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Q4000 Family Technical Data Sheet

1135-0902
Revision K

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SENSITIVITY LEVEL: **YELLOW**

Revision History

REV	ECO#	REASON	DATE
Rev. A	00236	Initial Production Release	8/30/2010
Rev. B	00260	Moved info to Q4000/QPRO User's Guide	11/4/2010
Rev. C	00288	Update Iridium Configuration Info, Canadian certification	3/10/2011
Rev. D	00413	Fix incorrect RS-232 values, fix incorrect table values for power and connectors	4/26/2011
Rev. E	00434	Change MTS_DCD_RS232 to Output; fix power calculations.	
Rev. F	00464	Change GPS TTFF to 60 seconds	6/20/2011
Rev. G	00487	Add warning about accessing serial ports for different networks.	7/18/2011
Rev. H	00536	Add additional Iridium part numbers, additional DIO info, new cable drawing and pinout to include ECO 526	9/26/2011
Rev. J	00584	Fix AUX port speed parameters and add info about losing data at high speeds. Update memory availability chart and GPS antenna information. Add low processor mode info.	12/7/2011
Rev. K	00XXX	Updated to meet Certification requirements	1/4/2011

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1 Introduction

1.1 *Overview*

The QUAKE Q4000 is a dual mode solution that is ready for global use. The Q4000 is designed to communicate with terrestrial cellular network systems when a cell signal is available, and to slide seamlessly into its back-up mode and communicate with a satellite system when a cell signal is not available. Besides this advanced modem functionality, the Q4000 has 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 6-32 volt input range. It has been specifically designed to meet the requirements of vehicular environments and supports communication over a vehicle bus using SAE J1939 standards. These features make the Q4000 an ideal stand-alone solution for a large variety of applications including transportation, oil and gas and heavy equipment markets.

The Q4000 can be purchased in many different configurations, ranging from a simple controller that operates with external communication devices, all the way to very complex integrated dual mode solutions.

This Data Sheet presents an overview of the Q4000 technology, device specifications, integration guidelines, and basic information on configuring and programming. Additional QUAKE manuals, including the User's Guide to Q4000/QPRO, P/N 1135-4713, can be accessed on our website or by contacting QUAKE Customer Support at http://QUAKEglobal.com/support/.

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1.2 *Control Options*

The Q4000 has the option of running in **standalone mode** or **QUAKE Communications Protocol (QCP) mode**.

In standalone mode, the user's application resides directly on the modem. QUAKE provides sample applications as part of the Development Kit to help users create, build and run their own custom applications.

QCP mode is used to send data via GSM/GPRS, or a single satellite system such as Orbcomm, Iridium, Globalstar or Inmarsat. 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. QUAKE Communication Protocol (QCP) is used to communicate between the Q4000 and the application.

1.3 *Reference Manuals*

Ref Doc Number	Part Number	Recommended Reference Manuals (Name)
1	Orbcomm E80050015	Orbcomm Serial Interface Specification
2	Orbcomm A80TD0008	Orbcomm System Overview
3	Orbcomm A80MK0019	Orbcomm Messaging Services Description
4	QUAKE 1135-4713	User's Guide to Q4000/QPRO
5	QUAKE 1135-3001	QUAKE API Reference Manual
6	QUAKE 4000-3000	Iridium SBD AT Command Set Manual
7	Iridium	SBD, Developer's Guide
8	QUAKE 1135-4715	QCP, QUAKE Communication Protocol, Manual
9	QUAKE 1135-4711	QUAKE Configuration Tool Manual
10	ORBCOMM E25050102	ORBCOMM SC Standards & Specs
11	MIL-STD-810E	DoD Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

1.4 *Development Kits*

Q4000 Development Kits are available from QUAKE. They include: Development Environment (IAR)

Compiler, QUAKE libraries and header files, sample application programs, Q4000 modem, necessary cables, antennas, and all documentation. Contact your QUAKE sales personnel for more details.

1.5 *Contacting QUAKE*

If you need to contact QUAKE Global regarding the Q4000 Development Kit or other issues, please refer to the following information:

QUAKE Global Inc.
4933 Paramount Dr
San Diego CA 92123
Phone Number: (858)-277-7290 Fax Number: (858) 277-7259
Website: www.QUAKEglobal.com
Submit a Customer Support Ticket: http://QUAKEglobal.com/support/

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2 Q4000 Hardware

2.1 *Q4000 Available Configurations*

As an “off the shelf” product, the Q4000 is available in various standard configurations. For volume applications, the Q4000 may be ordered in an almost unlimited number of configurations. QUAKE prides itself on the flexibility of the products we provide to our customers. If you need a customized configuration, please contact your QUAKE Global Sales Representative for details.

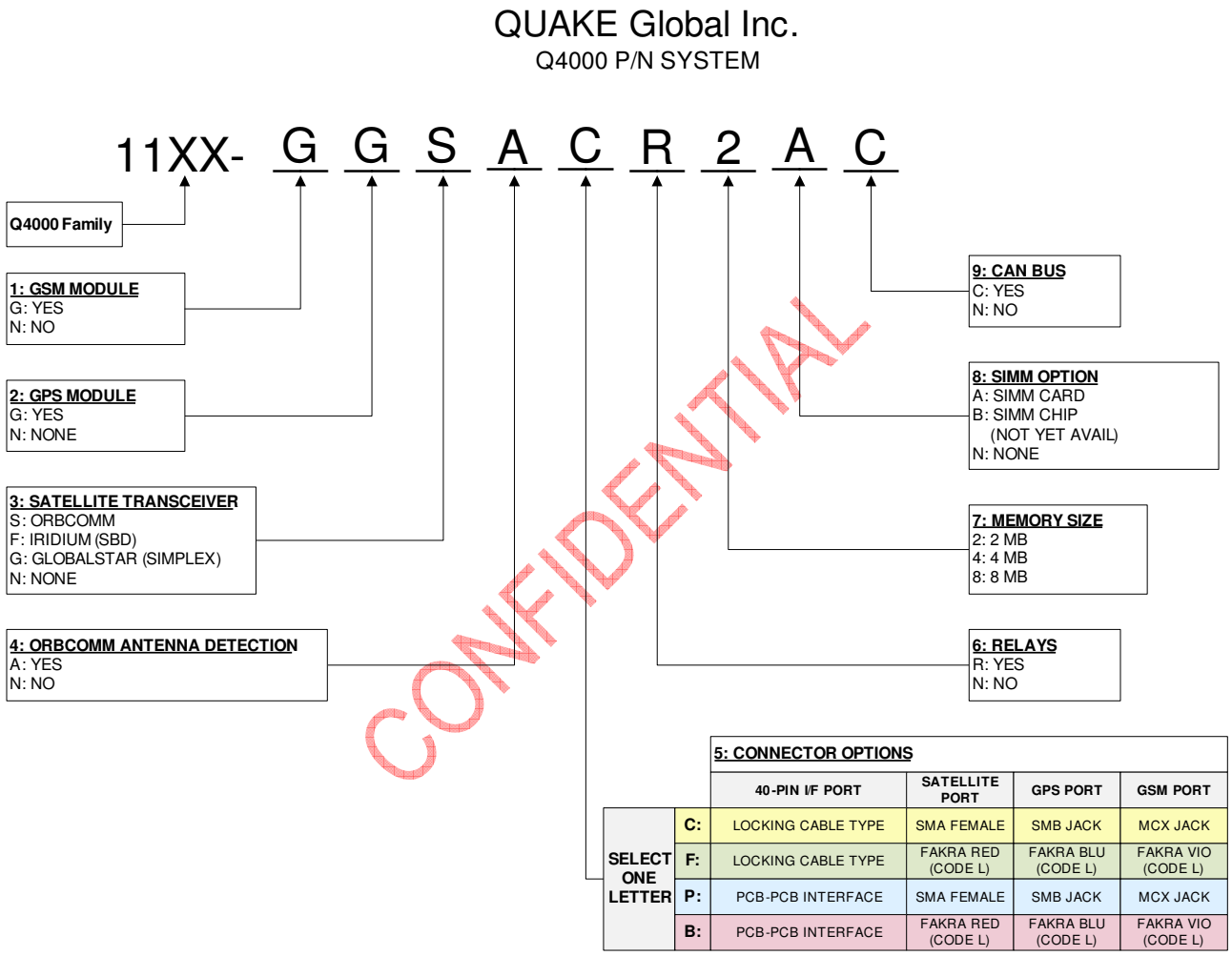

Figure 2-1, Q4000 Product Ordering Guide

Note: 11XX = 1135 is for Q4000, 1136 is for Q4000 with Iridium.

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2.2 *Standard Modem Configurations*

Below is a description of commonly configured Q4000 devices and their part numbers.

