilvl     | <div>-125 + 1%/bit</div> <ul style="list-style-type: none"><li>• J1939: 0.4%/bit</li></ul>                                                                                                                                                                                                                                        |
| oilpress  | <ul style="list-style-type: none"><li>• J1708: 0.5%/bit</li><li>• J1939: 4 kpa/bit</li></ul>                                                                                                                                                                                                                                      |
| coolvl    | <ul style="list-style-type: none"><li>• J1708: 2.45 kpa/bit</li><li>• J1939: 0.4%/bit</li></ul>                                                                                                                                                                                                                                   |
| coolpress | <ul style="list-style-type: none"><li>• J1708: 0.5%/bit</li><li>• J1939: 2 kpa/bit</li><li>• J1708: 0.862 kpa/bit</li></ul>                                                                                                                                                                                                       |

| Command                                              | Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                      | <div>iat</div> <ul style="list-style-type: none"> <li>• OBDII and J1939: <math>-40 + 1^{\circ}\text{C} \times \text{bits}</math></li> <li>• J1708: <math>0.25^{\circ}\text{F}/\text{bit}</math></li> </ul> <div>mantemp</div> <ul style="list-style-type: none"> <li>• OBDII and J1939: <math>-40 + 1^{\circ}\text{C} \times \text{bits}</math></li> <li>• J1708: <math>1^{\circ}\text{F}/\text{bit}</math></li> </ul> <div>brake</div> <p>0 = parking brake off<br/>3 = parking brake set</p> <div>seat</div> <p>0 = invalid/not supported<br/>1 = NOT buckled<br/>2 = OK Seat belt buckled</p> |
| :qoval                                               | Query OBD calculated information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| :qoi viol                                            | Query OBD Violations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| :qost                                                | Query OBD state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| :roval dtc                                           | Read OBD DTC List                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| :woval p <protocol> <cli>                            | Set OBD protocol to a com logical link                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| :woval dtc <mil value> <total dtc> <total ecu count> | Manually write DTC data (defaults to CAN protocol); if all fields are 0, DTCs are cleared                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| :wocmd debug <0/1>                                   | Disable/enable obd debug log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| :wocmd debug erase                                   | Erase OBD debug log                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| :wocmd debug lock                                    | Lock OBD debug off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### 9.5.20. System

| Command                            | Function                                                                                                                                                    |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| :cycfg                             | Clear system configs (set all parameters to default/RAM only and use :vycfg to make permanent)                                                              |
| :cycfg recipes                     | Clear system configs (set all parameters to default/RAM only and use :vycfg to make permanent); clear all recipes/appends from flash                        |
| :ehm                               | Enable watchdog timer debug monitor                                                                                                                         |
| :gycfg x <serial_port_id> "<name>" | Upgrade paramset via xmodem; "<name>" is the version of the paramset                                                                                        |
|                                    | <div>  <b>NOTE:</b> Command cannot be sent via SMS or UDP         </div> |
| :rycfg ...                         | Read system config                                                                                                                                          |
| :wycfg ...                         | Write system config                                                                                                                                         |

