4.3.2 Provisioning

There are several ways the modem can be provisioned with Iridium. It can be provisioned:

- with one to five **email/ID** addresses. Each modem-originated message is sent to all the email addresses with which the modem is provisioned.
- to work with Iridium's **Direct IP** gateway. Messages are sent directly to and from the server(s) of the customer backend over a TCP connection.
- to send messages to another **Short Burst Data modem** with an IMEI number or to itself (for testing purposes).
- to receive Geodata and Ring Alerts.
    - Geodata is an estimate of the latitude and longitude of the modem.
    - Ring Alerts provide notification when there are mobile terminated messages waiting for the modem.

Note: For modems utilizing the Direct IP gateway, the user's IP gateway and port number must be added to the Iridium firewall. This may require an extra day or two to be provisioned.

The above mechanisms can also be combined so that a modem can do both DirectIP and email-based message sending. Provisioning of the modem can also be edited from Iridium's SPNET portal. Contact Iridium or an Iridium Airtime Reseller for provisioning.

4.4 Inmarsat

4.4.1 Activation

In order to send or receive any message the Inmarsat modem must be activated on the IsatData Pro network. To do this:

1) Send an email to support@skywave.com to request an account and mobile device activation. If you already have an account, you can login at https://support.skywave.com, and select *Manage Mobiles* from the menu after logging in.
2) Under Batch Device Actions, select IsatData Pro Mobile Device Activations.
3) Under Solution Provider and Gateway Account:
    a. select QUAKE Global for the Gateway Account;
    b. add the Mobile ID of your modem in the box on the right;
    c. provide the mobile identification (mobile ID) number from the modem.
    d. Keep a copy of the mobile ID along with the server access ID and password you receive in the email from SkyWave Customer Support. You need these to communicate remotely with the modem.
4) Enter a notification email address at the bottom of the page, and press Submit.

Once power is applied to the modem, it goes into satellite search mode to acquire the SkyWave IsatData Pro network. This activity may take a few minutes to complete. Once the modem synchronizes itself with the network, it sends a registration message to the SkyWave IsatData Pro network.

Note: The modem will not register until it has a clear line of sight to the satellite.

The SkyWave IsatData Pro network records the registration message and forwards it to the user's application. The network then sends an acknowledgement message over the satellite to the modem. The modem is now ready to send and receive messages.