1135-GGSACR2AC GSM: Yes[4] GPS: Yes Satellite Transceiver: Orbcomm[3] Antenna Detection: Yes Interface Connector: Locking Cable Type Relays: Yes Memory Size: 2MB Sim Option: Card CAN Bus: Yes	**1135-NGSACN2NN** GSM: No GPS: Yes Satellite Transceiver: Orbcomm[3] Antenna Detection: Yes Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: None CAN Bus: No	**1135-NNNNCR2NC** GSM: No GPS: No Satellite Transceiver: None Antenna Detection: No Interface Connector: Locking Cable Type Relays: Yes Memory Size: 2MB Sim Option: None CAN Bus: Yes
1135-GGNNCN2AC GSM: Yes[4] GPS: Yes Satellite Transceiver: None Antenna Detection: No Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: Card CAN Bus: Yes	**1135-NNSNCN2NN** GSM: No GPS: No Satellite Transceiver: Orbcomm[3] Antenna Detection: No Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: None CAN Bus: No	**1135-GGSNPN2AN** GSM: Yes[4] GPS: Yes Satellite Transceiver: Orbcomm[3] Antenna Detection: No Interface Connector: PCB-PCB Relays: No Memory Size: 2MB Sim Option: Card CAN Bus: No
1135-NGNNCR2NC GSM: No GPS: Yes Satellite Transceiver: None Antenna Detection: No Interface Connector: Locking Cable Type Relays: Yes Memory Size: 2MB Sim Option: None CAN Bus: Yes	**1135-GNNNCN2AC** GSM: Yes[4] GPS: No Satellite Transceiver: None Antenna Detection: No Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: Card CAN Bus: Yes	**1140-GGFNCR2AC** GSM: Yes[4] GPS: Yes Satellite Transceiver: Iridium[2] Antenna Detection: No Interface Connector: Locking Cable Type Relays: Yes Memory Size: 2MB Sim Option: Yes CAN Bus: Yes
1140-NNFNCN2NC GSM: No GPS: No Satellite Transceiver: Iridium[2] Antenna Detection: No Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: None CAN Bus: Yes	**1140-NGFNCN2NC** GSM: No GPS: Yes Satellite Transceiver: Iridium[2] Antenna Detection: No Interface Connector: Locking Cable Type Relays: No Memory Size: 2MB Sim Option: None CAN Bus: Yes	**Notes** 1) **iSatData Pro/INMARSAT Approval (TBD)** 2) Module contains Iridium FCC ID: **PB596XXCS** 3) Module contains Orbcomm TAT ID: **819QWI** 4) Module contains GSM FCC ID: **RI7GE865**.

Figure 2-2, Standard Modem Configurations

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2.3 *System Overview*

The following System Block Diagram describes the fully loaded functional blocks of the Q4000:

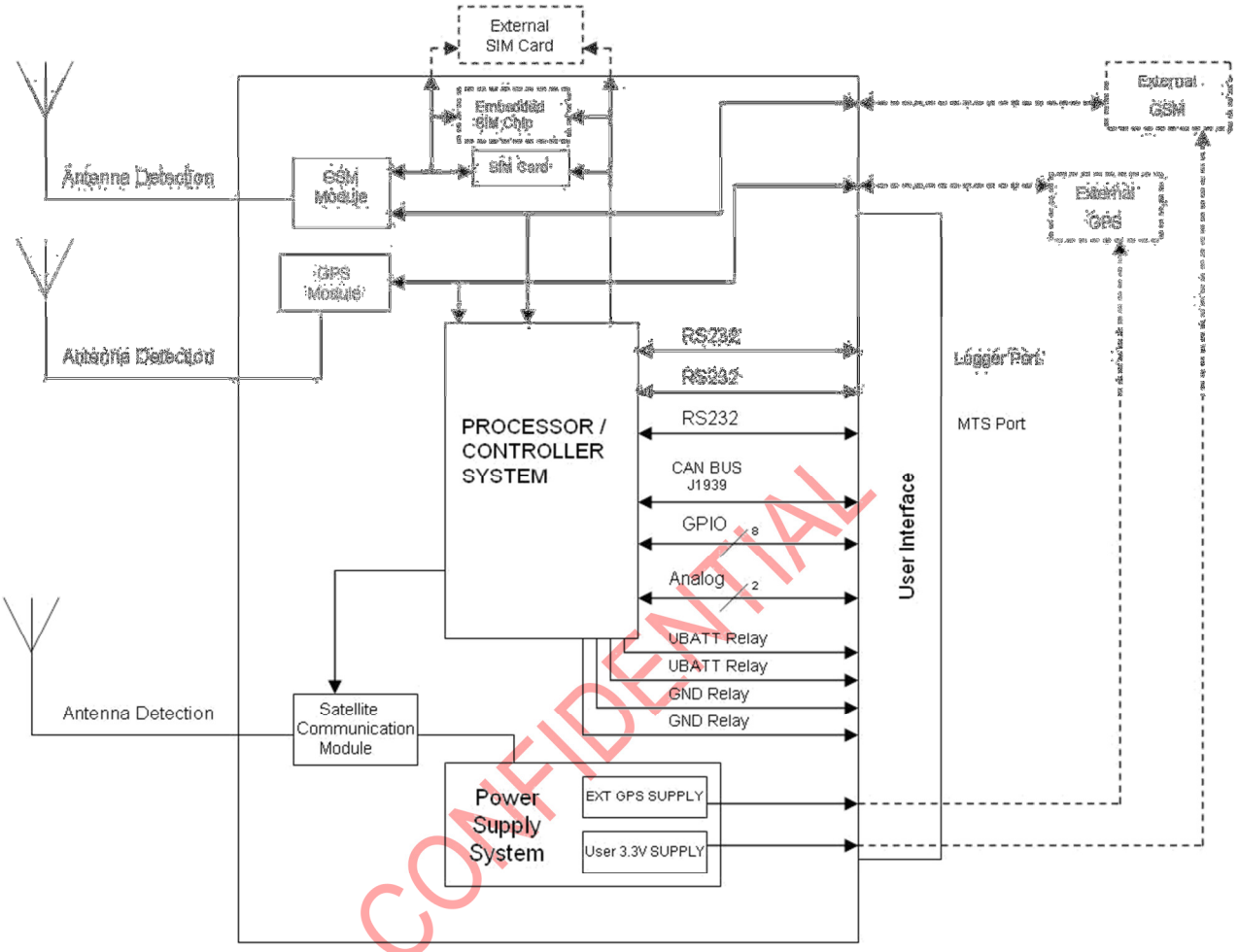

Figure 2-3, Q4000 System Block Diagram for Fully Loaded Configuration

2.4 *Input Power*

2.4.1 Internal Power Supply Description

The Q4000 contains the required internal regulation and reverse bias/overvoltage protection to meet J1455 specifications for 12VDC and 24VDC systems. DC power of +6VDC to +32VDC is supplied through pins 1 and 2 (BATT+) and pins 3 and 4 (BATT-) of the multi-pin connector. The ground pins are connected directly to the chassis of the Q4000. It is recommended that the power supply feeding the Q4000 be protected with a fast-blow fuse sized appropriately for the expected current draw. Current draw is dependent on the features and options that are installed and operating. See Table 2-2, Q4000 Power Consumption, for typical power consumption.

2.4.2 External Power Supply Requirements

In order for the modem to boot properly:

1) The supply voltage must be below 1.4 volts for 4 seconds before re-applying the 6 to 32 V.
2) The rise time on the supply voltage must be 10ms maximum, from 0 to 6Vdc.

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2.4.3 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 shown here, placed in parallel between power and ground of the input power supply, act to absorb this energy before it reaches the modem. In Figure 2-4 showing this Load Dump Protection Circuit, we are using two “Littlefuse, Inc.” 5KP33A diodes.

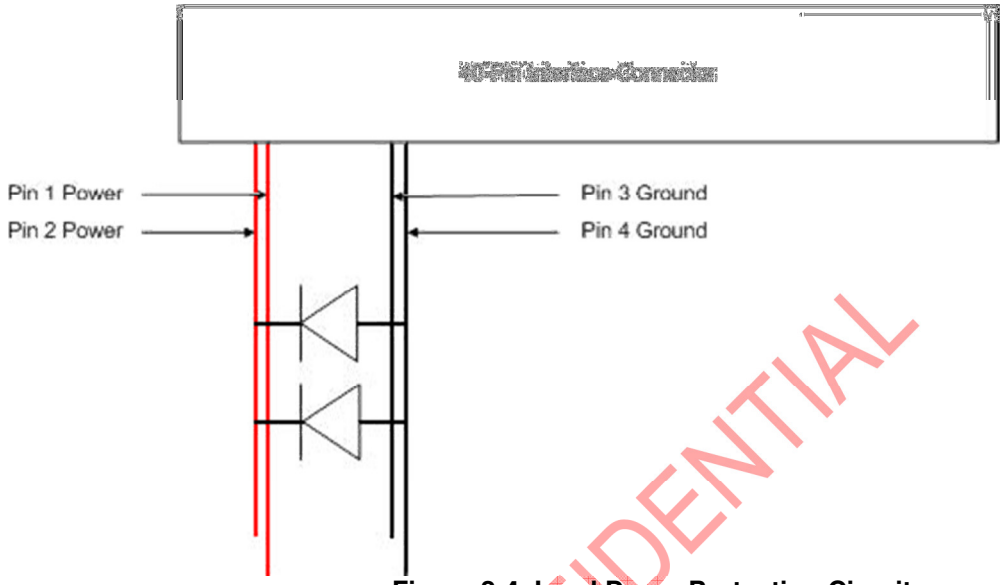

Figure 2-4, Load Dump Protection Circuit

2.4.4 Typical Power Consumption

This section describes the typical power consumptions of each component of the Q4000 modem. Table 2-1, Input Power Limits, is a listing of the required input voltage limits.

Table 2-1, Input Power Limits

Network	Volts
ORBCOMM	10.5 - 32
Iridium	9 - 32
GlobalStar	6 - 32
Inmarsat	9 - 32
GSM/GPRS	6 - 32
GPS	6 - 32

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2.4.5 Power Calculation

Depending on the configuration of the modem, add the appropriate power. For example:

Q4000 with GSM, GPS and Orbcomm with no messages being sent:

Current Calculation:
0.045A (Processor Only) + 0.032A (GSM RX) + 0.013A (GPS) + 0.035A (Orbcomm RX) = 0.125A or 12.5mA

Power Calculation:
0.544W (Processor Only) + 0.340W (GSM RX) + 0.155W (GPS) + 0.460W (Orbcomm RX) = 1.499W

Table 2-2, Q4000 Power Consumption, gives a breakdown of the different components of the Q4000.

