Q4000 Technical Data Sheet

Features

- Satellite and/or Terrestrial options
- Iridium SBD / ORBCOMM
- Terrestrial 2G / 2.5G / 3G / LTE
- TCP / SMS / UDP / FTP / POP / SMTP
- GPS positioning / NMEA
- Fully programmable QUAKE API
- Powerful processor / RTOS / Flash / RAM
- UART / CAN / Analog / Digital IO / Relays
- OTA / Field upgradeable
- Pre-certified in many countries
- SAE J1455 / SAE J1939
- SAE J1113-13:2004 / ISO 10605:2008

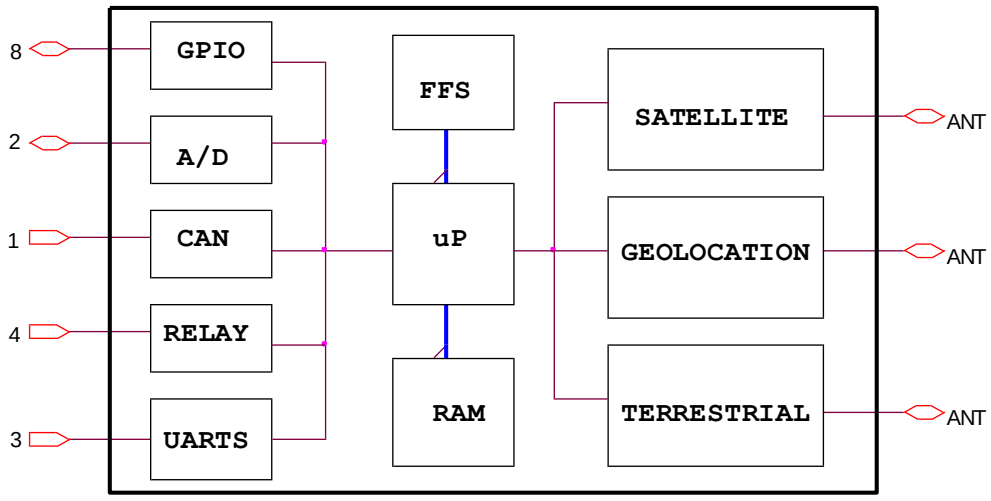
Applications

- Fixed and moving asset tracking/monitoring
- Heavy equipment

Product description

The QUAKE Q4000™ is a complete, fully programmable, dual mode capable solution ready for global use. The Q4000 is designed to communicate with terrestrial network systems when a cell signal is available and slide seamlessly into satellite mode when a cell signal is not available. Besides this advanced modem functionality, the Q4000 has the additional processing power, memory, and I/Os that allow sophisticated customer applications to run within the modem. Using an integrated power regulator, the Q4000 is designed to operate over a 6.5-32 volt input range. It has been specifically designed to meet the demanding requirements of vehicular environments and directly supports communication over a vehicle bus using industry or customer proprietary standards. The Q40000 is also fully programmable via a comprehensive API to realize any application need.

Functional diagram



SENSITIVITY LEVEL: YELLOW

Revision History

Date	Rev	ECO	Description
8/30/2010	A	236	Initial Production Release
11/4/2010	B	260	Moved info to Q4000/QPRO User Guide
3/10/2011	C	288	Updated Iridium configuration info, Canadian certification
4/26/2011	D	413	Updated: • RS-232 values. • table values for power and connectors.
5/19/2011	E	434	• Changed MTS_DCD_RS232 to Output. • Updated power calculations.
6/20/2011	F	464	Changed GPS TTFF to 60 seconds.
7/18/2011	G	487	Added warning about accessing serial ports for different networks.
9/26/2011	H	536	Added additional Iridium part numbers, additional DIO info, new cable drawing and pinout to include ECO 526
12/7/2011	J	584	• Updated AUX port speed parameters. • Added info about losing data at high speeds. • Updated memory availability chart and GPS antenna information. • Added low processor mode info.
Jul 2013	K	704	• Updated to meet certification requirements. ○ Added temperature ratings 1 & 2 to Table 8-1. • Complete edit and revamp of formatting. • Added RTC stabilization note in Table 3-1 (RTC). • Updated Figure 7-1: Q4000 part number system. • Updated Table 7-1: Standard configurations. • Added new 2G/3G platform info. • Added Notified Body Opinion certificate for Iridium (Figure 8-2).
May 2014	L	1145	• Added a note on voltage spikes waking the modem in section 6.6 – Sleep. • Added "6-32 volt input range" to Product Description. • Corrected the Iridium Tx current draw value in Table 3-1: Specifications. • Updated P/Ns in Table 7-1 and Table 8-3. • Updated ESD performance standards. • Updated data in Table 3-1: Specifications for relays and the operating modes: Sleep, 2G and 3G.
May 2016	M	1826	• Added reference to load dump protection in Table 3-1: Specifications. • Added section 3.2 - Load dump protection.
May 2017	N	2070	• Added Band VI and Band XIX to Terrestrial 3G in Table 2-1: Communication networks
Aug 2017	N1	2140	• Changed recommended blow fuse from 5amp to 3amp.
Aug 2017	N2	2143	• Change minimum supply voltage to the recommended value
Jan 2018	N3	2256	• No document change, BOM change only.
Aug 2018	P	2416	• LTE support updates, PNs, FCC ID
Jan 2019	P1	2599	• LTE single antenna notes
Mar 2019	P2	2656	• LTE CatM1 PN schema added to Figure 7-1

Nov 2020	P3	3155	• Updated Iridium transmit power shown on page 5 Table 2-1. The new power is shown as 31.7 +/- 0.5 dBm as per the guidance from the ATE
Mar 2021	P4	3287	• Added a default MTS Baud rate on Table 3-1: Specifications

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1 Introduction

Note: The information in this document is subject to change.

1.1 Related documents

The following documentation can be obtained from the *Downloads* tab of QUAKE's website or by contacting QUAKE Customer Support.

QUAKE

[1] Q4000/QPRO API Documentation Reference
[2] User Guide to QCT (QUAKE Configuration Tool)
[3] User Guide to QCP (QUAKE Communication Protocol)
[4] User Guide to Q4000/QPRO
[5] 1162-3002 - Recommended Antennas for LTE Q4000 - QPRO

ORBCOMM

For Q4000s with an ORBCOMM satellite transceiver installed, the following ORBCOMM documentation may assist in application development.

[6] ORBCOMM Application Development for Roaming Phase 1, Rev C
[7] ORBCOMM Developer API Specification XML Gateway Ver 5.0, Rev G or greater
[8] ORBCOMM Gateway Customer Access Interface Spec, D20050006, Rev C
[9] ORBCOMM MSD Messaging Services Description, A80MK0019, Rev E or greater
[10] ORBCOMM SC Standards and Specs, E25050102, Rev. C
[11] ORBCOMM Serial Interface Spec, E80050015, Rev G or greater

Iridium

For Q4000s with an Iridium satellite transceiver installed, the following Iridium documentation may assist in application development.

[12] Iridium SBD Developer's Guide
[13] ISU AT Command Reference

Department of Defense (DoD)

[14] MIL-STD-810E DoD Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

1.2 Development Kits

Q4000 Development Kits are available from QUAKE. They include the Development Environment (IAR) Compiler, QUAKE libraries and header files, sample application programs, Q4000 modem, necessary cables, antennas, and all documentation. Contact your QUAKE sales representative for more details.

1.3 Contacting QUAKE

Quake Global, Inc.
4711 Viewridge Avenue, Suite 150 San Diego, CA 92123
Phone: (858)-277-7290
Fax: (858) 277-7259
Website: http://quakeglobal.com
Submit a Customer Support Ticket: http://quakeglobal.com/support/
Email: customersupport@quakeglobal.com

2 Communication networks

Table 2-1: Communication networks

Communication Network	Parameter	Units	Comments
ORBCOMM			
Message Size			
Modem Originated (Tx)	6 / 8K	Bytes MIN / MAX	
	129	Bytes	Message size for a typical application
Modem Terminated (Rx)	6 / 8K	Bytes MIN / MAX	
Transmit			To ensure full transmit power, a minimum input voltage of 11 is required.
Frequency	148 /150.05	MHz MIN / MAX	
Power	38.5 / 40	dBm Typical/MAX	
Data rate	2.4	kbps	
Receive			
Frequency	137 /138	MHz MIN / MAX	
Data rate	4.8	kbps	
Sensitivity	-122 / -118	dBm Typical / MAX	1X10-5 BER
Dynamic range	70	dB	Typical -122 to -52 dBm
Output power	+37 / +40	dBm MIN / MAX	
Antenna RF input	50	Ω nom	Exceeding an RF input power level of +10dBm may result in damage to the receiver and will void the warranty.
Iridium Short Burst Data			
Message Size			
Modem Originated (Tx)	1 / 340	Bytes MIN / MAX	
Modem Terminated (Rx)	270	Bytes MAX	
Transmit			To ensure full transmit power, a minimum input voltage of 9 is required
Frequency	1616 / 1626.5	MHz MIN / MAX	
Power	31.7 +/- 0.5	dBm Typical	
Data rate	50	ksps	
Receive			
Frequency	1616 / 1626.5	MHz MIN / MAX	
Data rate	50	ksps	
Sensitivity	-116	dBm	1X10-2 BER
Antenna RF input	50	Ω	
Terrestrial 2G (P/N 1135-xxxx and 1140-xxxx)			
Maximum Message Size			
Modem Originated (Tx)			
SMS	168	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP	4095	Bytes	
FTP	4	kBytes	Lrgr file sizes may be possible but aren't guaranteed
Modem Terminated (Rx)			
SMS	168	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP	500	Bytes	
FTP			Limited only by the amount of space in memory.