| Command                                        | Function                                                                                                                                                                                                                                                                                                                                    |       |             |      |             |      |             |      |             |      |             |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|
| :qycfg ...                                     | Query parameter information                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| :uycfg revert                                  | Revert all system configs in RAM (reload from FLASH; must be used before :vycfg)                                                                                                                                                                                                                                                            |       |             |      |             |      |             |      |             |      |             |
| :vycfg                                         | Save system configuration                                                                                                                                                                                                                                                                                                                   |       |             |      |             |      |             |      |             |      |             |
| :uyscr x <serial_port_id>                      | Run system script (after upload via xmodem)                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| :ryscr                                         | Read system script (not the interpreter script)                                                                                                                                                                                                                                                                                             |       |             |      |             |      |             |      |             |      |             |
| :wyscr                                         | Write a new system script (script created to recreate current parameters)                                                                                                                                                                                                                                                                   |       |             |      |             |      |             |      |             |      |             |
| :wyval persist                                 | Force a save of persist data                                                                                                                                                                                                                                                                                                                |       |             |      |             |      |             |      |             |      |             |
| :ryval stack                                   | Print out stack high water marks                                                                                                                                                                                                                                                                                                            |       |             |      |             |      |             |      |             |      |             |
| :ryval time                                    | Print out current network, gps, and system times                                                                                                                                                                                                                                                                                            |       |             |      |             |      |             |      |             |      |             |
| :qyi                                           | Print out system information                                                                                                                                                                                                                                                                                                                |       |             |      |             |      |             |      |             |      |             |
| :uycmd resync <new_system_time_s>              | Force system time to resync with available source. If time argument is passed, use as new system time with lower priority than internal sources                                                                                                                                                                                             |       |             |      |             |      |             |      |             |      |             |
| :ryval hwid                                    | <p>Print out the hardware ID value</p> <p>Defined HWIDs:</p> <table> <tr> <th>Hex</th><th>Description</th></tr> <tr> <td>0x01</td><td>Hwid_2400_A</td></tr> <tr> <td>0x02</td><td>Hwid_6370_A</td></tr> <tr> <td>0x03</td><td>Hwid_6374_A</td></tr> <tr> <td>0xff</td><td>Hwid_6300_B</td></tr> </table>                                    | Hex   | Description | 0x01 | Hwid_2400_A | 0x02 | Hwid_6370_A | 0x03 | Hwid_6374_A | 0xff | Hwid_6300_B |
| Hex                                            | Description                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0x01                                           | Hwid_2400_A                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0x02                                           | Hwid_6370_A                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0x03                                           | Hwid_6374_A                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0xff                                           | Hwid_6300_B                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| :wyval hwid <value>                            | Set the hardware ID value                                                                                                                                                                                                                                                                                                                   |       |             |      |             |      |             |      |             |      |             |
| :wyval key <key_index><br><okok> <nkok> <oknk> | <p>Change AES key, where key_index:</p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Update</td></tr> <tr> <td>1</td><td>Customer</td></tr> <tr> <td>2</td><td>Transport</td></tr> </table>                                                                                                                      | Index | Description | 0    | Update      | 1    | Customer    | 2    | Transport   |      |             |
| Index                                          | Description                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0                                              | Update                                                                                                                                                                                                                                                                                                                                      |       |             |      |             |      |             |      |             |      |             |
| 1                                              | Customer                                                                                                                                                                                                                                                                                                                                    |       |             |      |             |      |             |      |             |      |             |
| 2                                              | Transport                                                                                                                                                                                                                                                                                                                                   |       |             |      |             |      |             |      |             |      |             |
| :wyval ptk <key_index><br><plaintext_key>      | <p>Change AES key, where key_index:</p> <table> <tr> <th>Index</th><th>Description</th></tr> <tr> <td>0</td><td>Update</td></tr> <tr> <td>1</td><td>Customer</td></tr> <tr> <td>2</td><td>Transport</td></tr> </table> <p>The desired key value is not encrypted. This command is only available via physical connection to the device.</p> | Index | Description | 0    | Update      | 1    | Customer    | 2    | Transport   |      |             |
| Index                                          | Description                                                                                                                                                                                                                                                                                                                                 |       |             |      |             |      |             |      |             |      |             |
| 0                                              | Update                                                                                                                                                                                                                                                                                                                                      |       |             |      |             |      |             |      |             |      |             |
| 1                                              | Customer                                                                                                                                                                                                                                                                                                                                    |       |             |      |             |      |             |      |             |      |             |
| 2                                              | Transport                                                                                                                                                                                                                                                                                                                                   |       |             |      |             |      |             |      |             |      |             |

### 9.5.21. TPS

| Command                              | Function                                             |
|--------------------------------------|------------------------------------------------------|
| :ecm                                 | Enable TPS debug prints                              |
| :dcm                                 | Disable TPS debug prints                             |
| :wcdm <mask>                         | Set debug mask                                       |
| :wcsim hdr                           | Write into the TPS simulator header                  |
| :wcsim tags <protocol> <link>        | Write a TPS simulator tag                            |
| :rctest vin                          | Check if the current tag VIN matches the vehicle VIN |
| :rctest file                         | Checks if there is a valid tps file                  |
| :rctest hdr                          | Read TPS header                                      |
| :rctest tag <tag_id>                 | Read TPS tag info                                    |
| :qci tag                             |                                                      |
| :rctest data                         | Read TPS tag data                                    |
| :qci data                            |                                                      |
| :qci block <block_id>                | Read TPS block                                       |
| :qccmd sync                          | Sync TPS file with AAb3 target servers               |
| :gcfw x <serial_port_id><br>"<name>" | Upgrade TPS file via xmodem                          |


