ALD Systems, inc.

WiRe Link: RF506-900

Features:

– Compact design
– Lightweight
– Low power consumption
– I^{2}C & Serial interface
– Programmable options
  ♦ Tx or Rx mode
  ♦ Auto or manual channel selection
  ♦ Network ID assignment
  ♦ Initiation group assignment
– Discrete and coded outputs
– Device status indicator LED

Applications:

– Aerial Testing
  ♦ Programmable parachute disreefing
  ♦ Drogue or main parachute release
  ♦ Multiple event sequencing
– Timing Synchronization

Pictured: RF506-900

General Description:

The **Wi**reless **Re**efing (WiRe) Link is a radio communications node that creates a network between two or more host devices by transmitting and receiving data packets via radio frequency signals. The WiRe Link transmitter generates a personal area mesh network with which receiver nodes automatically associate. The individually addressed radio nodes securely relay commands and supporting data across the network from one node to another. Paired with **E**lectronic **I**nitiation **D**evices, the WiRe Link radios enable wireless initiation triggers to command parachute disconnect and disreefing events from a payload mounted transmitter.

SPECIFICATIONS:

ELECTRICAL

Power Supply: 3.6v - 6v DC, regulated on-board to 3.3v DC
Reverse polarity protected
6.5 volt Absolute Maximum Rating

Enable/Stby: < 0.6v for Standby state
>1.8v to Enable output
6.5 volt Absolute Maximum Rating

Current Draw: Standby: < 1 µA nominal
Running: 30 mA nominal average
Indicating: LEDs upto 60 mA average

Output Switch: Isolated contacts, normally open analog switch control
Voltage maximum to follow power supply

ENVIRONMENTAL

Temperature: -40°C to 85°C Operating
-55°C to 150°C Storage

Humidity: 15 - 85% RH, non-condensing

MECHANICAL

Connectors: Sullins: SBH21-NBPN-D05-RA-BK
Mates with SFH213-PPPN-D05-ID-BK

Molex: 503471-0200
Mates with 503473-0200

Dimensions: 1.59" x .68" x .40" [40.4 mm x 17.3 mm x 10.1 mm]

Weight: < 1 oz. nominal (28 g), board only

OPERATIONAL

Wireless: Paired transmitter and receiver(s)
Range: ≥300 feet
Typical actuation time ~10 ms

Node Setup: Transmitter or Receiver mode select
Automatic or manual channel selection
Network ID selection
Initiation group assignment

Node Initiation: Discrete logic level output signal
I^2C encoded command

Initiation Data: I^2C encoded data
Node debug data
EID or host data

Communication: Serial data via header and TTL level adapter
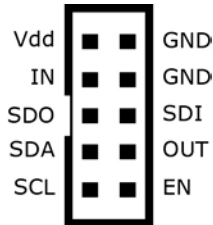
PART NUMBER REFERENCE

RF506-900

Product Model —
RF Frequency —
900 = US & Canada 902-928 MHz
800 = Europe 868-868.6 MHz
700 = China 779-787 MHz

1105 Shepard Hills Blvd ♦ Cleveland, Ohio, 44056 ♦ Phone (216) 244-4261 ♦ sales@ALDsystems.com

PIN CONFIGURATIONS:

Electrical interface header:

On-board connector, Sullins P/N: SBH21-NBPN-D05-RA-BK
Mating connector, Sullins P/N: SFH213-PPPN-D05-ID-BK

Vdd | GND
IN | GND
SDO | SDI
SDA | OUT
SCL | EN

- 1.Vdd - Supply voltage, 5v typical, 10v maximum
- 2.GND - Common ground with supply voltage
- 3.IN - Buffered input 5.5v maximum
- 4.GND - Common ground with supply voltage
- 5.SDO - Serial data output, 3.3v levels
- 6.SDI - Serial data input, 3.3v levels
- 7.SDA - I^2C data line, 5.5v maximum
- 8.OUT - Discrete output signal at Vdd voltage level
- 9.SCL - I^2C clock line, 5.5v maximum
- 10.EN - Power supply enable/standby input at Vdd voltage level