Communication Network	Parameter	Units	Comments
Transmit			
Frequency (Quad Dual Band)			
GSM850	824.2 / 848.8	MHz MIN / MAX	
EGSM900	890.0 / 914.8	MHz MIN / MAX	
	880.2 / 889.8	MHz MIN / MAX	
DCS-1800	1710.2 / 1784.8	MHz MIN / MAX	
PCS-1900	1850.2 / 1909.8	MHz MIN / MAX	
Power			
850 / 900 bands	33	dBm	Power Class 4
1800 / 1900 bands	30	dBm	Power Class 1
Data rate	92	kbps	
Receive			
Frequency (Quad Dual Band)			
GSM850	869.2 / 893.8	MHz MIN / MAX	
EGSM900	935.0 / 959.8	MHz MIN / MAX	
	925.2 / 934.8	MHz MIN / MAX	
DCS-1800	1805.2 / 1879.8	MHz MIN / MAX	
PCS-1900	1930.2 / 1989.8	MHz MIN / MAX	
Data rate	92	kbps	
Sensitivity			
@850 / 900 MHz	-107	dBm	
@1800 / 1900 MHz	-106	dBm	
Antenna RF input	50	Ω	
Terrestrial 2G (P/N 1161-xxxx and 1162-xxxx)			
Maximum Message Size			
Modem Originated (Tx)			
SMS	160	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP	4	kBytes	
FTP	4	kBytes	
Modem Terminated (Rx)			
SMS	160	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP			Limited only by Q4000 Flash File System size.
FTP			Limited only by Q4000 Flash File System size.
Transmit			
Frequency (Quad Dual Band)			
GSM850	824.2 / 848.8	MHz MIN / MAX	
EGSM900	890.0 / 914.8	MHz MIN / MAX	
	880.2 / 889.8	MHz MIN / MAX	
DCS-1800	1710.2 / 1784.8	MHz MIN / MAX	
PCS-1900	1850.2 / 1909.8	MHz MIN / MAX	
Power			
850 / 900 bands	33	dBm	Power Class 4
1800 / 1900 bands	30	dBm	Power Class 1
Data rate	92	kbps	EDGE

Communication Network	Parameter	Units	Comments
Receive			
Frequency (Quad Dual Band)			
GSM850	869.2 / 893.8	MHz MIN / MAX	
EGSM900	935.0 / 959.8	MHz MIN / MAX	
	925.2 / 934.8	MHz MIN / MAX	
DCS-1800	1805.2 / 1879.8	MHz MIN / MAX	
PCS-1900	1930.2 / 1989.8	MHz MIN / MAX	
Data rate	92	kbps	
Sensitivity			
GSM 850 / 900 MHz	-108	dBm	BER Class II <2.44%, spec for 3G unit in 2G mode
DCS1800 / PCS1900 MHz	-109	dBm	BER Class II <2.44%, spec for 3G unit in 2G mode
Antenna RF input	50	Ω	
Terrestrial 3G (P/N 1161-xxxx and 1162-xxxx)			3GPP release 7 compliant
Maximum Message Size			
Modem Originated (Tx)			
SMS	160	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP	13312	kBytes	
FTP	4	kBytes	
Modem Terminated (Rx)			
SMS	160	Bytes	
SMTP and POP	40	kBytes	
TCP and UDP			Limited only by Q4000 Flash File System size.
FTP			Limited only by Q4000 Flash File System size.
Transmit			
Frequency			
Band I	1920 / 1980	MHz MIN / MAX	2100 MHz IMT Band
Band II	1850 / 1910	MHz MIN / MAX	PCS Band
Band IV	1710 / 1755	MHz MIN / MAX	AWS Band
Band V	824 / 849	MHz MIN / MAX	850 MHz CLR Band
Band VI	830 / 840	MHz MIN / MAX	800 MHz Band
Band VIII	880 / 915	MHz MIN / MAX	900 MHz Band
Band XIX	830 / 845	MHz MIN / MAX	800 MHz Band
Output power	24	dBm	Power Class 3
Data rate	5.76	Mbps	Cat 6 Uplink
Receive			
Frequency			
Band I	2110 / 2170	MHz MIN / MAX	2100 MHz IMT Band
Band II	1930 / 1990	MHz MIN / MAX	PCS Band
Band IV	2110 / 2155	MHz MIN / MAX	AWS Band
Band V	869 / 894	MHz MIN / MAX	850 MHz CLR Band
Band VI	875 / 885	MHz MIN / MAX	800 MHz Band
Band VIII	925 / 960	MHz MIN / MAX	900 MHz Band
Band XIX	875 / 890	MHz MIN / MAX	800 MHz Band
Data rate	21.0	Mbps	Cat 14 Downlink
UMTS sensitivity	-110	dBm typical	BER <0.1%

Terrestrial LTE Asia Pacific with 3G (B1, B5, B8) fallback (P/N 1161-xxxx and 1162-xxxx)			3GPP release 7 compliant
LTE connectivity	Bands 1,3,5,8,28		
RF Power @ ARP 5MHz B			
LTE FDD 2100 Band 1	+21 / +23	dBm MIN/MAX	
LTE FDD 1800 Band 3	+21 / +23	dBm MIN/MAX	
LTE FDD 850 Band 5	+21 / +23	dBm MIN/MAX	
LTE FDD 900 Band 8	+21 / +23	dBm MIN/MAX	
LTE FDD 700 Band 28	+21 / +23	dBm MIN/MAX	
Terrestrial LTE North America with 3G (B1, B2, B4, B5, B8) and 2G (quad band) fallback (P/N 1161-xxxx and 1162-xxxx)			3GPP release 7 compliant
LTE connectivity	Bands 2,4,12		
RF Power @ ARP 5MHz B			
LTE FDD 1900 Band 2	+21 / +23	dBm MIN/MAX	
LTE FDD AWS Band 4	+21 / +23	dBm MIN/MAX	
LTE FDD 700 Band 12	+21 / +23	dBm MIN/MAX	
Terrestrial LTE Europe with 2G fallback (P/N 1161-xxxx and 1162-xxxx)			3GPP release 7 compliant
LTE connectivity	Bands 1,3,7,20		
RF Power @ ARP 5MHz B			
LTE FDD 2100 Band 1	+21 / +23	dBm MIN/MAX	
LTE FDD 1800 Band 3	+21 / +23	dBm MIN/MAX	
LTE FDD 2600 Band 7	+21 / +22.5	dBm MIN/MAX	
LTE FDD 800 Band 20	+21 / +23	dBm MIN/MAX	
GPS (P/N 1135-xxxx and 1140-xxxx)			
Time-To-First-Fix (TTFF)			Depending on antenna and signal strength
From cold start	60	seconds	Unobstructed view of the sky.
From warm start	25	seconds	
From hot start	2	seconds	
Sensitivity			
Tracking	-160	dBm	
Acquisition	-146	dBm	
Accuracy	within 2.5	meters	
Raw location data update (NMEA)	every 1	seconds	Available on pin 14 (settings: 9600 Baud, 8 bits, no parity bit, 1 stop bit))
GPS (P/N 1161-xxxx and 1162-xxxx)			
Satellite channels	50	channels	
Time-To-First-Fix (TTFF)			Depending on antenna and signal strength
From cold start	38	seconds	Unobstructed view of the sky.
Sensitivity			
Tracking	-160	dBm	
Acquisition	-146	dBm	
Accuracy	2.5	meters	
Raw location data update (NMEA))	1	second	Available on pin 14 (settings: 9600 Baud, 8 bits, no parity bit, 1 stop bit)

Note: Q4000 can operate on 3G, 2.5G, and 2G. -Data are bursted at network speeds. Continuous throughput at 100kbps maximum.

3 Specifications

Table 3-1: Specifications

Parameter	ORB	IRI SBD	No Sat	Unit	Comments
Power Supplies					
BATT+	+12 **Note 1** +32	+9 +32	+6.5 +32	Vmin Vmax	The power source must have a source capacity of 4 AMPS at 12V. **Note 1** – Operation down to 10.5V is allowed but will have degraded ORB Tx output.
Reverse bias protection	-32	-32		Vmax	
Turn ON Pwr supply slew rate	 1	 1		 V/mS MIN	
DTR power up DTR volt. tolerance	1.8 ±32	1.8 ±32		Vmin Volts	With a rise time of less than 100µs, from 0-6 VDC.
Turn OFF DTR power down	 .4	 .4		 Vmax	Must remain below Vmax for 3.5 sec.
Modem boot time	6 10	6 10		Sec TYP Sec MAX	From power supply or DTR turn on, or RTC wake-up.
3.5V AUX	650	650		mA MAX	650 mA total between the two 3V5 AUX supply pins.
Load dump protection					See section 3.2 - Load dump protection.
Operating Modes					Current draws at BATT+=12V. Add desired operating modes to determine the total current draw.
Sleep Normal Accelerometer ON ***(For P/Ns 1161- and 1162- only)***	 30 210	 30 210		 uA MAX uA MAX	 Software activated. RTC wakeup. Varies with accelerometer update rate. The max shown is for 400 Hz update rate. Slower rates and lower power modes will reduce this.
Standby	35	35		mA Typical	Digital system current draw. No network.
UARTs and CAN	18	18		mA Typical	
Satellite receive	70	85		mA Typical	
Satellite transmit Transmit duration	2 800	.8 8.33		A Typical mS	
2G Transmit Receive			 .65 32	 A PK mA Typical	
3G Transmit Receive			 .65 85	 A PK mA Typical	 Preliminary values
GPS tracking	13	13		mA Typical	The power consumed by a GPS device remains constant. It will save power to turn off the GPS during the power down sequence. It takes about a minute after it powers up to get a GPS fix.
Relays	.5	.5		A MAX	Per relay. Proper back-EMF protection required. Value derated for high temperature operation.