Table 2-2, Q4000 Power Consumption

Function Activated	Typical Current @6V (Amps)	Typical Current @12V (Amps)	Typical Current @24V (Amps)	Typical Current @32V (Amps)	Typical Power @6 - 32V (Watts)	Notes
PROCESSOR ONLY	.093	.045	.023	.017	.544	
Processor Low Power Mode	.080	.040	.020	.015	.480	
UARTs and CAN bus ON	0.035	0.018	0.009	0.004	0.128	iQ + Bus ON
UBATT Relays ON	2.000	2.000	2.000	2.000	64.000	Maximum rating on relays
GND Relays ON	2.000	2.000	2.000	2.000	64.000	Maximum rating on relays but not part of system power.
External 3.5V (Pins 3 and 4)	0.475	0.235	0.120	0.090	2.850	Maximum rating
GPS	0.025	0.013	0.007	0.005	0.155	
GSM RX	0.065	0.032	0.015	0.008	0.340	4 Slot DL
GSM TX pwr range	0.33-1.35	0.160-0.650	0.080-0.325	0.060-0.245	1.920-7.840	GPRS 4 slots (Class 10)
ORBCOMM SLEEP	.000050	0.000025	0.000012	0.000009	.000029	
ORBCOMM RX	.N/A	0.035	.0185	.0145	.46	
ORBCOMM TX	N/A	1.900	0.950	0.700	22.400	~3 mS ACQ, 38 mS COM and 800mS RSV Bursts
IRIDIUM RX	N/A	0.085	0.042	0.031	0.992	

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IRIDIUM TX	N/A	0.950	0.470	0.350	11.200	8.33 mS burst
GlobalStar Idle	N/A	1.5E-06	7.5E-07	5.6E-07	N/A	Between TX burst
GlobalStar TX	0.198	0.095	0.038	0.028	0.896	1.44 S Burst

Note that these are average values. Maximum values may be as much as 15% more. All currents shown above are individual contributions and at 25℃ ambient. Items with burst or slot in the notes are the peak values.

The power consumed by a GPS device remains constant. It will save power to turn off the GPS during power down sequence. It takes about a minute after power on to get a GPS fix.

There are no software controllable lines gating power to these devices. The MTS has full flow control for RS-232. You must ensure that whatever it is connected to is not drawing power from it

.

The use of Orbcomm and Iridium satellite network is not available when modem's voltage drops below 10.5/7.5 VDC respectively.

Relay current is 1A MAX at 25C, .5A MAX at 85C. Power usage depends on customer application.

DC Input power to QUAKE Q4000 modems is +6.0V to +32.0VDC. Supplied input voltages outside this range will result in damage to the modem and void the warranty.

2.5 *Connector Information*

Table 2-3, 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

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Table 2-4, Connector Information

Interface	OEM Module	Customer Interface
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").

⚠ Due to variances in connector designations, refer to provided Interface Control Drawing (ICD) in Chapter 0 for Pin 1 location on the Q4000.

⚠ If the 3.3 V Continuous Output Power pins are not being used, do not lead wires out of connector. Connecting these pins to an external supply will damage the modem and void the warranty. The 3.3 volts are supplied for external GPS modules. These voltages are fed from the same supply inside the Q4000 for the digital section. If they are not used, they should be left out of the connector for the safety of the unit. If you hook either of these supplies to, for example, VBATT by accident, the unit would be damaged.

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Figure 2-5, Connectors on Q4000

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3 Modem Wireless Communication

3.1 *Global Positioning System (GPS)*

- Internal GPS
  - Performance
    - 22-channel GPS chipset.
    - Rapid Time-To-First-Fix (TTFF) 60 seconds from a Cold Start, 25 seconds from warmstart, 2 seconds from hotstart (Depending on antenna and signal strength)
    - Accuracy within 2.5 meters
    - Updates raw location data every 1 second
    - Sensitivity: -160 dBm for tracking and -146 dBm for acquisition
  - Features
    - Antenna detection - The GPS detection is a current measurement based result. The typical detection threshold is 3mA for an OPEN/OK and greater than 130mA for a SHORT. A measured current of less than 3mA will result in an OPEN. A measured current greater than 6mA but less than 130mA will result in an OK. A measurement greater than 130mA will result in a SHORT. Note that the thresholds are typical and will vary +/- 2mA low end and +/- 5mA high end.
    - GPS Antenna Current: 6mA to 30mA.
    - Utilizes a passive or active 3.0V to 3.5V GPS antenna (Active recommended).
    - Active antenna with 20-50 dB gain @ 3.3 VDC. Max noise figure 1.5 dB
  - GPS Serial Port - RS-232 Tx signal line contains NMEA data that can be used externally if desired.
    - Pins: 14 (Tx), and GND (Pin 11, 19, 21, 30 or 40).
    - Pin 12 (GPS_RX_RS232) is not connected for an internal GPS module
    - NMEA 0183 data available externally on Pin 14, GPS_TX_RS232
      - 9600 Baud, 8 bits, no parity bit, 1 stop bit
      - Updates location data every 1 second
- External GPS
  - GPS Serial Port - If there is no internal GPS, the GPS RS-232 serial port can be used to interface to an external GPS module or for other application needs.
    - Pins: 12 (Rx), 14 (Tx), and GND (Pin 11, 19, 21, 30 or 40).

⚠ 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 conntact with the pin in the antenna connector on the GPS patch. This is the center conductor.

⚠ 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.

3.2 *Global System for Mobile Communications (GSM)*

- Internal GSM
  - Performance
    - Transmit Output Power 2W (Class 4) for 850/900 bands
    - 1W (Class 1) for 1800/1900 bands
    - Sensitivity -107 dBm @ 850/900 MHz
    - -106 dBm @1800/1900 MHz

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- Features
  - Band (Quad Dual Band)
    - GSM850 (TX: 824.2~ 848.8 MHz/ RX: 869.2 ~ 893.8 MHz)
    - EGSM900 (TX:890.0 ~ 914.8 MHz/Rx: 935.0 ~ 959.8 MHz)
      - (TX:880.2 ~ 889.8 MHz/Rx: 925.2 ~ 934.8 MHz)
    - DCS-1800 (TX:1710.2 ~ 1784.8 MHz/Rx: 1805.2 ~ 1879.8 MHz)
    - PCS-1900 (TX:1850.2 ~ 1909.8 MHz/Rx: 1930.2 ~ 1989.8 MHz)
  - TCP/IP stack
    - IP, TCP, SMTP, FTP, UDP, SMS protocols.
  - 92 kbps maximum continuous throughput
  - Antenna detection (see note below)

⚠ In order for the antenna detection circuitry to work properly, the GSM/GPRS antenna that is selected must have a 10Kohm DC resistance to ground from the center of the coax antenna cable. The user must purchase an antenna with this feature or our GSM detection will not work. This type of antenna can be obtained through the following antenna manufacturers: Taoglas, Hirschmann Car Communications, and Tyco Electronics.

- GSM Serial Port - RS-232 serial port used to upgrade the GSM module's firmware.
  - Pins: 7(Rx), 9 (Tx), and GND (Pin 11, 19, 21, 30, or 40).

- External GSM
  - GSM Serial Port – A Q4000 that DOES NOT include an internal GSM module has the option to use one of the RS-232 serial ports to communicate with an external GSM module, or it can be used as an additional serial port with the use of a custom application. For example, the following pins could be used:
    - Pins: 8 (Rx), 10 (Tx), and GND (Pin 11, 19, 21, 30, or 40).

⚠ Use only approved GSM antennas

3.3 *Orbcomm*

- Internal
  - Performance
    - Transmit Output Power: 5 watts minimum, 10 watts maximum
    - Sensitivity: -123 dBm with typical BER $1x10^{-5}$
  - Features
    - Uplink (Tx)
      - 148-150.05 MHz
      - 2400 baud
    - Downlink (Rx)
      - 137-138 MHz
      - 4800 baud
    - Optional antenna detection

- External
  - MTS Serial Port- The Main Transport Socket port; known as the MTS port, is an RS-232 port which implements the QUAKE Communications Protocol (QCP). For Q4000 models that support Orbcomm this port also supports the Orbcomm Serial Interface.
    - Pins: 13 (Rx), 15 (TX), 16 (DSR), 17 (DTR), 18 (DCD, and GND (Pin 11, 19, 21, 30 and 40)

⚠ Exceeding an RF input power level of +10dBm may result in damage to the receiver and will void the warranty.

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Do not place Orbcomm antennas within six feet of each other.

For best results use only approved Orbcomm antennas

3.4 *Iridium Short Burst Data (SBD)*

- Performance
  - Transmit Output Power: 2 Watts
- Features
  - Uplink (Tx)
    - 1616-1626.5 MHz
    - 50 ksps
  - Downlink (Rx)
    - 1616-1626.5 MHz
    - 50 ksps
- Message Size
  - Tx 340 bytes/Rx 270 bytes

If the antenna VSWR exceeds 3:1 the PA will be turned off to protect the modem from damage.

Iridium requires Iridium approved antennas

Antenna cables greater than 3 dB will degrade network performance. See Table 3-1, Cable Loss, for more information.

3.5 *Globalstar (Simplex)*

- Performance
  - Transmit Output Power: 18 dBm +/- 2 dBm
- Features
  - Frequency of Operation
    - 1611.25-1618.75 MHz
  - 9 to 144 byte messages

Antenna cables greater than 3 dB will degrade network performance. See Table 3-1, Cable Loss, for more information.

3.6 *Cable Loss Guidelines*

The table below shows the amount of loss for different cable types.