Optional on-board locking connector, Harwin P/N: M80-8511045
Optional mating connector, Harwin P/N: M80-8881005

Switched contacts (n/o) connector:

On-board connector, Molex P/N: 503471-0200
Mating connector, Moles P/N: 503473-0200

- 1.CMN - Switch common node
- 2.NO - Switch wiper node, normally open

COMMUNICATION PROTOCOLS

2-wire Serial Interface Bus (TWI or I^{2}C)

The 2 wire serial interface (I^{2}C) is well suited to for connecting the WiRe Link to other microcontroller devices. The standard I^{2}C protocol allows the interconnect of up to 128 different devices. A WiRe Link device connected to the bus occupies three (3) slave device addresses and maintains compatibility with other devices on the bus, each with their unique address. Detailed technical data on the I^{2}C protocol employed by the radio module OEM Atmel® (as TWI) can be reviewed in their document number 2549.

The WiRe Link device operates as a slave device with all I^{2}C communications initiated by the master device. The WiRe Link device has three (3) data registers that utilize I^{2}C addresses: Node Setup, Initiation, and Post-Initiation.

Node Setup Register

The Node Setup register is accessed via I^{2}C at the slave address 0x7A (hex). Reading data from the Node Setup address will recall the most recently written values for verification. Writing data to the Node Setup address configures the operation of the device. An I^{2}C write must begin within the first 100 ms after power-up in order to affect the node operation. Any data write occurring after 100 ms will be stored but will not go into effect until the next power cycle.

SETUP ADDR	PAN ID	NODE TYPE	NODE CTRL	INITIATION CODE	# RCVR GROUPS	RCVR QTY#1	RCVR QTY#2	...	I^{2}C STOP
Byte 0	Byte 1-2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8		

Byte 0   SETUP ADDR: slave address for node setup data register
          0x7A (hex)

Byte 1-2   PAN ID: personal area network identifier, 16 bit value
          Any 16 bit value, must match for transmitter and their intended receivers

Byte 3   NODE TYPE: node function set as transmitter or receiver with I^{2}C status, 8 bit value
          0x00 (hex) = Transmitter (legacy mode, I^{2}C disabled)
          0x08 (hex) = Transmitter (I^{2}C enabled)
          0x01 (hex) = Receiver (legacy mode, I^{2}C disabled)
          0x09 (hex) = Receiver (I^{2}C enabled)

Byte 4   NODE CTRL: node channel selection, 8 bit value
          0x00 (hex) = use previous/current channel
          0x01 through 0x0A (hex) = use corresponding channel number
          0x0B through 0x1F (hex) = scan for and use quietest or transmitter chosen channel

Byte 5   INITIATION CODE: checksum with host for I^{2}C enabled nodes, 8 bit value
          Any 8 bit value, should match for transmitter and their intended receivers

Byte 6   # RCVR GROUP: receiver group quantity or identity, 8 bit value
          Transmitters: the quantity number of groups of receiver nodes
          Receivers: the group ID number of the particular receiver node

Byte 7   RCVR QTY#1: receiver node quantity, 8 bit value
          Transmitters: the quantity of receiver nodes contained in group ID #1

Receivers: not used

Byte 8   RCVR QTY#2: receiver node quantity, 8 bit value
      Transmitters: the quantity of receiver nodes contained in group ID #2
      Receivers: not used

Byte 9+ RCVR QTY NXT: receiver node quantity of next (3rd, 4th,...) group, if present, 8 bit value
      Transmitters: the quantity of receiver nodes contained in group ID #
      Receivers: not used

Initiation Register

The Initiation register is accessed via I^2C at the slave address 0x7C (hex). Writing data to the Initiation Data register of a transmitter node commences wireless transmission of the initiation command to all receiver nodes associated with the specified group ID. Reading data from the Initiation Data register of a receiver node indicates if it has been triggered by the wirelessly transmitted initiation command. The data in the register remains blank until after being triggered by an initiation command, which also asserts the node trigger signal labeled OUT.