Parameter	ORB	IRI SBD	No Sat	Unit	Comments
RS232					General specs for all RS232 ports.
Output					
High level	+5	+5		Vmin	Rload = 3K to Ground
Low level	-5	-5		Vmin	Rload = 3K to Ground
Input					
High level	+2.7	+2.7		Vmin	
Low level	-2.7	-2.7		Vmin	
ESD Protection					
Air-gap discharge	±15	±15		kV	
Contact discharge	±8	±8		kV	
Protection					
Voltage	±32	±32		Volts	The short circuit should be prevented in order to not exceed power dissipation ratings.
Current	Short	Short		Short	
MTS	4800 9600 38400 115200	4800 9600 38400 115200		bps bps bps bps	Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF
Logger	38400 115200	38400 115200		bps bps	Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF
Aux	9600 38400 57600	Not avail Not avail Not avail		bps bps bps	Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF Rload=3K to Ground, 1000pF
Logic inputs					Ground unused inputs.
Input impedance	100	100		K Ohm	D0-D7 equivalent input resistance
Voltage tolerance	±32	±32		Volts	Short durations only. Typical < 10 sec
D0 Low / High D1 Low / High D2 Low / High D3 Low / High D4 Low / High D5 Low / High D6 Low / High D7 Low / High	.8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0	.8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0 .8 / 2.0		Vmin/Vmax Vmin/Vmax Vmin/Vmax Vmin/Vmax Vmin/Vmax Vmin/Vmax Vmin/Vmax Vmin/Vmax	When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms. When fed by Rsource < 5 ohms When fed by Rsource < 5 ohms
Logic outputs					
Output impedance	10	10		K Ohm	D0-D7 equivalent output resistance
Voltage tolerance	±32	±32		Volts	Short durations only. Typical < 10 sec
D0 D1 D2 D3 D4 D5 D6 D7	3.2V 3.2V 3.2V 3.2V 3.2V 3.2V 3.2V 3.2V	3.2V 3.2V 3.2V 3.2V 3.2V 3.2V 3.2V 3.2V		Vmin Vmin Vmin Vmin Vmin Vmin Vmin Vmin	Rload > 100K Rload > 100K Rload > 100K Rload > 100K Rload > 100K Rload > 100K Rload > 100K Rload > 100K

Parameter	ORB	IRI SBD	No Sat	Unit	Comments
Analog inputs					Specifications apply to ANA0/1. Ground unused inputs.
Input impedance	1M	1M		Ohms	• Greater than 1MΩ input impedance. • 3dB bandwidth and 160 kHz if driven with low impedance. The "greater than 1 M Ω" is at DC only. If you try to sample a frequency (not DC) of 160 KHz at the input, it will be down in amplitude by half power at the internal ADC input. If you go higher in frequency, the amplitude will be reduced more. This would give a false amplitude reading. This translates to a maximum sample rate of 7 to 8 microseconds. There is a capacitor right on the input of the Q4000 for the ADCs. If you place a series resistance in the line with the ADC input, the reduction mentioned above will be made worse. If you make the resistance 0 ohms, the spec remains at 160 KHz.
Input bias current	75	75		nA	
Sampling rate	1K	1K		Samp/sec	
Resolution	12	12		Bits	
Full scale	+3.55	+3.55		Volts	
Solid state relays					
Load current	1	1		A	See temperature derating chart for 85C (Figure 5-5).
Off State leakage	1	1		uA	
Turn On time	5	5		mS	
Turn Off time	1	1		mS	
Memory options					FLASH/RAM memory size must match. FLASH writes100K MIN.
Flash	2	2		MByte	1MB available to the user.
RAM	2	2		MByte	.5MB available to the user.
Real Time Clock (RTC)					
Resolution	1	1		sec	Programmable. **Note:** After power is initially applied to the Q4000, allow up to 60 seconds for the RTC to stabilize before beginning a power-down sequence.
Antenna detection					
VSWR reporting	1.1/10.0	Not Avail.		MIN/MAX	VSWR query by the customer via API
GPS	OK Open Short	OK Open Short		OK Open Short	DC continuity check only.
Terrestrial	OK Open Short	OK Open Short		OK Open Short	DC continuity check only. Requires a special GSM antenna that has 10K Ohm resistor to ground.
Antennas					
Satellite	50	50 **Note 2**		Ohms	**Note 2** – Iridium specifies an antenna with 3dBi Gain, RHCP polarization, 50 Ω nominal impedance and 1.5:1 VSWR. Several vendors have patch antennas that will meet this and are certified by Iridium to operate on their network.

Parameter	ORB	IRI SBD	No Sat	Unit	Comments
Terrestrial	50	50		Ohms	NOTE: Only single LTE antenna is supported by Q4000 and QPRO, RxD not supported for LTE configurations. If your LTE antenna has 2 connectors, only use the "main" connector, not the RxD Diversity connector. Refer to 1162-3002 – Recommended Antennas for LTE Q4000 – QPRO.
GPS	50	50		Ohms	Many vendors carry patch antennas with LNAs in them. They are powered by the voltage from the QUAKE unit.
RF CABLING					
Cabling loss	.5	3		dB MAX	See User Guide to Q4000/QPRO for cable listings.
CAN					Compliant to 2.0 A/B
J1939					
Identifiers	29	29		bit	Customer configurable via software
PGN request rate	32	32		PGN/sec	
Baud Rate	250	250		kbaud	
CANOpen					
Identifiers	11	11		bit	Customer configurable via software
COB-ID request rate	32	32		COB-ID/sec	
Baud rate	250	250		kbaud	
	500	500		kbaud	
RAW CAN					
Identifiers	11/29	11/29		bit	Customer configurable via software
CAN ID request rate	32	32		PGN/sec	
Baud rate	250	250		kbaud	
	500	500		kbaud	
Output Voltage					
Dominant Mode					
CAN H	2.45/3.5	2.45 / 3.5		Vmin/Vmax	
CAN L	.5 / 1.25	.5 / 1.25		Vmin/Vmax	
Recessive Mode					
CAN H	2.3	2.3		TYP Volts	
CAN L	2.3	2.3		TYP Volts	
Protection					
Voltage	±36	±36		Volts	
Air-gap discharge	±15	±15		kV	
Contact discharge	±8	±8		kV	

Note: The above power consumption values are average values. Maximum values may be as much as 15% more. All currents are individual contributions and at 25°C ambient.

3.1 Absolute maximum ratings

Table 3-2: Absolute maximum ratings

Parameter	Rating	Comments
+BATT to GND	±32V	
Digital I/O Voltage to GND	±32V	Designed to operate from 0 to 3.5V DC
Analog I/O Voltage to GND	±32V	Designed to operate from 0 to 3.5V DC
Temperature range • Operating • Storage	 -40C to +85C -40C to +85C	

3.2 Load dump protection

To pass the load dump testing requirement of the J1455 specification, there must be a minimum of two 33V diodes placed in parallel between power and ground of the input power supply. Load dump protection is necessary to protect the modem from possible high voltage at startup. With some heavy machinery at startup, the alternator voltage can jump quite high until it is pulled down into regulation.

The diodes, placed in parallel between power and ground of the input power supply, act to absorb this energy before it reaches the modem. Figure 3-1: Load dump protection circuit shows the utilization of two 5KP33A diodes from Littlefuse, Inc. (or equivalent).

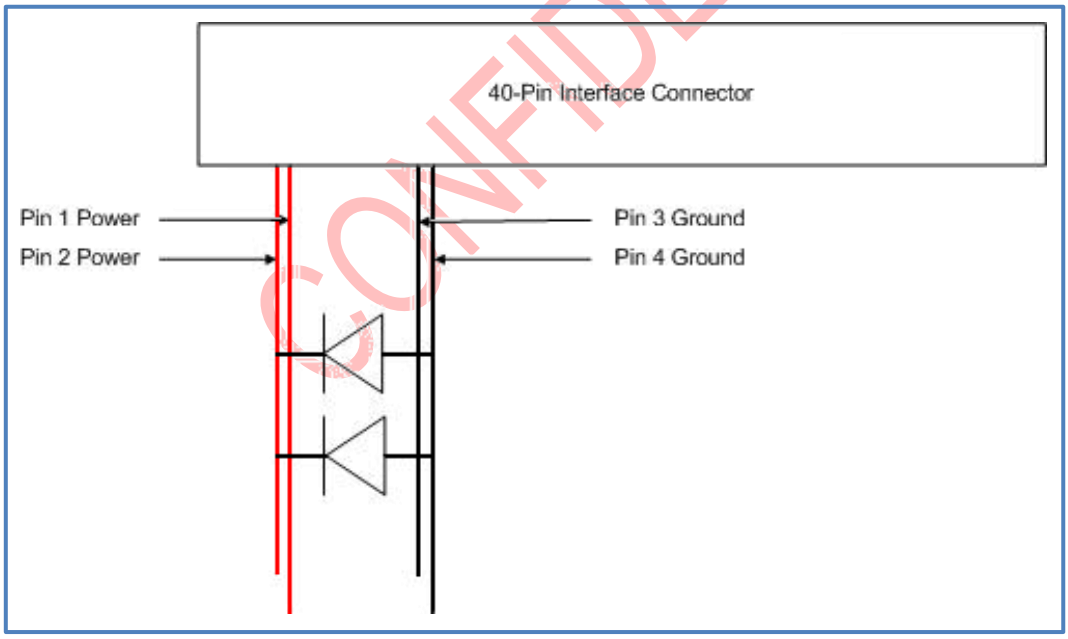


Figure 3-1: Load dump protection circuit

4 Pin configuration and description

Note: The signal names and types of the MTS port are in relation to the DTE. All other serial ports are in reference to the Q4000.