Table 3-1, Cable Loss Guidelines

Cable P/N	Cable type	Loss at 150 MHz dB/m	Loss at 1600 MHz dB/m
Belden 8216	RG-174	0.38 dB/m	1.59 dB/m
Belden 9201	RG-58	0.181dB/m	0.792 dB/m
Belden 9913	RG 8	0.56 dB/m	0.208 dB/m
TMS LMR-400	LMR-400	0.54 dB/m	0.188 dB/m
TMS LMR-600	LMR-600	0.034 dB/m	0.122 dB/m

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4 Customer Input/Output Interfaces

4.1 *External Interfaces*

4.1.1 Analog Inputs

Two available: Pins 29 and 31:

- 0 – 3.5 Volts.
- 12 bit resolution
- Greater than1MΩ 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 160KHz 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 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 is made worse. If you make that resistance 0 ohms the spec remains at 160KHz.

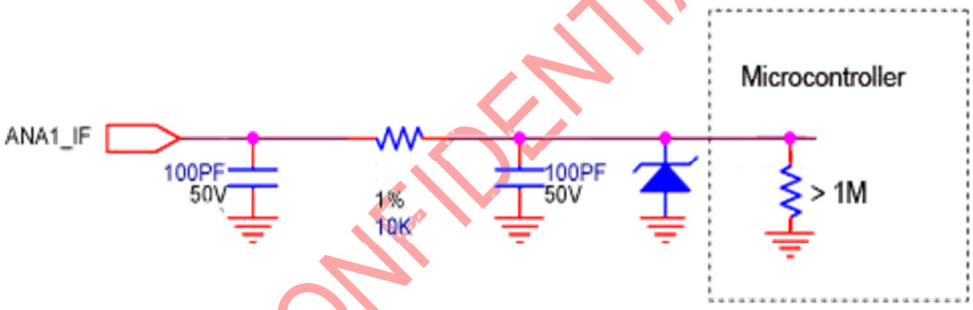

Figure 4-1, Analog Input Circuit

4.1.1.1 Sample Circuits for Appropriate Scaling to 0-3.5V

Analog inputs are 12 bits and have a Full Scale (F_{scale}) reading of 4095. The equation below can be used to determine the resistor values for varying maximum sensor voltage readings.

$$V_{F_s} = Full\ Scale\ Voltage$$
$$= \frac{3.5(R_1 + R_2)}{R_2}$$

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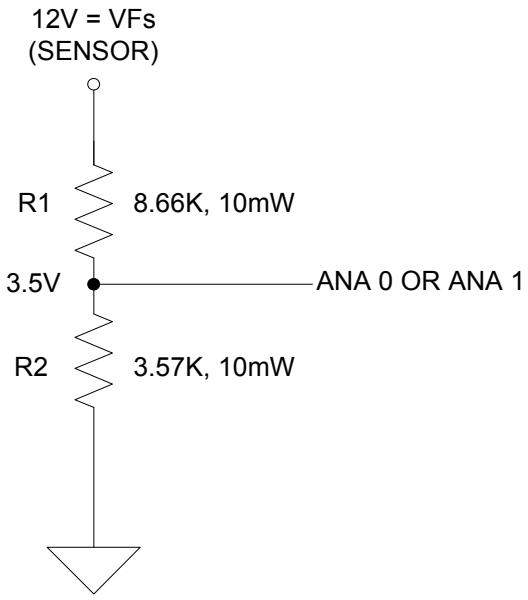

Figure 4-2, Sample 12V Sensor

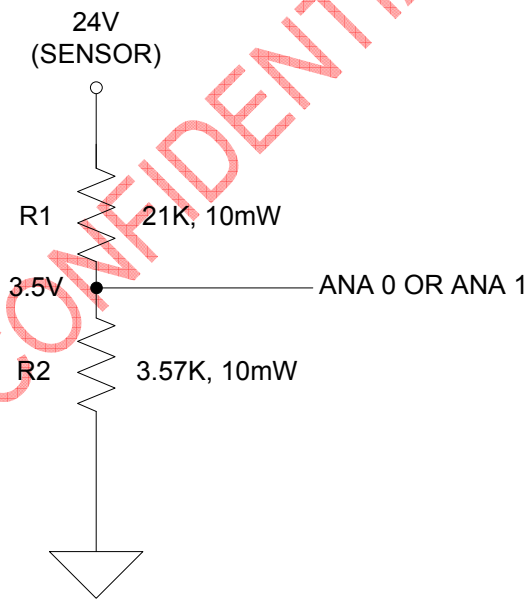

Figure 4-3, Sample 24V Sensor

The equation below can be used to determine the appropriate resistor value for sensors that are current scaled.

$$F_s mA = \text{Full Scale Milliamp Reading}$$

$$R = \frac{3.5\,V}{F_s mA}$$

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The example below scales a 0-20mA sensor to 0-3.5 VDC at the input to the modem.

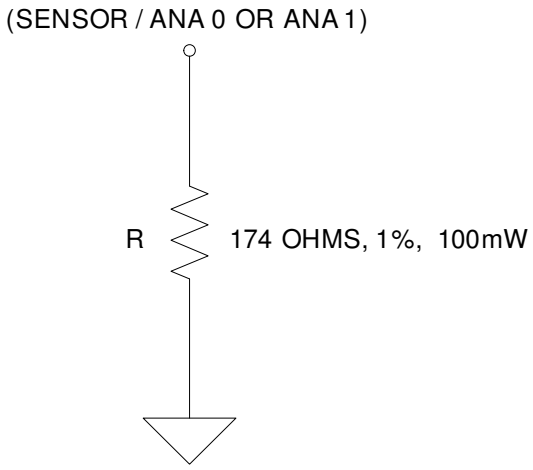

Figure 4-4, Sample 24V Sensor

4.1.2 Digital Inputs/Outputs

The Q4000 has eight general purpose digital CMOS (3.3VDC) level inputs/outputs. The DIO's are located on pins 33 - 39 of the 40-pin interface connector. The DIO's may be configured as inputs or outputs, set and cleared and read by software. As seen below in Figure 4-5, Digital Input Circuit, there are no internal pull up or pull down resistors.

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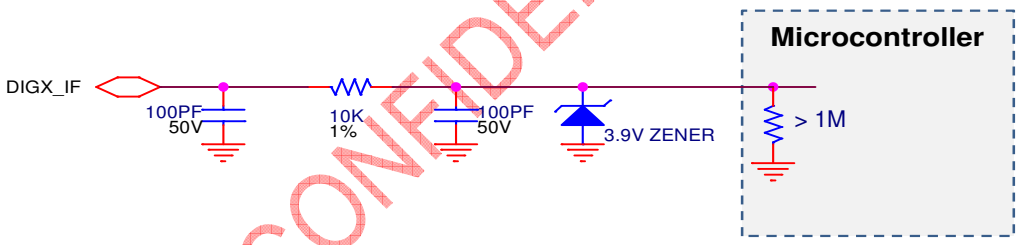

Figure 4-5, Digital Input Circuit

4.1.2.1 DIO as Input

When utilized as an input, a logic level "high" is obtained when the input voltage is greater than 2.2 VDC. It remains in this asserted state until the voltage on the pin falls below .8 Volts where a valid logic level "low" is read. This hysteresis prevents noise on the input pin from causing the input to jitter.

4.1.2.2 DIO as Output

When used as an output, the voltage/current provided is dependent on the impedance or load presented on the line.

- For voltage use the 10K ohm resistor works against the line impedence (R_{LINE}) and **V_{OUT}** is as follows:

$$V_{OUT} = 3.5 * R_{LINE} / (10{,}000+R_{LINE})$$

- For Current usage the 10K ohm drops voltage across it as the current is increased. The output voltage follows the current draw (I_{LOAD}) as follows:

$$V_{OUT} = 3.5 - (I_{LOAD} * 10{,}000)$$

To increase current drive, insert a buffer with high input impedence between the DIGX_IF configured as an output and the load as shown below. A typical buffer might be a 74 series 126 with a part number of 74LVC1G126DBV. This will increase the drive to > +/- 20 milliamps.

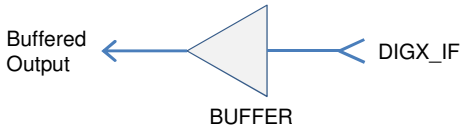

Figure 4-6, Buffer for DIO as Output

4.1.2.3 Switched Digital Relays

There are four digital relays available on Pins 26/28 and 25/27:

- Two pins provide switch closure to ground Pins 26 and 28
- Two pins route the supplied input voltage Pins 25 and 27.

Two of the inputs can source (pulls to input voltage) and two sink (pulls to ground) at 1A continuous current at ambient temperatures and are de-rated as seen in the chart below.

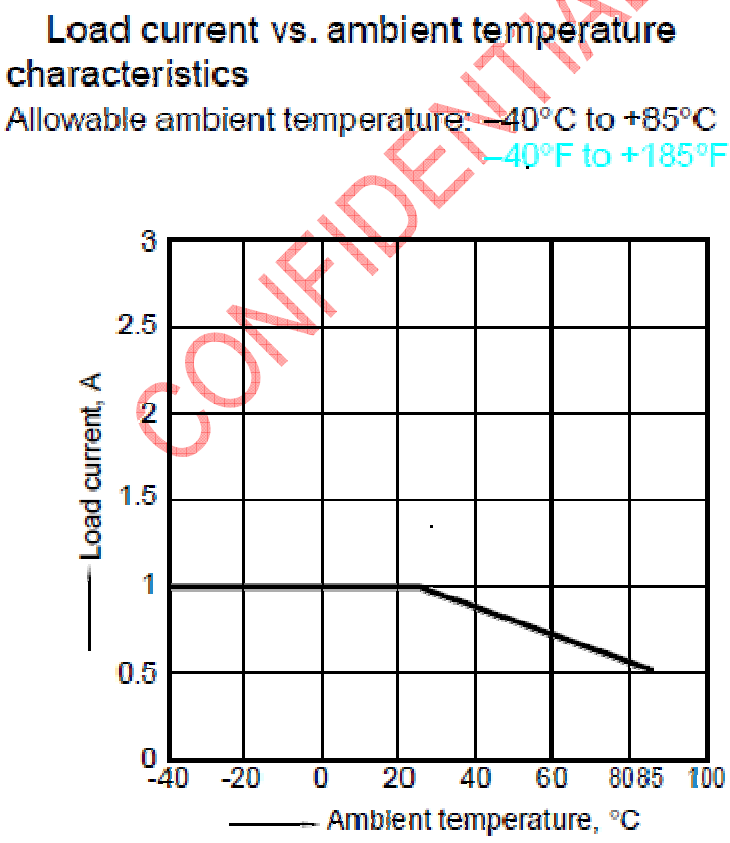

Figure 4-7, Switched Relay Characteristics

Warning: Connecting SW_UBATT1 or SW_UBATT2 (pin 27 and 25) directly to ground while the switch is turned “ON” will damage the unit. If SW_GND1 or SW_GND2 (pin 26 and 28) is tied directly to VBATT (Pin 1 and 2) while the switches are turned “ON,” the unit will be damaged.