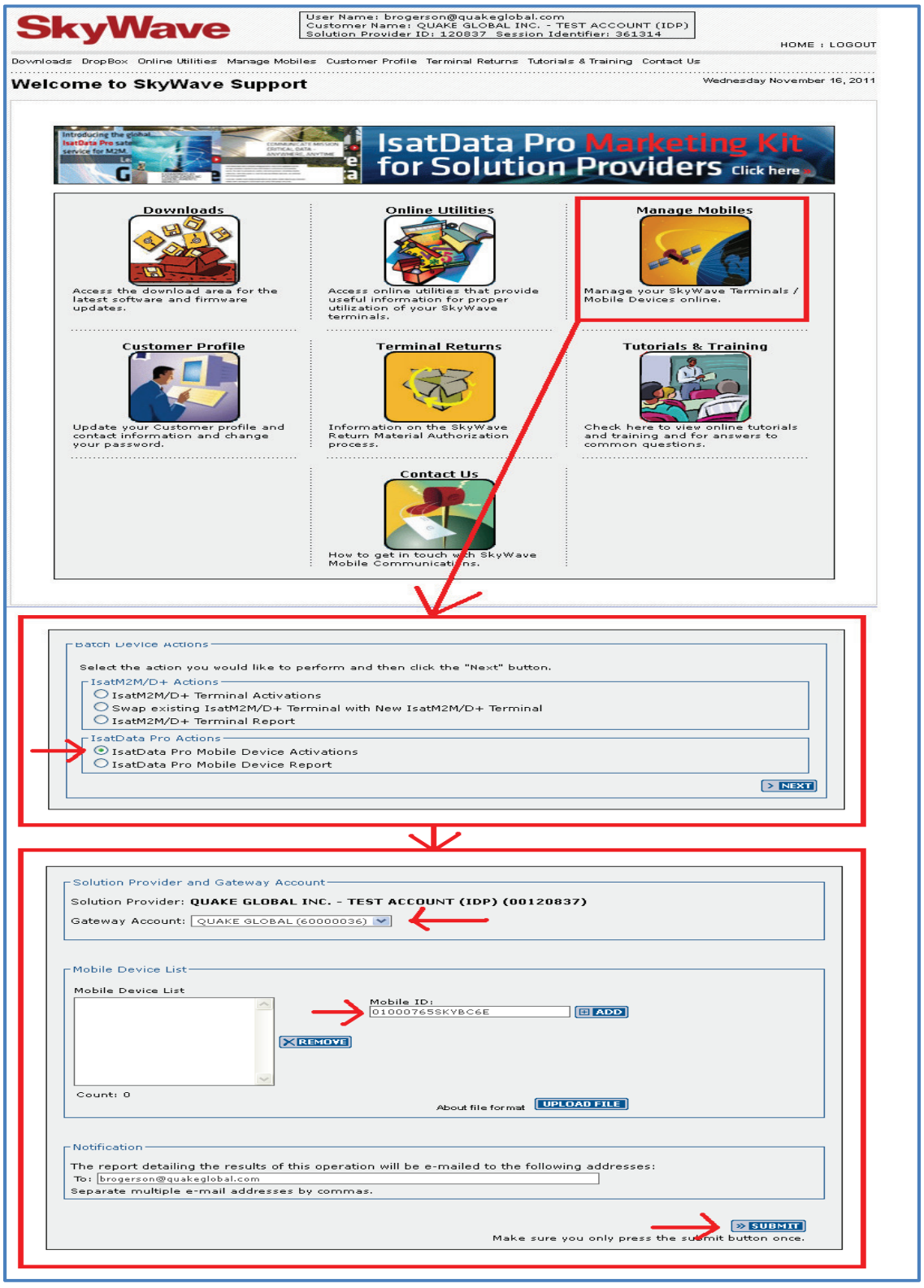

Figure 4-1: Inmarsat activation process

5 Logger messages

Log messages are continuously printed to the Logger port on the modem. The level of detail of the log messages may be adjusted with the **`QCFG_debug_level_parameter`** (0x39). The default level is set to 4. This parameter may be changed via the Logger port by typing '**d**' '**e**' and a number between 1 and 6. The higher the number, the more detailed the log messages.

5.1 ORBCOMM

The receiver is normally in one of two modes: Acquire or Receive. When in Acquire mode, the modem is looking for a satellite downlink. When in Receive, the modem is receiving a satellite downlink. When in Receive mode, there are many different messages that are sent to the Logger. Most of these messages are unimportant to the user, containing information such as satellite ephemeris data, downlink packet information, uplink packet information, etc.
Below are two examples of log information displayed when using the ORBCOMM network.

5.1.1 Acquire mode

Aq[26Jun02 22:29:48] chan 265 (WB Search) estDplr -2300 Pwr -115 Ebno 11.1

where:

- **Aq**: Indicates receiver is in acquire mode searching for a satellite.
- **26Jun02 22:29:48**: Greenwich Mean Time (GMT) according to the modem's internal RTC (Real-Time Clock).
- **chan 265**: Satellite downlink channel.
- **(WB Search)**: Indicates a Wide-Band search is being performed.
- **estDplr -2300**: Estimated Doppler frequency in Hz. This is the relative position of the satellite to the modem. A positive number means the satellite is moving towards the modem; a negative number means the satellite is moving away from the modem.
- **Pwr -115**: Estimated Power level in dBm. When the satellite is in view this is the satellite's signal strength; when the satellite is not in view this is the amount of noise on this frequency.
- **Ebno 11.1**: Estimated Signal/Noise ratio in dB. The larger this number is, the better the connection.