INIT ADDR	INITIATION CODE	# RCVR GROUP	QTY IN GROUP	PAN ID	FUTURE USE	FUTURE USE	FUTURE USE	I^2C STOP
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4-5	Byte 6	Byte 7	Byte 8	

Byte 0   INIT ADDR: slave address for node initiation data register
      0x7C (hex)
Byte 1   INITIATION CODE: checksum with host for I^2C enabled nodes, 8 bit value
      Any 8 bit value, should match for transmitter and their intended receivers
Byte 2   # RCVR GROUP: initiation receiver group identity, 8 bit value
      The group ID number of the particular receiver group being commanded/initiated
Byte 3   RCVR QTY#1: receiver node quantity, 8 bit value
      The quantity of receiver nodes contained in group being commanded/initiated
Byte 4-5 PAN ID: personal area network identifier, 16 bit value
      Any 16 bit value, must match for transmitter and their intended receivers
Byte 6-8 FUTURE USE: reserved for future use, 8 bit values
      Three 8 bit values

Post-Initiation Register

The Post-Initiation register is accessed via I^2C at the slave address 0x7E (hex). Reading this data recalls the stored performance parameters from the devices of the previous initiation command. The dataset is 128 bytes per radio node and host pair, 64 bytes each. The local radio and host data are always stored in the first register location of the Post-Initiation Data. Remote radio and host data are located in each subsequent 128 byte block of data, up to 15 devices maximum.

| POST-INIT DATA ADDR	LOCAL NODE DATA 64B	LOCAL HOST DATA 64B	REMOTE NODE #1 DATA 64B	REMOTE HOST #1 DATA 64B	REMOTE NODE #2 DATA 64B	REMOTE HOST #2 DATA 64B	...	I^2C STOP

OPERATIONAL DESCRIPTION

Operational Flow

- Power-up
- Programming period - 100 millisecond wait
    - New Setup Data received via I²C - overwrite previous data
    - No data received - no change to data
- Node operation begins - based on Node Setup Data
    - Transmitters begin broadcast for searching receivers
    - Receivers begin search for transmitter
- Automatic association between transmitters and receivers
    - Nodes with matching PAN ID
    - Continuous status pings to maintain link
- Initiation command
    - Transmitter nodes triggered via I²C or discrete input signal
        - I²C write to Initiation Data register
    - Command repeated wirelessly to associated receiver nodes
    - Receiver nodes trigger host device via I²C and discrete output signal
        - I²C read from Initiation Data register
        - Output signal assertion indicates to perform I²C read
    - Receiver node accepts post-initiation data from host device via I²C
        - Host device performs I²C write to Post-Initiation Data register
- Subsequent Initiation command
    - If multiple receiver groups, transmitter node triggered via I²C
        - I²C write to Initiation Data register
    - Command repeated wirelessly to associated receiver nodes of specified group
    - Receiver nodes trigger host device via I²C and discrete output signal
        - I²C read from Initiation Data register
        - Output signal assertion indicates to perform I²C read
    - Receiver node accepts post-initiation data from host device via I²C
        - Host device performs I²C write to Post-Initiation Data register
- Data retrieval
    - Receiver node data wirelessly transferred to transmitter node for storage
    - Transmitter host device accepts post-initiation data from transmitter node via I²C
        - Host device performs I²C read from Post-Initiation Data register
- Power-down

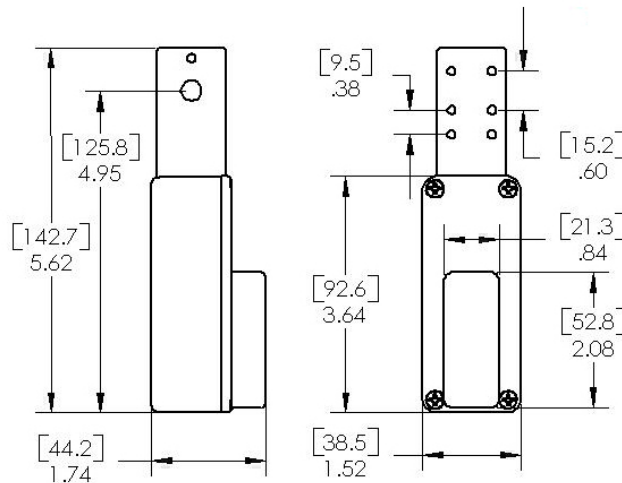# DEVICE DESCRIPTIONS: Dimensions in inches [millimeters] unless otherwise noted.