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Inductive Load Use Warning: If an inductive load such as a relay is used, it can generate a spike voltage across it. If that exceeds 60 volts peak, the spike must be limited. Check if the external inductive load is internally limited. If not, a clamp diode across the inductive load with the cathode towards the positive input lead must be used.

4.1.3 J1939

The J1939 bus connection is used on Heavy Truck Engine Computers to obtain engine and other subsystem parameters such as Oil Pressure and Fuel Level. See the SAE J1850/1939 specification for additional information on this engine bus.

- CAN Bus with J1939 stack interface
- This bus is connected on pins 23 (CAN_H) and 24 (CAN_L)

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4.1.4 3.5V Power

There are two pins that provide 3.5 VDC continuous power: Pin 5 and Pin 6. The total current added up between these two pins cannot exceed 650 mA. Do not include these pins on the connector if they are not being used.

Warning: Connecting these pins incorrectly could damage the unit and void the warranty.

4.1.5 RS-232 Ports

The Q4000 has up to five RS-232 serial ports.

1) The Main Transport Socket (MTS) Port implements QUAKE's Communication Protocol (QCP).
2) The Logger Port provides diagnostic data for the user and the ability to debug and configure the custom application.
3) The third, fourth and fifth serial ports are only available depending on the specific Q4000 model.

All serial ports support baud rates up to 115.2 Kbps. All ports are protected against shorts to both the BATT+ and BATT- lines. The serial ports meet the standard voltage level for RS-232 operation. The chart below shows the relationship between modem type and serial port availability.

Serial Ports	1135-NGSACN2NN (Q1400)	1135-NGNNCR2NC (IQ)	1135-GGSACR2AC (Q4000)	1135-NNNNCR2NC	1135-GGNNCN2AC (Q-GSM)	1135-NNSNCN2NN	1135-GGSNPN2AN	1135-GNNNCN2AC	1136-GGFNCR2AC	GlobalStar Q4000
MTS Port	1	1	1	1	1	1	1	1	1	1
Logger Port	1	1	1	1	1	1	1	1	1	1
AUX Port	1	1	1	1	1	1	1	1	0	1
GPS (NMEA Data)	0	1	1	0	1	0	1	0	1	1
GPS (external serial connection)	1	0	0	1	0	1	0	1	0	0
GSM (Firmware Update) (3G if applicable)	0	0	1	0	1	0	1	1	1	1
GSM (external serial connection)	1	1	0	1	0	1	0	0	0	0
Total	5	5	5	5	5	5	5	5	4	5

Figure 4-8, Serial Port Availability

Warning: There are important hardware differences between various Q4000/QPRO models depending on the part number/network. Developers who plan to use multiple network configurations with Q4000/QPRO hardware should ensure that their application will run across all platforms.

For example, the AUX port is not available in Iridium and Inmarsat networks. Developers planning to use serial ports must be aware that the AUX port is not available on all configurations of the Q4000/QPRO. **Note that the AUX port may lose bytes at speeds over 57600 bps.** Information on the availability of serial ports is contained in 2.1**Error! Reference source not found.** Q4000 Available Configurations

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- MTS Serial Port – RS-232 port which implements the QUAKE Communications Protocol (QCP). For Q4000 models that support Orbcomm this port also supports the Orbcomm Serial Interface.
- Logger Serial Port – RS-232 3-wire used for debugging and logging of system data/performance and programming firmware and custom applications.
- AUX Serial Port – RS-232 3-wire can be used by application developers on Q4000 models that do not include the Iridium satellite feature. **Note that the AUX maximum speed is 57600 bps.**
- GSM Serial Port- RS-232 3-wire can be used on Q4000 models which include the GSM feature for firmware updates. For Q4000 models that do not include the GSM feature this port can be used by the application directly.
- GPS Serial Port- RS-232 3-wire can be used on Q4000 models which include the GPS feature to externally monitor NMEA strings. For Q4000 models that do not include the GPS feature this port can be used by the application directly.

4.1.5.1 MTS

The following RS-232 lines are available for the MTS port: RX, TX, DTR, CD, and DSR. The signal names are from the perspective of the DTE. The interface protocol for this port complies with the RS-232 standard serial specification.

4.1.5.2 DTR

The DTR line is an RS-232 input that is used in the power supply wake-up circuitry to wake up the **Q4000** from sleep mode. In order to wake the Q4000 via DTR, a 1.8 Volt rise on the DTR line with a rise time of less than 100µs is required. MTS_DTR is a software readable digital input. The low and high thresholds are 0.8 volts and 2.0 volts respectively.

NOTE: If DTR is de-asserted, you must wait at least 3.5 seconds before re-asserting the DTR to allow enough time for a controlled power down sequence to occur.

4.1.5.3 Logger

This port is typically used for logging and debugging activities. See the Q4000/QPRO User's Manual for details of the Logger port operations.

4.1.6 Interface Connector Electrical Specifications

Note: All lines are protected against over-voltage and transients; the Max (Min) Nominal Voltage column is intended to provide information about the voltage limits for normal operation. See the following table for pinout information.

Table 4-1, Interface Connector Electrical Specifications/RF Connections

Pin	Signal	Type	Voltage (Min/Max/ Nominal) VDC	Max Output Current	Notes
1	**UBATT (+)**	Power	6/32/12	See table	1, 5
2	**UBATT (+)**	Power	6/32/12	See table	1
3	**UBATT (-)**	Ground			
4	**UBATT (-)**	Ground			
5	**3V5_500MA**	Continuous Output	+/- 1%	650mA	4
6	**3V5_500MA**	Continuous Output	+/- 1%	650mA	4
7	**GSM_RX_RS232**	Input	+/- 15	-	
8	**AUX_TX_RS232 / DPL_TX_RS232**	Output			5
9	**GSM_TX_RS232**	Output			
10	**AUX_RX_RS232 / DPL_RX_RS232**	Input			5
11	**GND**	Ground			

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12	**GPS_RX_RS232**	Input			6
13	**MTS_RXD_RS232**	Output			
14	**GPS_TX_RS232**	Output			
15	**MTS_TXD_RS232**	Input			
16	**MTS_DSR_RS232**	Output			
17	**MTS_DTR_RS232**	Input	6/32		2
18	**MTS_DCD_RS232**	Output			
19	**GND**	Ground			
20	**LOG_RXD_RS232**	Input			
21	**GND**	Ground			
22	**LOG_TXD_RS232**	Output			
23	**CANH**	Input/Output			
24	**CANL**	Input/Output			
25	**SW_UBATT_0**	Output	UBATT(+)	1A@25C	1
26	**SW_GND_0**	Output	GND	1A@25C	1
27	**SW_UBATT_1**	Output	UBATT(+)	1A@25C	1
28	**SW_GND_1**	Output	GND	1A@25C	1
29	**ANA0**	Input	0-3.5	-	3
30	**GND**	Ground			
31	**ANA1**	Input	0-3.5	-	3
32	**DIG_0**	Input/Output	3.5V CMOS/TTL		3
33	**DIG_1**	Input/Output	3.5V CMOS/TTL		3
34	**DIG_2**	Input/Output	3.5V CMOS/TTL		3
35	**DIG_3**	Input/Output	3.5V CMOS/TTL		3
36	**DIG_4**	Input/Output	3.5V CMOS/TTL		3
37	**DIG_5**	Input/Output	3.5V CMOS/TTL		3
38	**DIG_6**	Input/Output	3.5V CMOS/TTL		3
39	**DIG_7**	Input/Output	3.5V CMOS/TTL		3
40	**GND**	Ground			

1. See Table 2-2, Q4000 Power Consumption, for complete operating current consumption specifications.
2. DTR asserted can wake the modem from sleep mode.
3. Input resistance high impedance >1M ohms
4. Pins 5 and 6 provide a continuous output that cannot be disabled. The total current added up between Pin 5 and 6 cannot exceed 650 mA. If any external voltages are applied to these pins it may cause permanent damage and will void the warranty.
5. Pin 8 (AUX_TX_RS232) and Pin 10 (AUX_RX_RS232) are the DPL ports in the Q4000 with Iridium version of the modem.
6. If the Q4000 contains an internal GPS, then Pin 12 (GPS_RX_RS232) is not connected. Otherwise it's part of the serial port.

Due to variances in connector designations, refer to provided ICD for Pin 1 location on the Q4000.

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4.2 *Internal Interfaces*

4.2.1 Memory

- 2 Mbytes standard of Flash and RAM.
- 8 Mbytes optional

The Q4000 can have 2 different memory configurations: 2MB and 8 MB. Note that the User Space is limited to 640KB in both configurations.

Table 4-2, User Flash and RAM Availability

	2 MB	8 MB
Available Flash	~1 MB	7 MB
Available RAM	0.5MB	6 MB

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 64K or larger to ensure that a whole Flash File System Block is written.