**NOTE:** Command cannot be sent via SMS or UDP

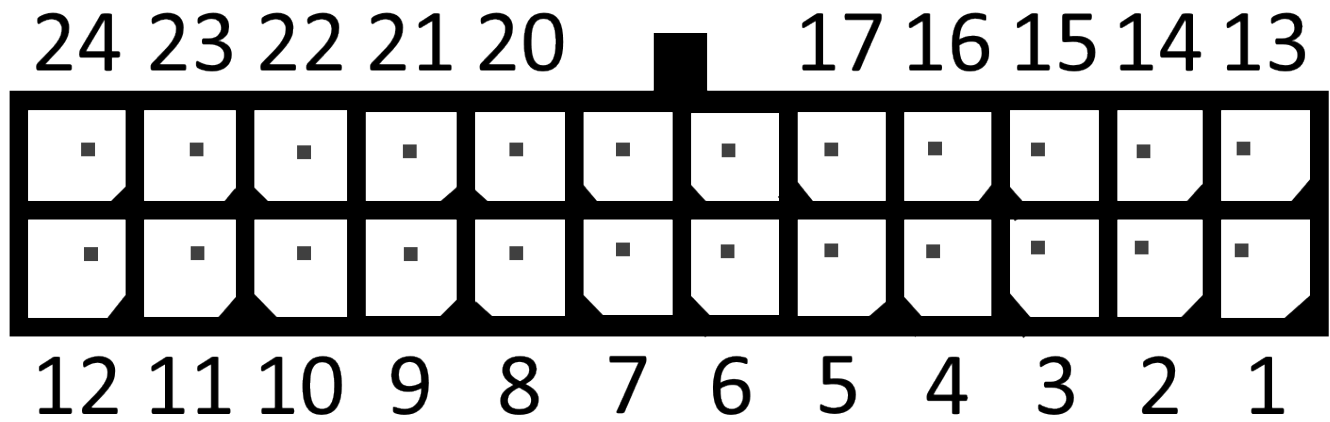
### 9.5.22. Aux Passthru

| Command             | Function                                                                                                                                                                     |       |             |   |      |   |         |   |            |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|---|------|---|---------|---|------------|
| :qvi                | Print info                                                                                                                                                                   |       |             |   |      |   |         |   |            |
| :evm                | Enable aux passthru debug channel monitoring                                                                                                                                 |       |             |   |      |   |         |   |            |
| :dvm                | Disable aux passthru debug channel monitoring                                                                                                                                |       |             |   |      |   |         |   |            |
| :wvdm <mask_base10> | Write (configure) aux passthru debug mask                                                                                                                                    |       |             |   |      |   |         |   |            |
|                     | Mask Values:                                                                                                                                                                 |       |             |   |      |   |         |   |            |
|                     | <table> <tr> <th>Value</th><th>Description</th></tr> <tr> <td>0</td><td>None</td></tr> <tr> <td>1</td><td>Payload</td></tr> <tr> <td>2</td><td>Scratchpad</td></tr> </table> | Value | Description | 0 | None | 1 | Payload | 2 | Scratchpad |
| Value               | Description                                                                                                                                                                  |       |             |   |      |   |         |   |            |
| 0                   | None                                                                                                                                                                         |       |             |   |      |   |         |   |            |
| 1                   | Payload                                                                                                                                                                      |       |             |   |      |   |         |   |            |
| 2                   | Scratchpad                                                                                                                                                                   |       |             |   |      |   |         |   |            |
| :rvdm               | Read (print out) aux passthru debug mask                                                                                                                                     |       |             |   |      |   |         |   |            |
| :xvmsg <bytes>      | Send a packet to be transmitted out over the aux port                                                                                                                        |       |             |   |      |   |         |   |            |
|                     | If the <bytes> field begins with "0x", the message is sent in hex;                                                                                                           |       |             |   |      |   |         |   |            |
|                     | if the <bytes> field does not begin with "0x", the message is sent in ASCII                                                                                                  |       |             |   |      |   |         |   |            |

## 10. ELECTRICAL CHARACTERISTICS

The XT6384-1 has two electrical connectors on the body of the device which contain all necessary power and data communication lines. One of these connectors is a Molex 24-pin female header (43045-2421) and the other is a Molex 14-pin female header (43045-1421).