5.1.2 Receive mode

If the modem is in Receive mode, the receiver has acquired a satellite. When in this mode, a typical message sent to the Logger would be:

Rx[26Jun02 22:30:06|11.00] Sync(23* 285 04): Dplr -2448 Pwr -103 Ebno 15.8 0/50

where:

- **Rx**: Indicates a satellite signal is being received.
- **26Jun02 22:30:06**: GMT according to the satellite.
- **11.00**: Indicates how many seconds the modem has been receiving from the current satellite.
- **Sync**: Indicates a Synchronization Segment.
- **(23* 285 04)**: Indicates that satellite number 23 is currently being received, on downlink channel 285. The asterisk indicates that the satellite is currently usable for communications. The 04 is the downlink frame number.
- **Dplr -2448**: Estimated Doppler frequency in Hz. This is the relative position of the satellite to the modem. A positive number means the satellite is moving towards the modem; a negative number means the satellite is moving away from the modem.
- **Pwr -103**: Estimated Power level in dBm. When the satellite is in view this is the satellite's signal strength; when the satellite is not in view this is the amount of noise on this frequency.
- **Ebno 15.8**: Estimated Signal/Noise ratio in dB. The larger this number is, the better the connection.
- **0/50**: Bad/Total Segment Count. 0/50 indicates 50 Downlink Segments were received in the previous frame, with 0 checksum errors.

5.2 Iridium

Iridium messages are displayed like modem commands with the label "**[IRI]**" at the beginning. Tx stands for Transmit; Rx stands for Receive. Below are some common Iridium messages:

5.2.1 Request signal strength

Tx[IRI]T+CSQ: Request signal strength reading (performed every 10 seconds)
Rx[IRI]+CSQ:1: A signal strength of 1 is barely readable. Maximum is 5.
Rx[IRI]OK

5.2.2 Check modem status

Tx[IRI]+SBDSX: Request modem status (performed every 20 seconds). If a message is available for the modem, generate Ring Alert.

5.2.3 Ring Alert sequence

Received MSG_ALERT!!! The modem has received a Ring Alert from the satellite.
Tx[IRI]AT+SBDRB: Short Burst Data Read Byte is an attempt to see if the message is already in the modem's message queue.

5.2.4 Mailbox check

Rx[IRI]+SBDIX: 32, 415, 2, 0, 0, 0: This is a mailbox check and the network response (32) indicates that an invalid response from the network was received.

Rx[IRI]+SBDIX: 0, 415, 1, 44, 156, 3: This mailbox check with a network response of (0) indicates that a valid response from the network was received.

5.3 GSM/GPRS

GSM/GPRS messages are displayed like modem commands with the label "**[TERR]**" at the beginning. Tx stands for Transmit; Rx stands for Receive. Below are some common GSM/GPRS messages:

```
Turning on TERR modem
Tx[TERR]ATE0
Rx[TERR]ATE0
Rx[TERR]OK
Tx[TERR]AT&K0
Rx[TERR]OK
CELL_NET_IN_VIEW: TERR_NET_IN_VIEW    //Modem is registering with GSM/GPRS network
Rx[TERR]OK
CELL_NET_IN_VIEW: TERR_CONNECTED      //Modem is connected to GSM/GPRS network
Tx[TERR]AT+CSQ                        //Modem is requesting signal strength
Rx[TERR]+CSQ: 9,0                     //Signal strength is 9 (very good)
```

6 QUAKE Communication Protocol (QCP)

QCP mode is used to send data via AT commands or SLIP/RPC packets to the modem. API commands can be used in 'C' programs. There is a subset of APIs called QCP commands that are used in both 'C' programs and the QUAKE version of AT commands. QCP commands can be used to control the Q4000/QPRO externally with a DTE Processor. QCP can:

1) turn on/off individual modules (Satellite Communication, GSM/GPRS/GPS)

2) set and read Digital IOs, Analog IOs and Relays

3) send messages over GSM/GPRS or Satellite Communication

4) load files and set configuration parameters

6.1 Examples of QCP

QCP is initiated via an AT Command Shell or as a SLIP/RPC packet. In order to use QCP, configure the MTS port to:

Baud rate: 4800 bps
Data bits: 8
Parity: None
Stop bits: 1.