4.2.2 Real-Time Clock (RTC)

- Programmable

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5 Q4000 Data Interface Specifications

5.1 *Data Interfaces*

- 4 Digital Controlled Output Switches (2 Switched GND/2 Switched Input Voltage)
- 8 Digital General Purpose Inputs/Outputs (CMOS level 3.5VDC)
- 3 Serial Ports (External) with up to 5 RS-232 serial ports depending on Q4000 configuration
- 1 CAN BUS 2.0: J1850/1939
- 2 Analog Inputs (0 – 3.5 V)

5.2 *Environmental Considerations*

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.

- Operating Temperature
  - –40C to 85C
- 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
  - Humidity Test in Orbcomm Spec E25050102 REV D is per MIL SPEC 810E, Method 507.3 with test conditions.
  - *Procedure I, Cycle 2* - Procedure 1 simulates natural environmental cycles and is conducted on test items which are open to a frequently ventilated environment. Cycle 2 sets the temperature at a 24C constant with humidity maintained at 95% minimum. The Test Duration is 15 Cycles (15 days).
- Cyclic Humidity
  - Temperature/Cyclic Humidity Test is 5 days at -10C to 65C at 85% relative humidity
- Thermal Shock
  - -40C to 85C (30 minutes at each temp, 10 cycles)
- Shock
  - Mechanical shock of a 20G, sawtooth 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-STD-810E [11].
- Vibration
  - 20 Hz to 2 KHz, 8 G_{rms} 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 axis
  - 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 Rev D spec [10] and MIL-STD-810E [11]

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- SAEJ1455 vibration requirements.

5.3 *Certifications*

- Orbcomm Type Approval Pending
- Iridium Certification pending
- FCC
- CE
- J1455 – Note: Please see environmental considerations for Cyclic Humidity
- J1939 compliance

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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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.

Note: Any changes or modifications to the QPRO product could avoid the final operation of equipment and will void Quake Global's warranty.

5.3.1 FCC IDs

One of the following FCC ID's will apply, depending on the modem network type (see standard modem configurations for details on which part numbers contain which approvals):

- iSatData Pro/Inmarsat Approval (TBD)
- Iridium FCC ID: **PB596XXCS**
- Orbcomm TAT ID: **819QWI**
- GSM FCC ID: **RI7GE865**.

5.3.2 FCC Part 15 Class B - Radio Frequency Interference (RFI) (FCC 15.105)

This equipment has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, 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 and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.

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- 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.

5.3.3 Labeling

1135-GGSACR2AC	Label must have: "This equipment contains FCC ID: 819QWI (Orbcomm) and FCC ID: RI7GE865 (GSM)".
1135-NGSACN2NN	Label must have: "This equipment contains FCC ID: 819QWI (Orbcomm)".
1135-NNNNCR2NC	No internal FCC ID.
1135-GGNNCN2AC	Label must have: "This equipment contains FCC ID: RI7GE865 (GSM)".
1135-NNSNCN2NN	Label must have: "This equipment contains FCC ID: 819QWI (Orbcomm)".
1135-GGSNPN2AN	Label must have: "This equipment contains FCC ID: 819QWI (Orbcomm) and FCC ID: RI7GE865 (GSM)".
1135-NGNNCR2NC	No internal FCC ID.
1135-GNNNCN2AC	Label must have: "This equipment contains FCC ID: RI7GE865 (GSM)".
1140-GGFNCR2AC	Label must have: "This equipment contains FCC ID: PB596XXCS (Iridium) and FCC ID: RI7GE865 (GSM)".
1140-NNFNCN2NC	Label must have: "This equipment contains FCC ID: PB596XXCS (Iridium)".
1140-NGFNCN2NC	Label must have: "This equipment contains FCC ID: PB596XXCS (Iridium)".

5.4 *GSM/GPRS Module- Quad Band*

PTCRB, FCC, CE, AT&T and T-Mobile Certifications Pending.

5.5 *GSM Communications*

- Operating Temperature: -40℃ ~ +85℃
- Band (Quad Dual Band)
- GSM850 (TX: 824.2~ 848.8 MHz/ RX: 869.2 ~ 893.8 MHz)
- EGSM900 (TX:890.0 ~ 914.8 MHz/Rx: 935.0 ~ 959.8 MHz)
  (TX:880.2 ~ 889.8 MHz/Rx: 925.2 ~ 934.8 MHz)
- DCS-1800 (TX:1710.2 ~ 1784.8 MHz/Rx: 1805.2 ~ 1879.8 MHz)
- PCS-1900 (TX:1850.2 ~ 1909.8 MHz/Rx: 1930.2 ~ 1989.8 MHz)
- Transmit Output Power 2W (Class 4) for 850/900 bands
  1W (Class 1) for 1800/1900 bands

5.6 *Integrated GPS Chip Set*

- 22 Channel Module
- Rapid Time-To-First-Fix (TTFF) 60 seconds from a Cold Start.
- Accuracy within 2.5 meters

5.7 *Application Interface*

- Orbcomm Serial Protocol
- QUAKE Application Programmer's Interface API (C Code)
- Iridium Developers guide
- AT Command Set

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5.8 *Power*

External Power Source:

- 6 – 32V* (*No Orbcomm Tx from 6-10.5 VDC)
- 10.5 – 32V (All features supported)

Typical Power Consumption at 12V (not including other modem features):

- Transmit - Orbcomm 22.26 Watts
- Transmit - GSM 7.80 Watts
- Transmit – Iridium 11.4 Watts
- Standby - Orbcomm 0.42 Watts
- Standby - GSM 0.24 Watts
- Standby – Iridium 1.02 Watts
- Sleep Mode 25µA (max)

Note: The Q4000 uses a switching mode DC-DC converter power supply. This means that the current draw of the Q4000 drops with an increase in the input voltage. QUAKE Global recommends that the Q4000 be connected to a power supply through a 5 Amp fast-blow fuse.

⚠ DC Input power to QUAKE Q4000 modems is +6.0V to +32.0VDC. Input voltage outside this range will result in damage to the modem and void the warranty.

5.9 *Operation Modes*

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

Standby: In this 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 portion of the modem are active in this mode.

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

Sleep: In this mode the Q4000 is completely shut down. The processors and memories are off. Only the real-time clock (RTC) is running, maintaining GPS time. The Q4000 can be configured to shut down when DTR goes low, or it can be programmed to shut down with software. A normal shutdown sequence includes a data save to Flash consisting of unsent messages, and configuration parameters. A power cycle, external DTR pulse, or RTC alarm will wake up the unit.

5.10 *Physical Specifications*

Size: 3.91”x 2.52”x .63” (99.3mm x 64mm x 15.9mm)
Weight: .375 lbs (.170 kg)

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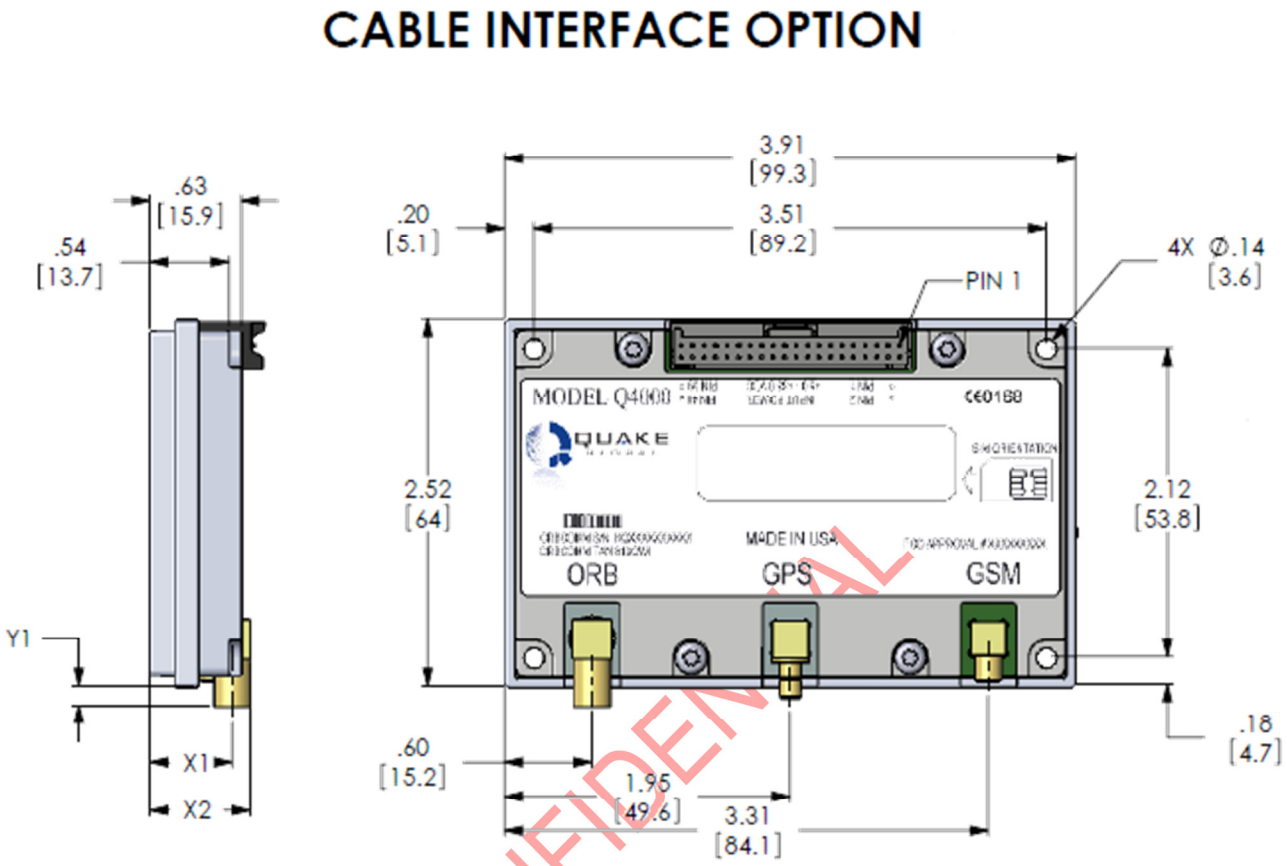
6 Q4000 Drawings