Table 4-1: Pin configuration

Pin	Signal	Color	Type	Description
1	UBATT(+)	Red	Power	Main power input. Connect this pin to the positive terminal of the voltage source. It is recommended that the power supply feeding the Q4000 be protected with a 3 AMP slow-blow fuse.
2	UBATT(+)	Red	Power	Main power input. Connect this pin to the positive terminal of the voltage source.
3	UBATT(-)	Black	Gnd	Ground reference for the modem.
4	UBATT(-)	Black	Gnd	Ground reference for the modem.
5	3V5	Brown	Continuous Output	3.55V auxiliary output used to power external devices. Pins 5 and 6 are connected internally to provide a total source current of 650mA. This pin is output only and applying external voltage/current to this pin will damage the device and void warranty.
6	3V5	Brown	Continuous Output	Internally connected to pin 5. All notes from pin 5 apply.
7	GSM_RX_RS232	White	Input	• Auxiliary 3-Wire RS232 (when an internal terrestrial module is not installed). • To be used to upgrade the terrestrial module firmware when an internal terrestrial module is installed (for P/Ns 1135- and 1140-). • Leave this pin unconnected if not used.
8	AUX_TX_RS232	White	Output	• Auxiliary 3-Wire RS232 • Leave this pin unconnected if not used.
9	GSM_TX_RS232	White	Output	• Auxiliary 3-Wire RS232 • To be used to upgrade the terrestrial module firmware when an internal terrestrial module is installed (for P/Ns 1135- and 1140-). • Leave this pin unconnected if not used.
10	AUX_RX_RS232	White	Input	• Auxiliary 3-Wire RS232 • Leave this pin unconnected if not used.
11	GND	Black	Ground	Ground reference for the modem.
12	GPS_RX_RS232	White	Input	• Auxiliary 3-Wire RS232 • Leave this pin unconnected if not used.
13	MTS_RXD_RS232	White	Output	RS232 level. Main communications port.
14	GPS_TX_RS232	White	Output	• Auxiliary 3-Wire RS232 (when an internal GPS module is not installed). • Leave this pin unconnected if not used.
15	MTS_TXD_RS232	White	Input	RS232 level.
16	MTS_DSR_RS232	White	Output	• RS232 level data set ready signal from the modem. Main communications port. • Leave this pin unconnected if not used.

Pin	Signal	Color	Type	Description
17	MTS_DTR_RS232	White	Input	• RS232 level • This signal can also be used to power the modem from an off state. A high on this pin turns on the modem if configured to do so by the modem's software configuration. • Leave this pin unconnected if not used.
18	MTS_DCD_RS232	White	Output	• RS232 level data carrier detect signal from the modem. Main communications port. • Leave this pin unconnected if not used.
19	GND	Black	Ground	Ground reference for the modem.
20	LOG_RXD_RS232	White	Input	• RS232 level. • Debug communications port used to view real time modem logs when connected to a serial terminal application. • Leave this pin unconnected if not used.
21	GND	Black	Ground	Ground reference for the modem.
22	LOG_TXD_RS232	White	Output	• RS232 level. • Debug communications port used to view real time modem logs when connected to a serial terminal application. • Leave this pin unconnected if not used.
23	CANH	Grey	I/O	• CAN interface • Leave this pin unconnected if not used.
24	CANL	Grey	I/O	• CAN interface • Leave this pin unconnected if not used.
25	SW_UBATT_0	Brown	Output	• The relay connected between BATT+ and pin 25. Closing the relay connects to pin 25 to BATT+. • **CAUTION**: The relay is not currently limited. Connecting pin 25 to ground while the relay is turned on will short BATT+ to ground through the relay. This may damage the relay and void modem warranty. • If an inductive load such as a relay is used, it can generate a spike voltage across it. If that exceeds 50 volts peak the spike must be limited. Apply a clamp diode across the inductive load with the cathode towards the positive input. • Leave this pin unconnected if not used.
26	SW_GND_0	Black	Output	• The relay connected between GND and pin 26. Closing the relay connects to pin 26 to GND. • **CAUTION**: The relay is not currently limited. Exceeding the current limits will damage the relay and void modem warranty. • If an inductive load such as a relay is used, it can generate a spike voltage across it. If that exceeds 50 volts peak the spike must be limited. Apply a clamp diode across the inductive load with the cathode towards the positive input. • Leave this pin unconnected if not used.
27	SW_UBATT_1	Brown	Output	• The relay connected between BATT+ and pin 27. Closing the relay connects to pin 27 to BATT+. • **CAUTION**: The relay is not currently limited. Connecting pin 27 to ground while the relay is turned on will short BATT+ to ground through the relay. This may damage the relay and void modem warranty. • If an inductive load such as a relay is used, it can generate a spike voltage across it. If that exceeds 50 volts peak the spike must be limited. Apply a clamp diode across the inductive load with the cathode towards the positive input. • Leave this pin unconnected if not used.

Pin	Signal	Color	Type	Description
28	SW_GND_1	Black	Output	• The relay connected between GND and pin 28. Closing the relay connects to pin 28 to GND. • Ground this pin if not used. • **CAUTION**: The relay is not currently limited. Exceeding the current limits will damage the relay and void modem warranty. • If an inductive load such as a relay is used, it can generate a spike voltage across it. If that exceeds 50 volts peak the spike must be limited. Apply a clamp diode across the inductive load with the cathode towards the positive input.
29	ANA0	Green	Input	• Analog input to be used to measure analog levels. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used
30	GND	Black	Ground	Ground reference for the modem.
31	ANA1	Green	Input	• Analog input to be used to measure analog levels. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used
32	DIG_0	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
33	DIG_1	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
34	DIG_2	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
35	DIG_3	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
36	DIG_4	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
37	DIG_5	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
38	DIG_6	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used
39	DIG_7	Yellow	I/O	• Software configurable (Input/Output) digital level I/O to drive or read peripherals. This low current drive output requires a buffer to drive loads < 100K ohms. Do not apply a voltage to this pin while modem power is off. • Ground this pin if not used.
40	GND	Black	Ground	Ground reference for the modem.

5 Circuit descriptions

5.1 Analog inputs

The analog inputs are buffered by a unity gain amplifier to ensure minimum loading of an analog sensor. Any voltage level of the sensor can be connected by adding scaling resistors to the input. The value of the resistors should be chosen such that the largest voltage seen by the sensor is equal to 3.5V at the analog input. Neglecting the effects of the bias current from the input unity gain buffer, the example below shows an example of connecting to a 12V sensor.

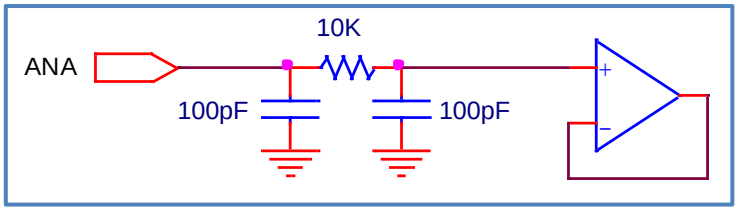


Figure 5-1: Analog 0 and 1 circuit

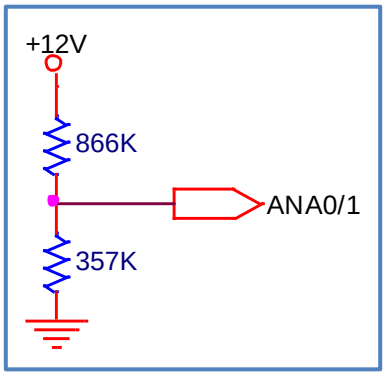


Figure 5-2: 0-12V example circuit

5.2 Solid state relays

The modem contains two sets of solid state relays (pins 25-28). One set is used to connect a load to the modem input voltage BATT+. The other set is used to close a ground connection for a load. See the User Guide to Q4000/QPRO for precautions to take when using the relays.