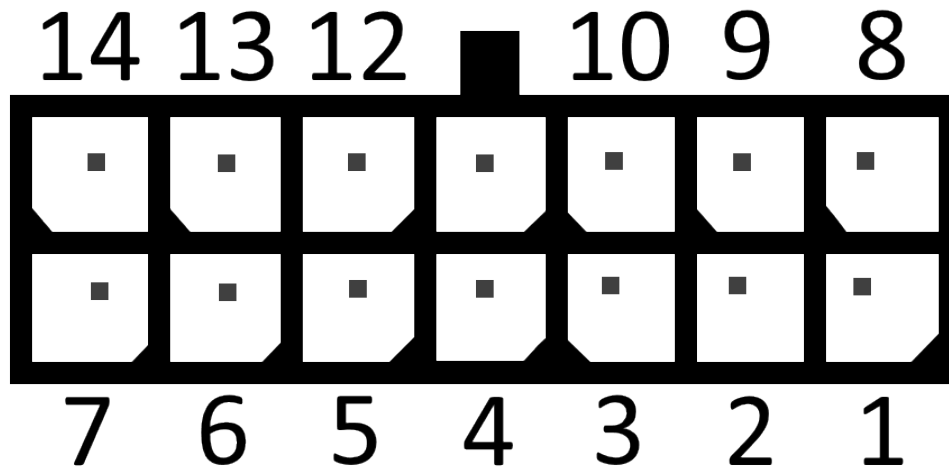
### 10.1. 24-PIN CONNECTOR



| Pin | Description              |
|-----|--------------------------|
| 1   | Vin 12/24V               |
| 2   | LED V+                   |
| 3   | GND                      |
| 4   | Ignition Out             |
| 5   | IN 0                     |
| 6   | IN 1                     |
| 7   | IN 2                     |
| 8   | IN 3                     |
| 9   | IN 4                     |
| 10  | OUT 0                    |
| 11  | OUT 1                    |
| 12  | OUT 2                    |
| 13  | SW controlled Vin output |
| 14  | RS232 interface 2 RX     |
| 15  | RS232 interface 2 TX     |
| 16  | GND                      |
| 17  | RS232 interface 1 RX     |
| 18  | RS232 interface 1 TX     |
| 19  | GND                      |
| 20  | 1-Wire interface 1       |
| 21  | 1-Wire interface 2       |

| Pin | Description                                                       |
|-----|-------------------------------------------------------------------|
| 22  | ADC IN 1                                                          |
| 23  | ADC IN 2 (THIS IS SHUNTED TO GROUND ON ALL KNOWN XT6300 HARDWARE) |
| 24  | GND                                                               |

## 10.2. 14-PIN CONNECTOR



| Pin | Description          |
|-----|----------------------|
| 1   | CAN (J-2234) High    |
| 2   | J-1708 RX            |
| 3   | J-1708 TX            |
| 4   | ISO 9141-2 Low       |
| 5   | J-1850 Bus -         |
| 6   | J-1850 Bus +         |
| 7   | N/C                  |
| 8   | CAN (J-2234) Low     |
| 9   | Vendor Option Pin 3  |
| 10  | Vendor Option Pin 11 |
| 11  | Vendor Option Pin 1  |
| 12  | ISP 9141-2 K-Line    |
| 13  | GND                  |
| 14  | Battery +            |

## 11. APPENDIX

### 11.1. UDPC

1. Open a standard *udp server* to the configuration of `dst[<dst_index>]`.
2. Issue the command `:ukcmd tunnel cmd <dst_index>` via console to the device.