CONNECTOR DIMENSIONS				
DIMENSION	SMB	SMA	MCX	FAKRA
X1	.56 [14.3]	.53 [13.5]	.42 [10.8]	.51 [12.9]
X2	.69 [17.5]	.67 [16.9]	.55 [14]	.67 [17.1]
Y1	.13 [3.3]	.07 [1.8]	.05 [.12]	.47 [12]

Figure 6-1, Dimensions for Q4000

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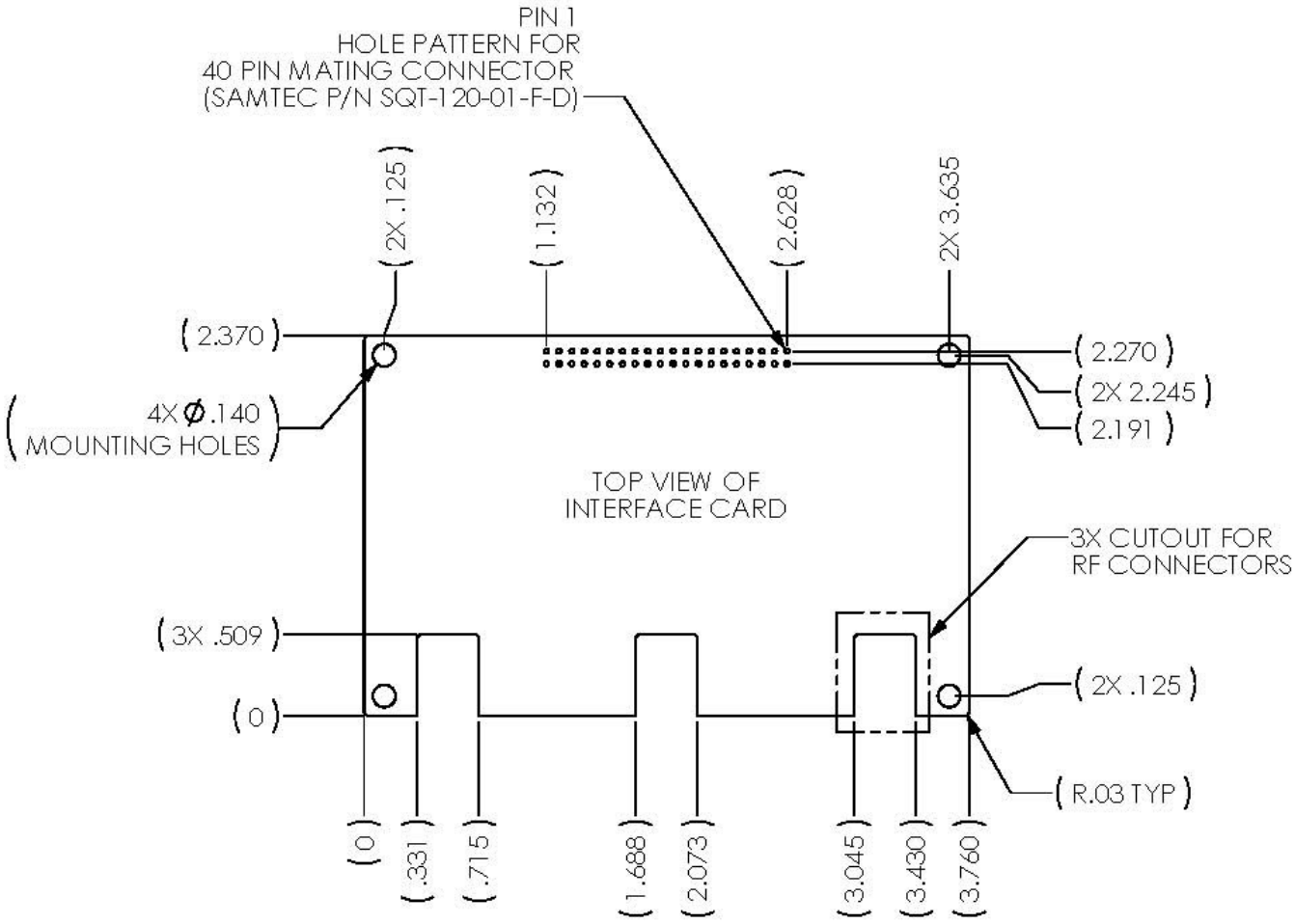

Figure 6-2, Interface Card Constraints

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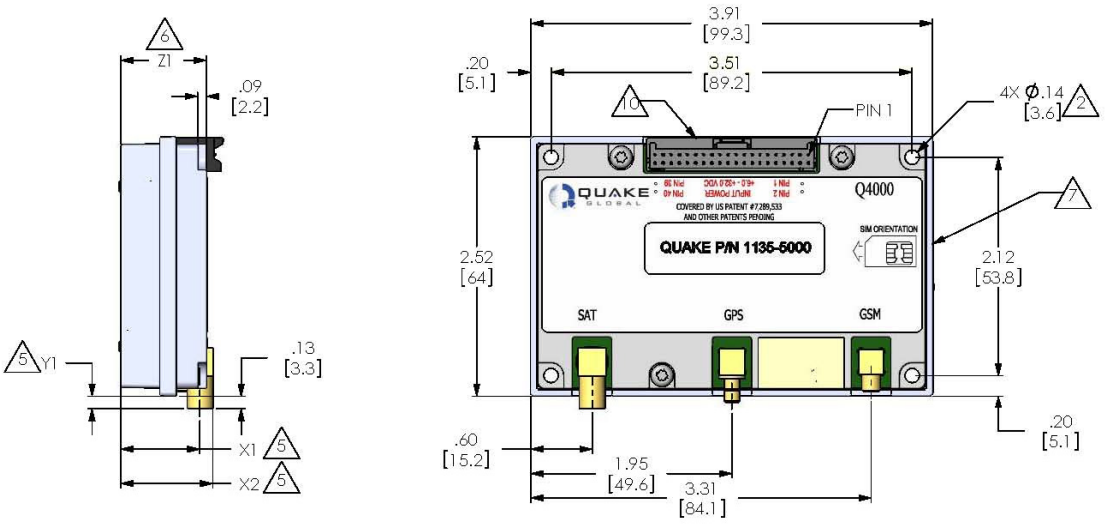

TABLE 2: CONNECTOR DIMENSIONS						
5	X1		X2		Y1	
	Q4000	Q4000i	Q4000	Q4000i	Q4000	Q4000i
SMB	.56 [14.3]	.77 [19.5]	.69 [17.5]	.89 [22.7]	.13 [3.3]	
SMA	.53 [13.5]	.74 [18.7]	.67 [16.9]	.87 [22.2]	.07 [1.8]	
MCX	.42 [10.8]	.63 [16]	.55 [14]	.76 [19.2]	.05 [.12]	
FAKRA	.51 [12.9]	.72 [18.2]	.76 [19.2]	.96 [24.4]	.47 [12]	

TABLE 3: SHIELD HEIGHT DIMENSIONS	
6	DIMENSION
	Z1
Q4000	.63 [15.9]
Q4000i	.83 [21.1]

Figure 6-3, Q4000 Dimensions with Iridium

Iridium specifications are preliminary and subject to change.

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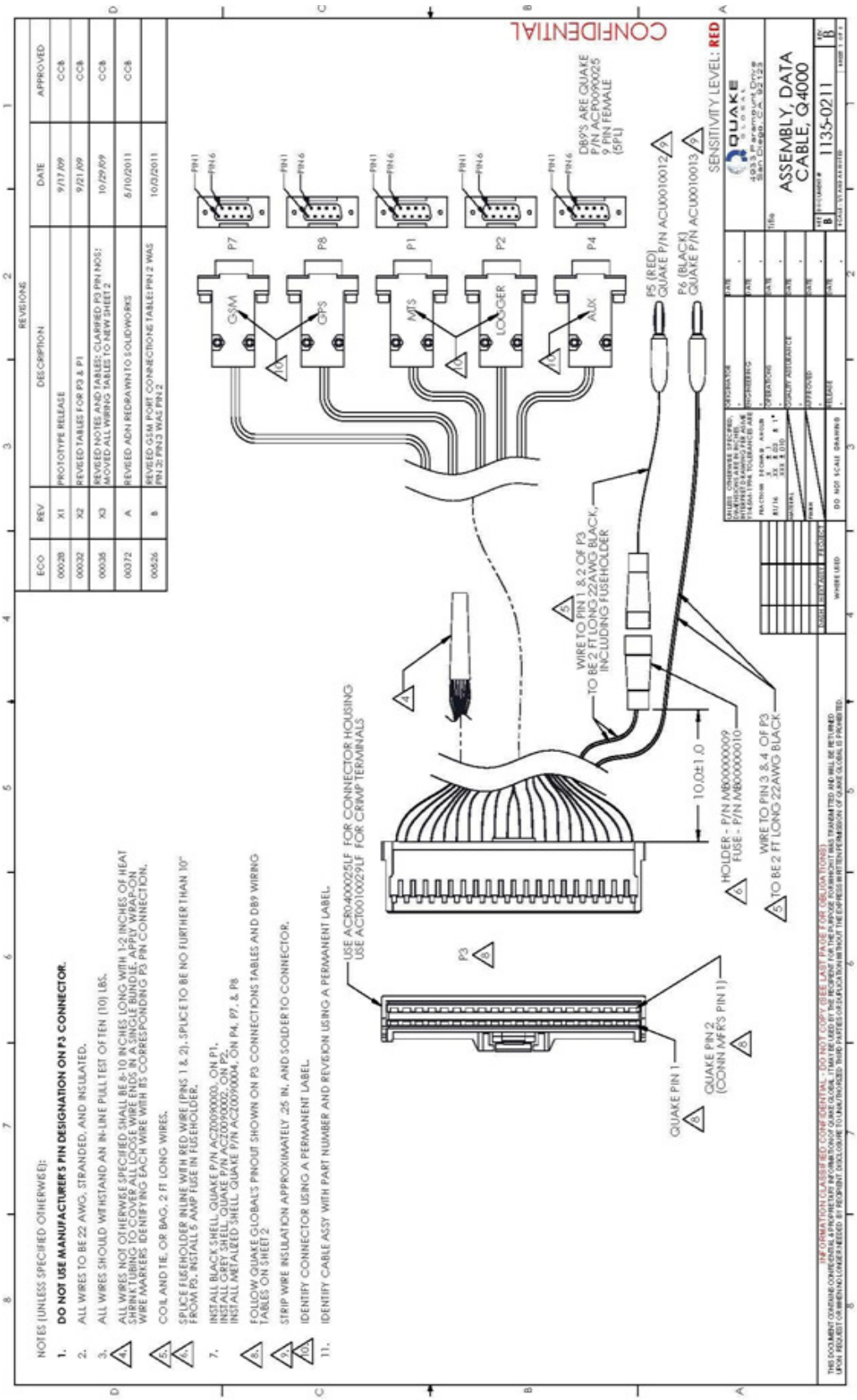