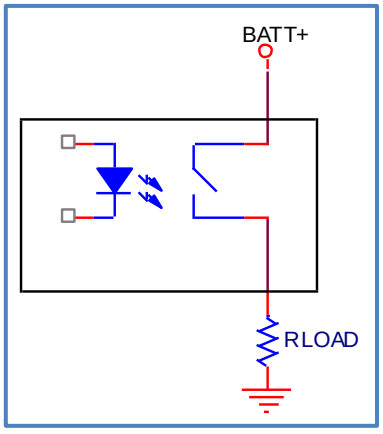


Figure 5-3: SW_BATT+

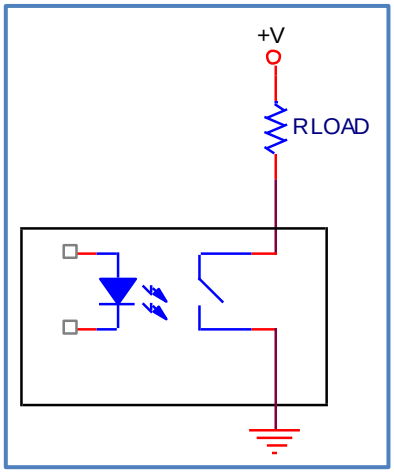


Figure 5-4: SW_GND

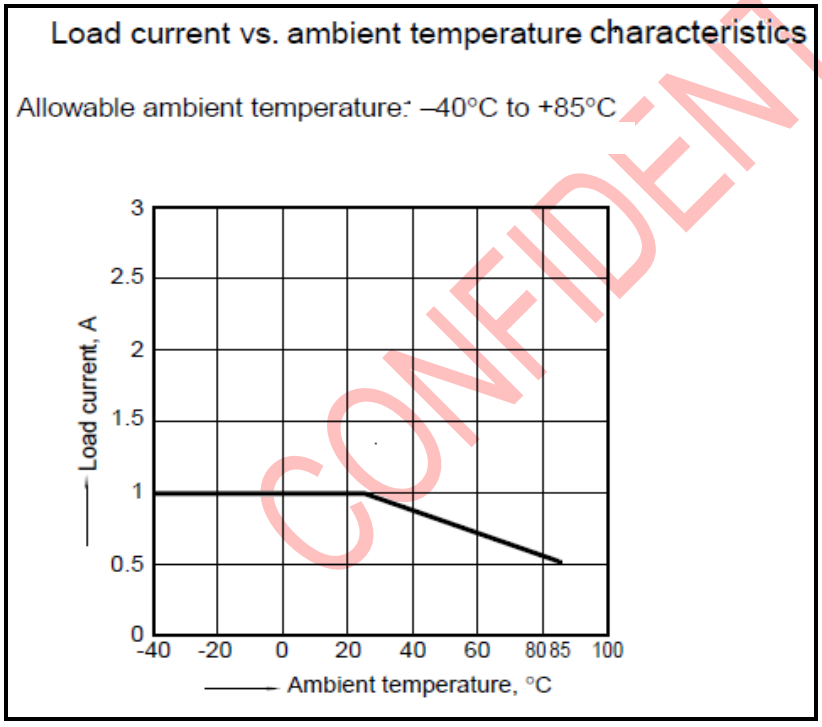


Figure 5-5: Solid state relays temperature derating

6 Modes of operation

The Q4000 family of products may be driven in several modes by the available RS-232 ports. The MTS (Main Transport Socket) RS-232 port is the main communications interface for the modem. It supports the ORBCOMM Serial Interface (OSI) and QUAKE Communications Protocol (QCP). Below is a description of each operational mode. Refer to the User Guide to Q4000/QPRO for further details.

6.1 Standalone

When a user application is stored in the Q4000's non-volatile memory, its presence is detected at boot up and it is executed. This allows full autonomous operation. QUAKE provides sample applications as part of the Development Kit to help users create, build and run their own custom applications.

6.2 QCP

The QUAKE Communication Protocol (QCP) mode is used to send data via a terrestrial or satellite systems such as ORBCOMM or Iridium. Customers who use the Q4000 in this mode typically have a processor and the necessary I/O for their specific applications, and use the Q4000 as a modem only, or to add functionality such as additional I/O's, GPS, etc. QCP is used to communicate between the Q4000 and the application.

6.3 Data transmit

In this mode, the unit is sending an outgoing message. The message could result from any programmed condition such as an alarm, an application event, or a scheduled report. The message could also be a response to an over-the-air inquiry. The Q4000 may also query the satellite or terrestrial network, looking for incoming messages.

6.4 Standby

While in standby mode, the Q4000 is in a constant receive mode. Depending on the availability of the satellite, the unit will be receiving satellite downlink information or searching for a downlink. The RF, digital signal processor, and control processor portions of the modem are active in this mode.

6.5 Data collection

In this mode, the control processor (CP) is active. The Q4000 may be sampling data inputs through the serial port or interacting with other Q4000 subsystems. The CP is used to power on, control and collect data from the RF subsystem. The CP is active during its interaction with these subsystems but does not need to stay active while the other subsystems run their tasks.

6.6 Sleep

The Q4000 is completely shut down during sleep mode. The processors and memories are off. Only the real-time clock (RTC) is running. The Q4000 can be configured to enter sleep mode when DTR goes low, or it can be programmed to enter sleep mode by the software. A normal shutdown includes a data save to flash consisting of unsent messages and configuration parameters. A power cycle, external DTR pulse, RTC alarm, or a 1.5V or greater rise in voltage in less than 10ms can subsequently wake up the unit.

Note: A power cycle, external DTR pulse, RTC alarm, or a 1.5V or greater rise in voltage in less than 10ms can subsequently wake up the unit.

7 Ordering information

The Q4000 is available in standard configurations. For volume applications, the Q4000 may be ordered in custom configurations by contacting your Quake Global sales representative for details.

Table 7-1: Standard configurations

Part Number	Terr	GPS	Satellite	Solid State Relays	Mem Size (MB)	SIM Option	CAN Bus
1161-3GSACR8AC-NN	3G/2G	✓	ORB	✓	8	Card	✓
1135-NGSACN2NN	No	✓	ORB		2	None	
1161-3GNNCR8AC-NN	3G/2G	✓	None	✓	8	Card	✓
1162-3GFACR8AC-NN	3G/2G	✓	Iridium	✓	8	Card	✓
1162-NGFACR8NC-NN	No	✓	Iridium	✓	8	Card	✓

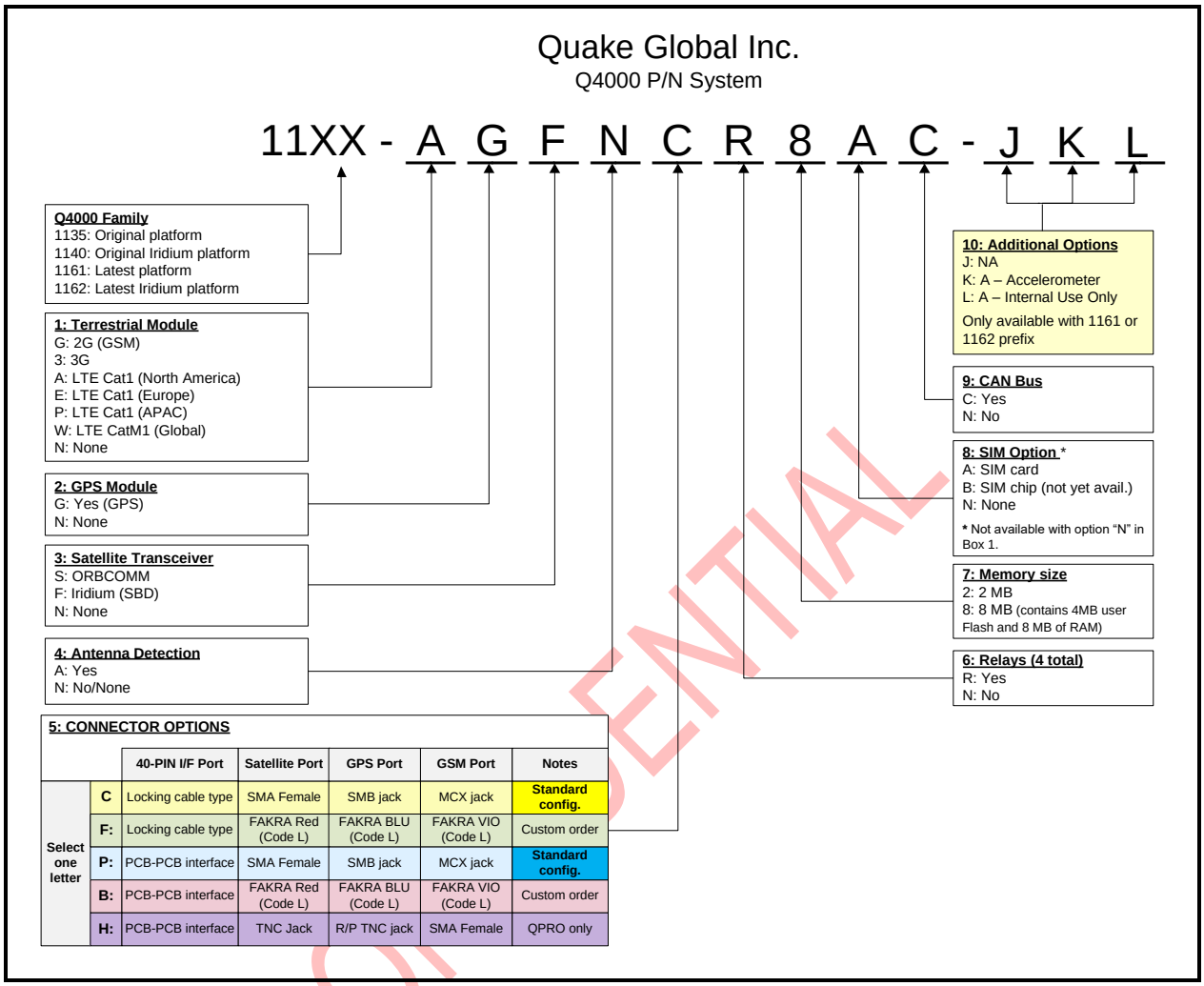


Figure 7-1: Q4000 part number system

8 Ratings and certifications

8.1 Environmental ratings

As an OEM product, the Q4000 is designed to be housed in a sealed enclosure or in an environmentally benign area, since it is not sealed against moisture ingress.