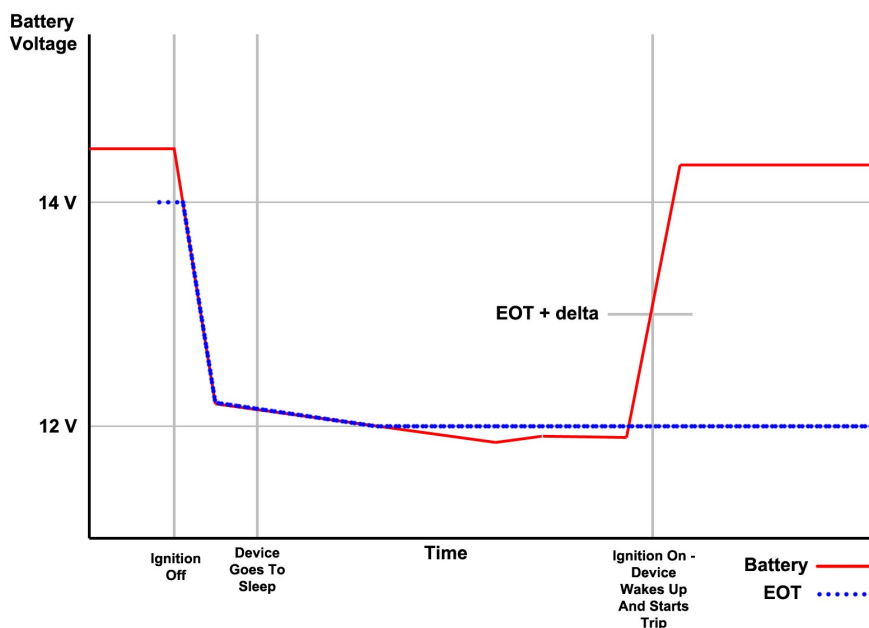


**NOTE:** This will send out a hello message to `dst[<dst_index>]` and open a temporary socket for an “ack” response to come back on a non-blocked port.

3. Reply with the intended udpc message.

### 11.2. DYNAMIC ALTERNATOR

This feature is only available on ignition type OBD.



#### 11.2.1. Overview

Due to differences in batteries, battery age and charging systems, setting the alternator on/off thresholds to arbitrary values does not always work to capture the start of a trip. The dynamic alternator feature was developed to try to capture the missing trips by monitoring the battery voltage for jumps instead of just crossing a threshold.

When the dynamic alternator is enabled, the device overrides the alternator on/off settings (`ast[0]/ast[1]`) with dynamically calculated values as the battery voltage changes. When a voltage change larger than a user

configured voltage delta (ast[3]) is detected, the device attempts to start vehicle communications. If successful, a trip is started.

When vehicle communications stop, the trip is ended and the battery voltage is captured (End of Trip Voltage - EOT). If the battery voltage continues to go down, EOT is adjusted accordingly. EOT is not adjusted if the voltage goes up. EOT is used to calculate the dynamic alternator on/off thresholds as follows:

Alternator on threshold = EOT + delta

Alternator off threshold = EOT + ½ delta

The battery voltage continues to be monitored and EOT adjusted as long as the alternator state is off, including during sleep. The device will wake up if the alternator on threshold is crossed and vehicle communications will be attempted. The dynamic alternator overrides the Wake Battery Voltage (wbv) setting.

### 11.2.2. Configuring

The dynamic alternator feature is enabled by setting a non-zero value in ast[3]. For ast[3] details Alternator State Threshold (ast) on p. 39. Ast[3] = 0 disables dynamic alternator.