Figure 6-4, Development Kit Cable Drawing

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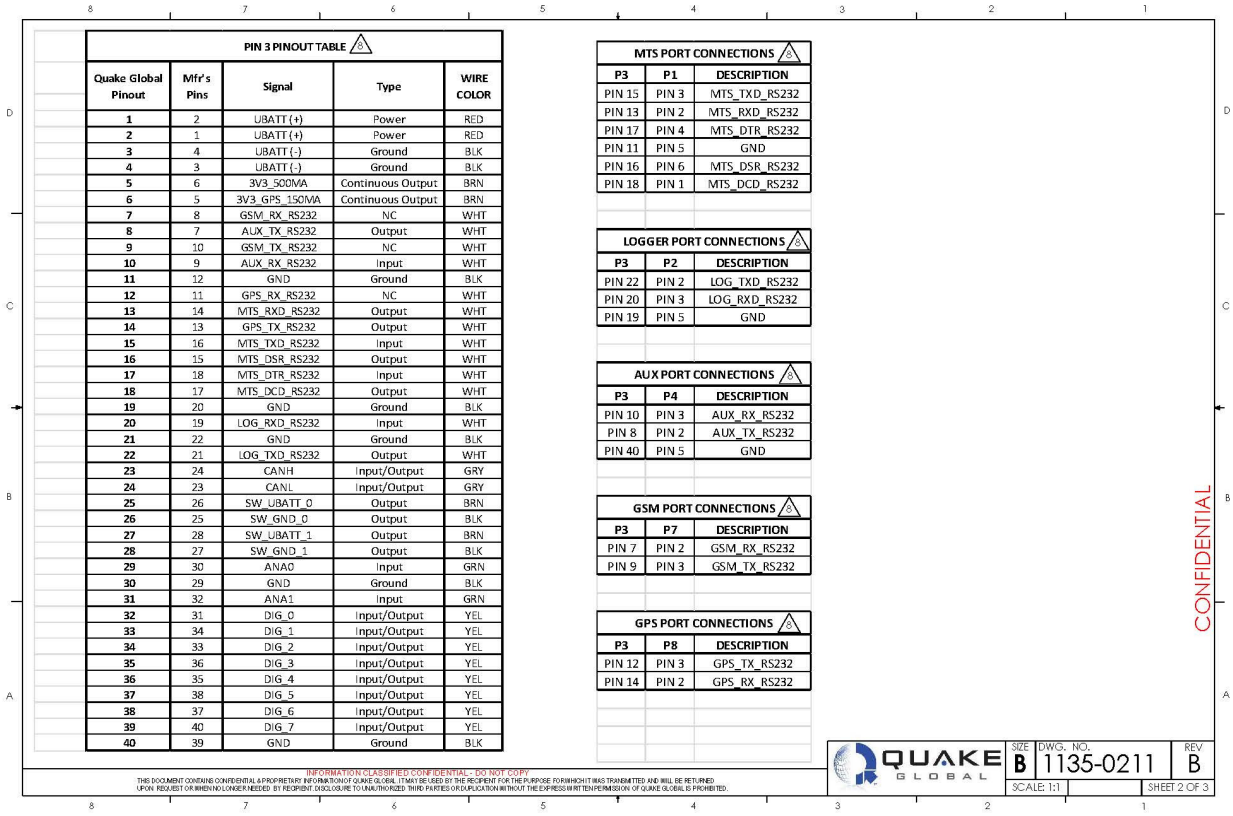

PIN 3 PINOUT TABLE (6)

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	3V3_500MA	Continuous Output	BRN
6	5	3V3_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 (6)

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 (6)

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 (6)

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 (6)

P3	P7	DESCRIPTION
PIN 7	PIN 2	GSM_RX_RS232
PIN 9	PIN 3	GSM_TX_RS232

GPS PORT CONNECTIONS (6)

P3	P8	DESCRIPTION
PIN 12	PIN 3	GPS_TX_RS232
PIN 14	PIN 2	GPS_RX_RS232

Figure 6-5, Q4000 Pinout

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7 Q4000 Recommended Installation Guidelines

7.1 *QPRO Mounting Recommendations*

- Remember that it is best to connect the UBATT (-) to chassis ground rather than the (-) battery terminal.
- Remember that the input voltage range is 6-32 VDC.
- On the 40-pin connector positive power UBATT (+) is located on pins 1 and 2 and negative UBATT (-) is Pins 3 and 4.
- In order to protect wires installed within the engine compartment or along the undercarriage make sure all wires are wrapped with wire loom.

7.2 *Antenna Recommendations*

ORBCOMM
When selecting an ORBCOMM antenna, make sure it is a 50 ohm 137-150.05 MHz antenna. Due to the fairly wide frequency range used by ORBCOMM (137 - 150 MHz), and the variety of installation factors and tradeoffs between antenna size, cost, and performance, it is often not practical to achieve a VSWR of below 1.5:1 throughout the 137 - 150 MHz frequency range. See the User's Guide User's Guide to Q4000/QPRO, Document #1135-4713 for more details on antennas.

GSM/GPRS

- Gain must be less than 3dBi.
- Must be placed greater than 20cm from a person. If antenna is placed within 20cm of a person, the system integrator needs to assess the final product against SAR regulation.
- If the antenna is co-located and transmitting simultaneously with another antenna, additional FCC/IC testing may be required.
- Antenna cannot be placed within a metal shield and must be installed with care to avoid any interference with other electronic devices.

IRIDIUM
Iridium Antennas must be approved by Iridium before being used on the Iridium network. A list of approved antennas can be found on Iridium's home page at www.iridium.com.

When selecting an Iridium antenna, make sure it is a 50 ohm, Gain 3dBi maximum, polarization Right Hand Circular Polarized (RHCP) and VSWR 1.5:1 or better (in both receive and transmit bands) for optimal messaging. Make sure that the Iridium antenna is located so it has an unobstructed view of the sky.

The antenna must be placed greater than 20cm from a person. If antenna is placed within 20cm of a person, the system integrator needs to assess the final product against SAR regulation.

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8 Frequently Asked Questions

Q: How do I contact service or a help desk?

A: Email customersupport@QUAKEglobal.com

Q: What type of PC do I need to program the Q4000?

A: To configure the sample applications you can use any computer that runs a terminal emulation program such as HyperTerminal, and at least one available serial port.
For users of QUAKE's API any Windows computer can be used to set up the API and Development Environment.

Q: Can I use any Orbcomm antenna with the Q4000?

A: Yes. Any Orbcomm antenna with 50-ohm impedance can be used with the Q4000. However, there are great differences in the performance of various antennas and testing should occur to ensure proper operation for your application needs.

Q: Can I use any GPS antenna with the Q4000?

A: QUAKE recommends that the antenna shipped with the Development Kit be used with the Q4000. This is a 3.3V active antenna with 26-dB gain. The Q4000 can utilize a passive or active 3.3VDC GPS antenna (Active recommended). Active antenna with 20-50 dB gain @ 3.3 VDC. Max noise figure 1.5 dB. A 5V active antenna will not work with the Q4000.

Q: Does QUAKE provide any other products?

A: Yes. QUAKE offers a variety of products ranging from OEM modules to "Off the Shelf" and ready to go turn-key products.

Q: How do I load firmware into the Q4000?

A: Loading new code is extremely easy with the use of the PC based QUAKE Configuration Tool (QCT). See the User's Guide to Q4000/QPRO, P/N 1135-4713, for more information.

Q: Can I connect the Q4000 directly to a vehicle power supply?

A: Yes. The Q4000 is designed to work in most 12 and 24V based vehicles.

Q: The sensors I want to attach to my modem send out data as an ASCII string over a serial line. Will the Q4000 accept this?

A: With the use of QUAKE's Application Programmer's Interface, the receiving serial data can be received and used as needed.

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9 Declaration of Conformity

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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**

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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

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Reichenwalde, 10. June, 2010

Ort, Ausstellungsdatum
Place, Date of issue

Unterzeichnet von/Signed by Jörg Kusig
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