Table 8-1: Environmental ratings

Parameter	Rating
Operating temperature	-40C to +85C **Note:** The Q4000 has two operating temperature ratings: • Rating 1 (-40C to 50C) The Q4000 may be installed in an environment in which it is accessible to either an operator or service person. • Rating 2 (50C to 85C) The Q4000 must be installed in an environment in which there is no access by any person during normal use.
Storage temperature	-40C to +85C
Low pressure	Up to 4 hours at 15000 ft elevation pressure
Humidity	Relative humidity range of 0% to 95% non-condensing at 65C MIL SPEC 810E, Method 507.3 with test conditions. Procedure I, Cycle 2 Procedure 1 simulates natural environmental cycles. It is conducted on test items which are open to a frequently ventilated environment, Cycle 2 set temperature at 24 deg C constant with humidity maintained at 95% minimum. Test Duration: 15 Cycles (15 days)
Cyclic humidity	Temperature/Cyclic Humidity Test, 5 days at -10C to 65C at 85% relative humidity
Thermal shock	-40C to 85C (30 minutes at each temp, 10 cycles)
Mechanical shock	20G, saw tooth profile, over an 11 msec period. (Three positive and three negative shocks in each of three mutually perpendicular axes.) SAEJ1455 shock requirements and those in MIL SPEC 810E.
Vibration	20 Hz to 2 KHz, 8 Grms vibration profile in each of three mutually perpendicular axes, 1 hour per axis, 10 Hz to 150 HZ, 0.5 g square/Hz vibration profile in each of three mutually perpendicular axes, 1 hour per axis. 10 Hz to 150 HZ, 0.05 g^2/Hz vibration, 16 hours on each of three orthogonal axes 5 Hz to 20 Hz, 0.05 g^2/hz, and from 20 to 150 Hz, -3 dB/octave, 1 hour each axes. Vibration requirements in ORBCOMM SC Standards Spec and MIL-STD-810E. SAEJ1455 vibration requirements

8.2 Certifications

Table 8-2: Certifications

Parameter	Rating
ORBCOMM	ORBCOMM Type Approval
Iridium SBD	Iridium Network Certification
FCC	FCC Part 15 Class B - Radio Frequency Interference (RFI) (FCC 15.105) The operation is subject to the following two conditions: 1. This device may not cause harmful interference. 2. This device must accept any interference received, including interference that may cause undesired operation. Iridium FCC ID: PB5Q4000 ORBCOMM TAT ID: 819QWI GSM FCC ID: RI7ME910C1WW See also section 8.3 - FCC below.
GSM/GPRS Quad Band	PTCRB / FCC / CE
Canada	This device complies with Industry Canada licence-exempt RSS standard(s). The operation is subject to the following two conditions: 1. This device may not cause interference. 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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*
CE	European Community marking
J1939	J1939 Compliance
J1455	J1455 Compliance. Note: see Environmental ratings for Cyclic Humidity.

Warning

Any changes or modifications to the Q4000 product could alter/damage the final operation of the equipment and may also void the user's authority to operate the equipment and void Quake Global's warranty.

8.3 FCC information

Table 8-3: FCC information

Q4000 model	FCC Information
1135-GGSACR2AC	"This equipment contains FCC ID: 819QWI (ORBCOMM) and FCC ID: RI7ME910C1WW (GSM)."
1135-NGSACN2NN	"This equipment contains FCC ID: 819QWI (ORBCOMM)."
1135-NNNNCR2NC	No internal FCC ID.
1135-GGNNCN2AC	"This equipment contains FCC ID: RI7ME910C1WW (GSM)."
1135-NNSNCN2NN	"This equipment contains FCC ID: 819QWI (ORBCOMM)."
1135-GGSNPN2AN	"This equipment contains FCC ID: 819QWI (ORBCOMM) and FCC ID: RI7ME910C1WW (GSM)."
1135-NGNNCR2NC	No internal FCC ID.
1135-GNNNCN2AC	"This equipment contains FCC ID: RI7ME910C1WW (GSM)."
1135-NGSACN2NC	"This equipment contains FCC ID: 819QWI (ORBCOMM)."
1140-GGFNCR2AC	"This equipment contains FCC ID: PB5Q4000 (Iridium) and FCC ID: RI7ME910C1WW(GSM)."
1140-GGFNPR2AC	"This equipment contains FCC ID: PB5Q4000(Iridium) and FCC ID: RI7ME910C1WW (GSM)."
1140-NGFNPN2NC	"This equipment contains FCC ID: PB5Q4000(Iridium)."
1140-NNFNPN2NC	"This equipment contains FCC ID: PB5Q4000 (Iridium)."

8.4 Notified Body certificates

eurofins | Eurofins Product Service

EXPERTISE

Expert Opinion of the Notified Body based on the Conformity Assessment according to Annex IV of the R&TTE Directive 1999/5/EC

Eurofins Product Service GmbH

EU Identification Number **0681**

recognized by

Bundesnetzagentur

BNetzA-bS-02/51-53

Registration Number:	**U9M21005-3264-C**
Certificate Holder:	**Quake Global Inc.** **9765 Clairemont Mesa Blvd. Suite A** **San Diego, CA 92124** **USA**
Model Name(s): Brand Name:	**QPRO Family, Q4000 Family** **Quake Global Inc.**
Product Description:	**UHF satellite and Quad band Cellular/PCS**
Applied Standards:	Radio: EN 301721 V1.2.1 (06/2001) EN 301511 V9.0.2 (GSM 13.11) EMC: EN 55022 :2006 EN 61000-3-2 :2006, EN 61000-3-3 :1995+A1 :2001+A2 :2005 EN 301489-1 V1.8.1 (04/2008), EN 301489-20 V1.2.1 (11/2002) Safety: EN 60950-1:2006

This certificate is issued in accordance with Annex IV of the R&TTE Directive 1999/5/EC of 9th March, 1999 and is only valid in conjunction with the following annex: - 1 -

Marking Example according to Article 12 of the R&TTE Directive: CE0681

Reichenwalde, 10. June, 2010
Ort, Ausstellungsdatum
Place, Date of Issue

Unterzeichnet von/Signed by Jörg Kusig
Benannte Stelle/ Notified Body

Eurofins Product Service GmbH

Storkower Straße 38c, D-15526 Reichenwalde b. Berlin, Germany. Phone +49 33631 66800 Fax +49 33631 888640

Figure 8-1: Notified Body certificate – ORBCOMM

NB Opinion: TRA-005709-01-32-01A

COPY No: 1

ISSUE No: 1

18 July 2012

RADIO & TELECOMMUNICATIONS TERMINAL EQUIPMENT DIRECTIVE 1999/5/EC NOTIFIED BODY OPINION

TECHNICAL CONSTRUCTION FILE IDENTITY No:	TRA-005709-35-00A TRA-005709-45-00A TRA-005709-00-W-EU-1
REVISION STATUS: 51F021 Issue 5	Revision 1, July 2011
APPLICANT:	Quake Global Limited 4933 Paramount Drive San Diego CA92123 USA
MANUFACTURER:	Quake Global Limited 4933 Paramount Drive San Diego CA92123 USA
EQUIPMENT IDENTIFICATION:	Q4000 / QPRO
INTENDED USE/PURPOSE:	Remote Tracking Equipment / Satellite LBT
FREQUENCY BAND(S):	1616MHz - 1626.9MHz
TYPE OF MODULATION:	FDMA / TDMA

Figure 8-2: Notified Body certificate – Iridium (1)

NORTH WEST
Unit 1, Pendle Place, Skelmersdale, West Lancashire, WN8 9PN UK.
T +44 (0)1695 556666 **F** +44 (0)1695 557077 **E** test@tracglobal.com
www.tracglobal.com

Environmental • Analysis • Telecoms • Radio • EMC • Safety

AUTHORIZED SIGNATORY

Mark Heaven
CEO TRaC Global

TRANSMIT POWER / POWER RANGE:	-12.84 dBW/4kHz Mean EIRP Density,Limit -3 dBW/4kHz
DUTY CYCLE:	8.28%
CHANNEL ACCESS PROTOCOL:	Not Applicable
TYPE OF ANTENNA:	External, maximum 3dBi Gain Right Hand Circular Polarised
REFERENCE STANDARDS:	Radio: EN 301 441 V1.1.1 : 2000 EMC: EN 301 489-20 V1.2.1 : 2009 EN 301 489-1 V1.9.2 : 2011 Safety: EN 60950-1:2006 + A11:2009
CONFORMITY ASSESSMENT PROCEDURE:	Annex IV Technical Construction File