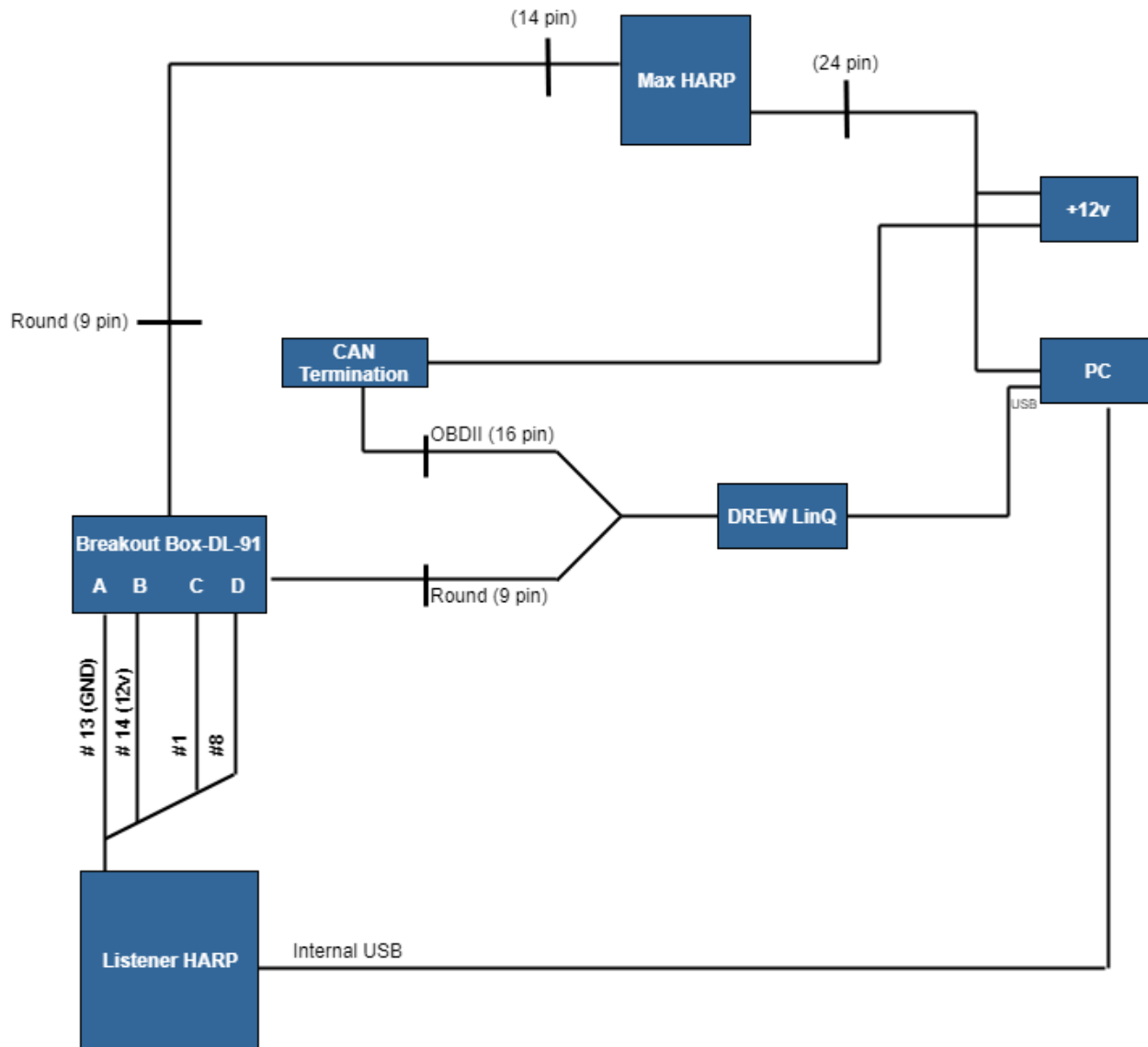
**CAUTION:** Setting ast[3] too low will cause the device to have too many failed communication attempts, which could affect sleep current consumption. Setting it too high could cause missed trips. Recommended settings of 0.3 - 0.5V deltas seem to work for most vehicles.

EOT is captured at end the of active trip, at end of failed communication attempts, and on device re-connect events. EOT voltage range is 12-14V.