Circuit board and enclosure for attachment to EID1 (for reference only)
RF506-900 outline & mounting holes; Enclosure p/n: RFLC1

TOP VIEW   END VIEW
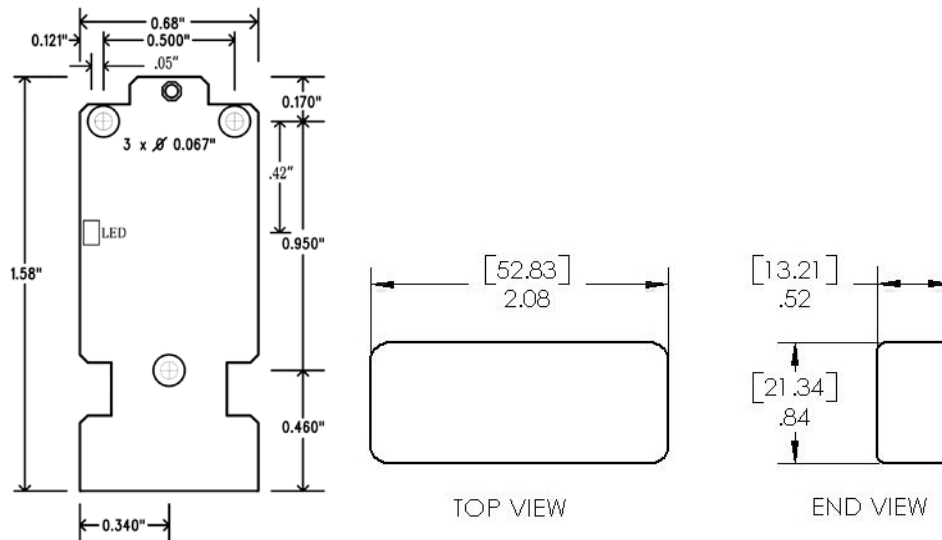
Example of RF506-900 attached to EID1 enclosure (for reference only)
Model EID1-xW-M/CB (CB2-RRLG4 @ L1, RFLC1 on lid)

NOTES:

FCC Compliance Statement

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.

This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in Part 15 of FCC rules. Changes or modifications to this product not authorized by ALD Systems Inc. could void the authority to operate the product.

This equipment must be installed such that the FCC ID label is visible, or if the label is not visible when installed inside another device then the outside of the device must also display a label referring to the enclosed equipment stating "Contains FCC ID: QXK506900" or any similar wording that expresses the same meaning.

FCC RF Radiation Exposure Statement
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
This transmitter must not be co-location or operating in conjunction with any other antenna or transmitter.
This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and the body.

Important Notice

ALD Systems reserves the right to make changes to its products or to discontinue any product or service without notice, and advises customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement.

ALD Systems warrants performance of its products to the specifications applicable at the time of sale in accordance with ALD Systems' standard warranty when used properly and as directed. Testing and other quality control techniques are utilized to the extent ALD Systems deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed.

CERTAIN APPLICATIONS USING ELECTRONIC INITIATION DEVICE PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS") AND ARE NOT TO BE USED BY PERSONS UNLESS THEY ARE COMPLETELY FAMILIAR WITH SAFE PROCEDURES FOR THEIR USE, OR UNDER THE DIRECTION OF COMPETENT, EXPERIENCED PERSONS. INCLUSION OF ALD SYSTEMS' PRODUCTS IN SUCH CRITICAL APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. ALD Systems assumes no liability for applications assistance or for customer product or system design. ALD Systems does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, or other intellectual property right of ALD Systems covering or relating to any combination, system, or process in which such products or services might be or are used. ALD Systems' publication of information regarding any third party's products or services does not constitute ALD Systems' approval, warranty or endorsement thereof.