51F021 Issue 5 Page 2 of 2

The Technical Construction File to which this document relates has been assessed and in the opinion of the undersigned Notified Body is found to conform to article 3 (excluding SAR), the essential requirements of Council Directive 1999/5/EC on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

This product also contains a GSM/GPRS Module, approval to article 3.2 of the R&TTE Directive is covered by RFI Notified Body Opinion Reference: RFI-NOTA1-SC74296JD14 Dated 15th June 2009. Further information on this approval can be obtained from the manufacturer detailed on this certificate

NOTIFIED BODY:	TRaC Global 100 Frobisher Business Park Leigh Sinton Road Malvern Worcestershire WR14 1BX
NOTIFIED BODY NUMBER:	0891

Figure 8-3: Notified Body certificate – Iridium (2)

NORTH WEST
Unit 1, Pendle Place, Skelmersdale, West Lancashire, WN8 9PN UK.
T +44 (0)1695 556666 F +44 (0)1695 557077 E test@tracglobal.com
www.tracglobal.com

Environmental • Analysis • Telecoms • Radio • EMC • Safety

9 Mechanical information

Figure 9-1: Connectors on the Q4000

9.1 Connectors

Table 9-1: Q4000 connector types

Product	Q4000 Sat Connect	Sat Antenna Connect	Q4000 GPS Connect	GPS Antenna Connect	Q4000 GSM Connect *	GSM Antenna Connect
Q4000 SAT/GPS/Cellular	SMA-Female	SMA-Male	GPS SMB-Jack	GPS SMB-Plug	GSM MCX-Female	GSM MCX-Male

- *NOTE: Only single LTE antenna is supported by Q4000 and QPRO, RxD not supported for LTE configurations. If your LTE antenna has 2 connectors, only use the “main” connector, not the RxD Diversity connector. Refer to 1162-3002 – Recommended Antennas for LTE Q4000 – QPRO.

Table 9-2: Recommended RF connector mating torque

Connector type	Material	Recommended torque	
		American	Metric
SMA	Gold plated brass	3 - 5 in-lbs	0.34 - 0.57 NM

Table 9-3: Connector information

Name	OEM Module	Customer Interface	Comments
Locking	Molex p/n 501645-4020	Molex p/n 501646-4000	
Pins	-	Molex p/n 501647-1000	
Crimping Tool	-	Molex p/n 0638192300	
PCB-PCB	Samtec p/n TMM-120-02-L-D	Samtec p/n SQT-120-01-F-D	This pair creates a board-to-board interface that places the interface board directly on top of the modem (distance 0.313”).

Note: Due to variances in connector designations, refer to the technical drawings in sections 9.2, 9.3, and 9.4 for Pin 1 location on the Q4000.

9.2 Modem/Connector dimensions

Modem Size	Modem Weight
3.91" x 2.52" x .63" (99.3mm x 64mm x 15.9mm)	0.375 lbs. (0.170 kg)

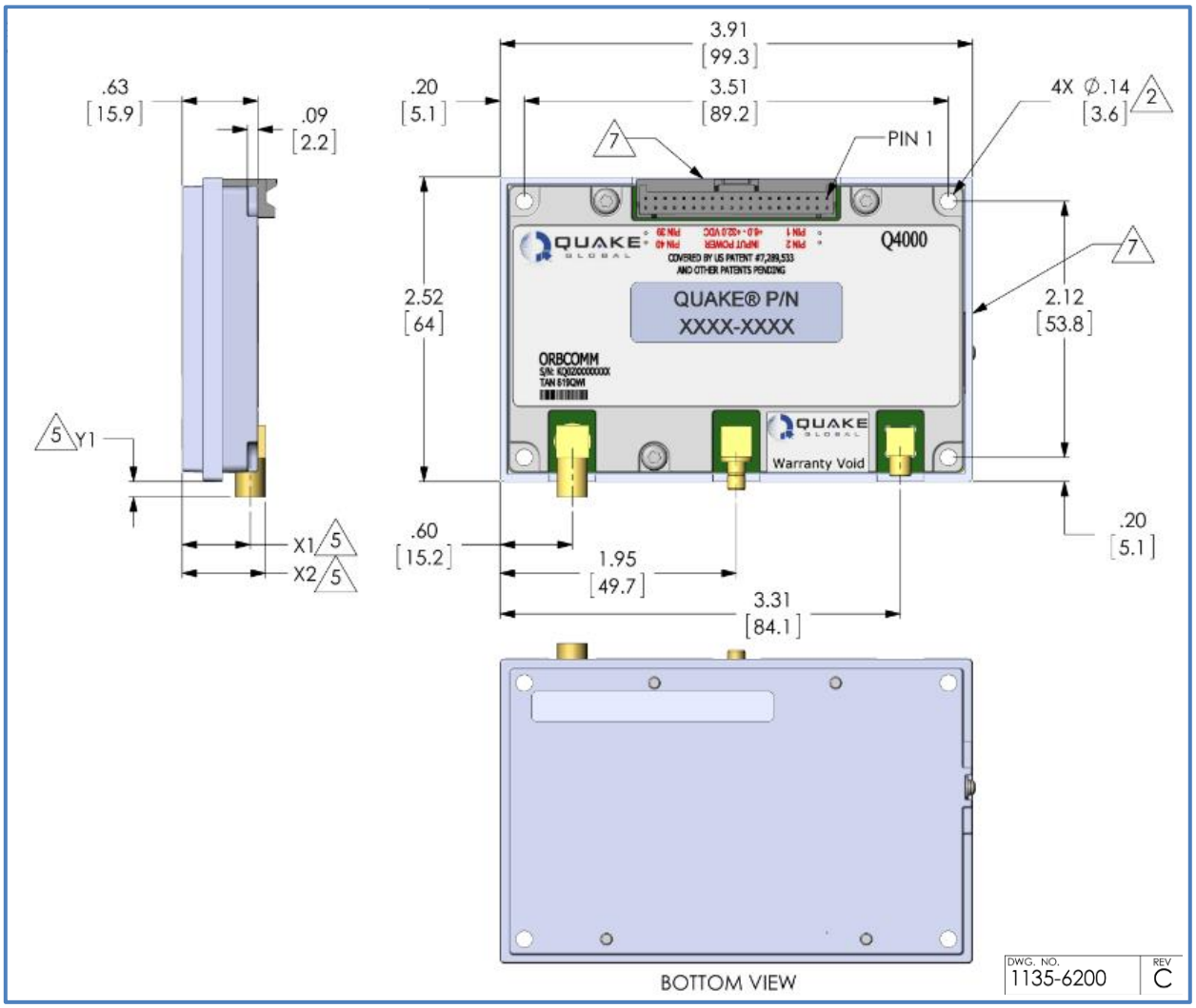
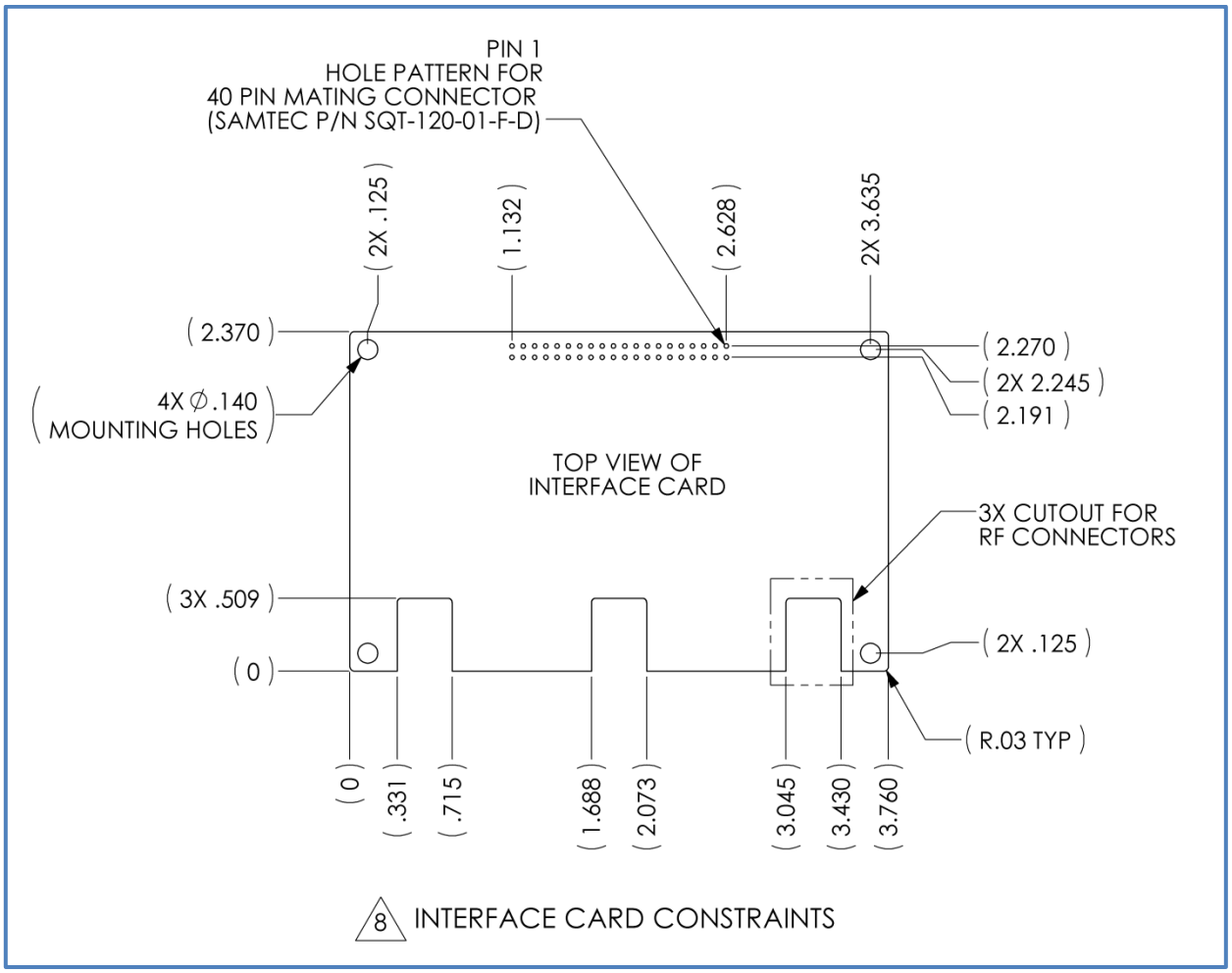
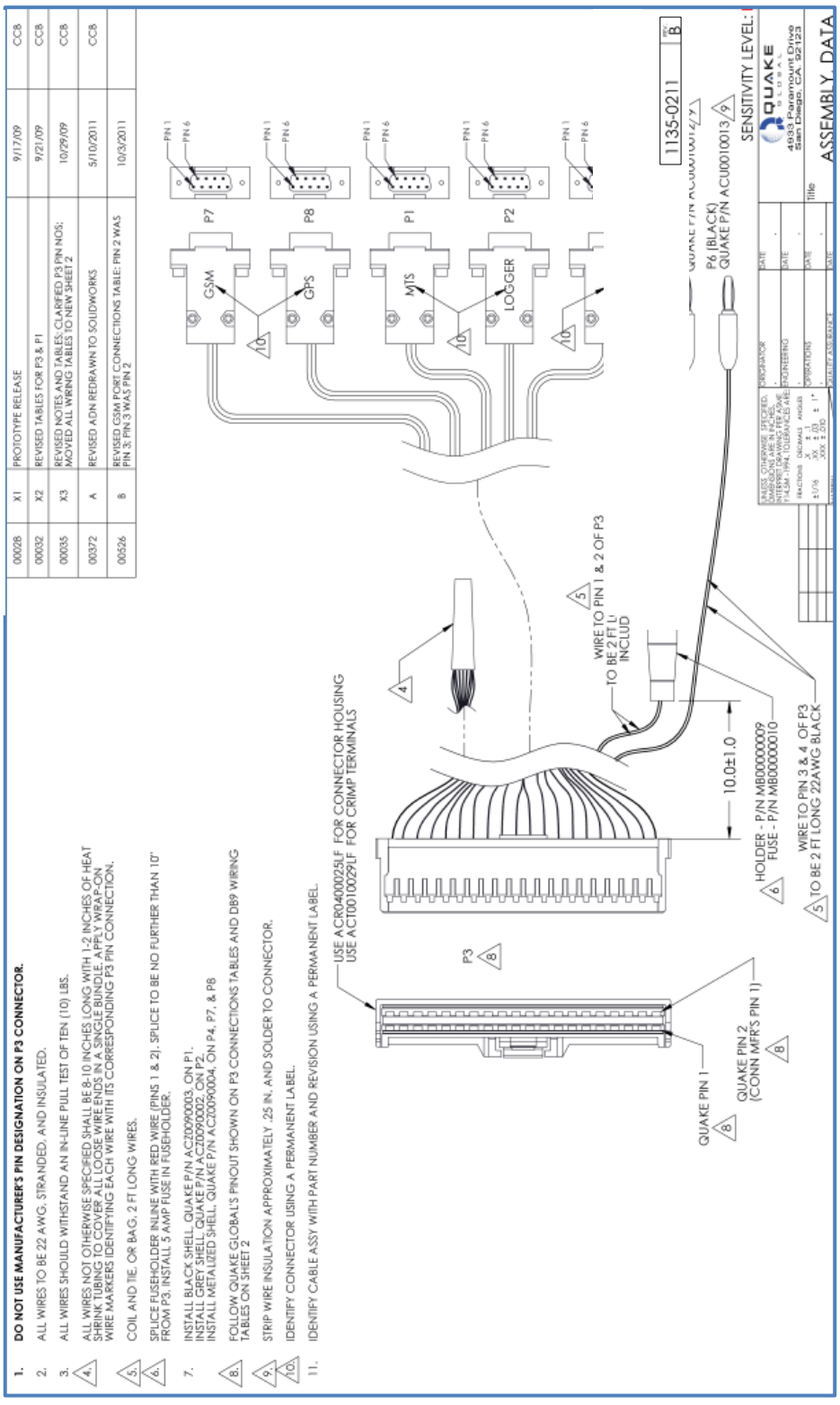