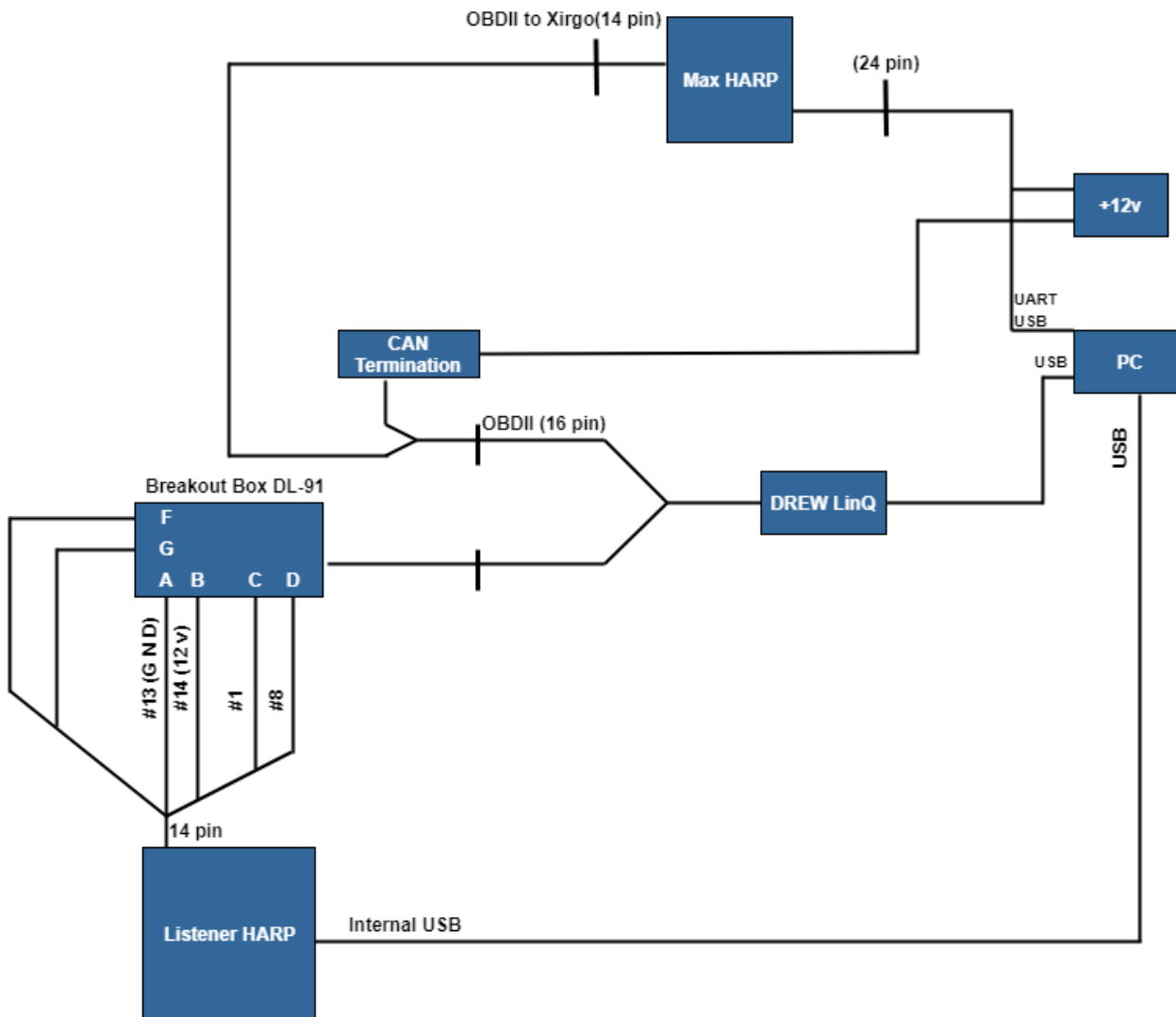
While we are able to capture a larger percentage of trips using dynamic alternator, it does not work well on some hybrids, vehicles with dual batteries, or smart charging systems.

For a more complete solution, dynamic alternator is used in conjunction with GPS motion detection and by listening for bus traffic under certain voltage conditions.

### 11.3. J1939 AND J1708 TEST SETUP BLOCK DIAGRAM



## 11.4. J1939 DUAL CAN TEST SETUP BLOCK DIAGRAM



## 12. REGULATORY STATEMENTS

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### 12.1. FCC

This equipment with FCC-ID: GKM-XT6384-1 and IC-ID: 10281A-XT6384A, Model: XT6384-1 is subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

**NOTICE:**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications made to this equipment not expressly approved by Xirgo Technologies, LLC may void the FCC authorization to operate this equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**Radio frequency radiation exposure Information:**

This equipment, XT6384-1, complies with FCC and ICED radiation exposure limits set forth for an uncontrolled environment. This equipment must be installed and operated with minimum distance of 20cm between the XT6384-1 and your body.

## 12.2. IC

### Antenna Statement

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

### Licence Exempt

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause interference, and
2. this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### 12.3. CALIFORNIA PROPOSITION 65 WARNING



**WARNING:** This product can expose you to chemicals including Nickel (Metallic), which is known to the State of California to cause cancer and Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm.

For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)