TABLE 2: CONNECTOR DIMENSIONS			
	X1	X2	Y1
SMB	.56 [14.3]	.69 [17.5]	.13 [3.3]
SMA	.53 [13.5]	.67 [16.9]	.07 [1.8]
MCX	.42 [10.8]	.55 [14]	.05 [.12]
FAKRA	.51 [12.9]	.76 [19.2]	.47 [12]

9.3 Interface card constraints



9.4 Development Kit cable



9.5 Port pinout

PIN 3 PINOUT TABLE (8)				
Quake Global Pinout	Mfr's Pins	Signal	Type	WIRE COLOR
1	2	UBATT (+)	Power	RED
2	1	UBATT (+)	Power	RED
3	4	UBATT (-)	Ground	BLK
4	3	UBATT (-)	Ground	BLK
5	6	3V5_500MA	Continuous Output	BRN
6	5	3V5_GPS_150MA	Continuous Output	BRN
7	8	GSM_RX_RS232	NC	WHT
8	7	AUX_TX_RS232	Output	WHT
9	10	GSM_TX_RS232	NC	WHT
10	9	AUX_RX_RS232	Input	WHT
11	12	GND	Ground	BLK
12	11	GPS_RX_RS232	NC	WHT
13	14	MTS_RXD_RS232	Output	WHT
14	13	GPS_TX_RS232	Output	WHT
15	16	MTS_TXD_RS232	Input	WHT
16	15	MTS_DSR_RS232	Output	WHT
17	18	MTS_DTR_RS232	Input	WHT
18	17	MTS_DCD_RS232	Output	WHT
19	20	GND	Ground	BLK
20	19	LOG_RXD_RS232	Input	WHT
21	22	GND	Ground	BLK
22	21	LOG_TXD_RS232	Output	WHT
23	24	CANH	Input/Output	GRY
24	23	CANL	Input/Output	GRY
25	26	SW_UBATT_0	Output	BRN
26	25	SW_GND_0	Output	BLK
27	28	SW_UBATT_1	Output	BRN
28	27	SW_GND_1	Output	BLK
29	30	ANA0	Input	GRN
30	29	GND	Ground	BLK
31	32	ANA1	Input	GRN
32	31	DIG_0	Input/Output	YEL
33	34	DIG_1	Input/Output	YEL
34	33	DIG_2	Input/Output	YEL
35	36	DIG_3	Input/Output	YEL
36	35	DIG_4	Input/Output	YEL
37	38	DIG_5	Input/Output	YEL
38	37	DIG_6	Input/Output	YEL
39	40	DIG_7	Input/Output	YEL
40	39	GND	Ground	BLK

MTS PORT CONNECTIONS (8)		
P3	P1	DESCRIPTION
PIN 15	PIN 3	MTS_TXD_RS232
PIN 13	PIN 2	MTS_RXD_RS232
PIN 17	PIN 4	MTS_DTR_RS232
PIN 11	PIN 5	GND
PIN 16	PIN 6	MTS_DSR_RS232
PIN 18	PIN 1	MTS_DCD_RS232

LOGGER PORT CONNECTIONS (8)		
P3	P2	DESCRIPTION
PIN 22	PIN 2	LOG_TXD_RS232
PIN 20	PIN 3	LOG_RXD_RS232
PIN 19	PIN 5	GND

AUX PORT CONNECTIONS (8)		
P3	P4	DESCRIPTION
PIN 10	PIN 3	AUX_RX_RS232
PIN 8	PIN 2	AUX_TX_RS232
PIN 40	PIN 5	GND

GSM PORT CONNECTIONS (8)		
P3	P7	DESCRIPTION
PIN 7	PIN 2	GSM_RX_RS232
PIN 9	PIN 3	GSM_TX_RS232

GPS PORT CONNECTIONS (8)		
P3	P8	DESCRIPTION
PIN 12	PIN 3	GPS_TX_RS232
PIN 14	PIN 2	GPS_RX_RS232

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10 General cautions

The GPS connector has a white circular area and a small hole at the center. This hole has small metal fingers in it that make contact with the pin in the antenna connector on the GPS patch. This is the **center conductor**.

Warning

Do not feed voltage into or short the GPS port to ground. The Q4000 supplies DC bias voltage on the antenna center conductor. Violating this warning may cause damage to the unit and void the warranty.

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A minimum of 100,000 raw program erase cycles are expected from the flash manufacturer before possible failure. For Raw Flash, there are 64K Flash Sectors and each Flash File System Block is 512 Bytes. It is recommended to write files that are a modulus of 64K to ensure that whole Flash File Sectors are written.

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