The following is an example of an AT command shell:

```
AT
```

The modem should respond with:

```
OK
```

If there is no response, check the serial connection and that the modem is powered on.

There is a full set of commands available to use via QCP. A description of these commands is contained in the "Application Files" link on the QUAKE website, www.Quakeglobal.com under Downloads. Once you extract this zip file, click on the "API_Parser_Output" folder, and then open the **index.html** file. This will give you a list of all the available QCP and SLIP/RPC commands that are supported on the Q4000/QPRO modem.

Also available on the QUAKE Downloads page is the QUAKE Communication Protocol (QCP) manual, containing more detailed information on this subject.

PUT EXAMPLE HERE

6.2 Passthrough and Direct mode

Customers who have their own processor and the necessary I/O for their specific application may also communicate directly with the Q4000/QPRO's satellite or GSM/GPRS modules. The communication is implemented in either Passthrough mode or Direct mode. Both of these modes allow the user to send native commands to the modules, bypassing the Q4000/QPRO's

foundation code. Passthrough mode is implemented with QCP commands and Direct mode is implemented with API commands.

- **Passthrough mode** connects the modem's MTS serial port directly to either the satellite or GSM/GPRS modules in the modem. The QCP commands:
  - IRI_passThrough
  - INMR_passThrough, and
  - TERR_passThrough

  can be used to turn on Passthrough mode.

- **Direct mode** connects the user's application to the satellite modules. The API commands:
  - IRI_directMode()
  - INMR_directMode()
  - MSG_queueOsiPkt()

  can be used to turn on Direct mode.

7 Configuration parameters

There are a number of parameters that may be configured as part of the modem's foundation code. These parameters control logging, auto-roaming, baud rates, satellite network operations, SMTP and POP addressing, and other modem functions.

Configuration parameters in the Q4000/QPRO are associated with numbers 0x00 through 0xFF. ORBCOMM has reserved numbers 0x00 through 0x7F for their network parameters, leaving the remainder (0x80 – 0xFF) for QUAKE-specific parameters.

In general, the foundation configuration parameters should be left at their default values, as these are appropriate for the majority of applications. If, however, it is necessary to modify them, this can be done by using any of the methods described in Section 7.2.1. Once you have completed your application development and testing, you may opt to have any non-default settings pre-programmed by QUAKE into any future modems you purchase.

7.1 Orbcomm-specific parameters

There are a number of ORBCOMM-specific parameters between 0x00 through 0x7F. For example, the ORBCOMM `ob_route` parameter `0x0A`, determines whether outbound (OB) messages and commands are routed to:

- the application – set to 0
- the MTS serial port - set to 1
- both – set to 2.

By setting `ob_route` to 1, the modem acts as a standard ORBCOMM modem, i.e. with no built-in application. By setting `ob_route` to 0, the application will receive all outbound messages, commands, and message acknowledgements. By leaving `ob_route` set at the default value of 2, both the application and the MTS port will receive any outbound messages.

The complete list of ORBCOMM parameters is shown in Appendix A. There are several ways to modify the ORBCOMM configuration parameters. They can be modified via:

1. the MTS port using the ORBCOMM Serial Interface (OSI) protocol. See the ORBCOMM Serial Interface Specification for more information.

2. a user application using the functions:
   - `CFG_setValOrb()`
   - `CFG_getValOrb()`.

See the Q4000/QPRO API for more information on these functions.

7.2 QUAKE Configuration Parameters (QCFG)

QUAKE uses parameters 0x80 – 0xFF. All these parameters have "**QCFG_**" as a prefix. For a complete list of the QCFG parameters, see Appendix B - QUAKE's ORBCOMM configuration parms (QCFG) and Appendix C - QUAKE's Iridium & Inmarsat config parms (QCFG). There are several ways to modify QCFG parameters. They can be modified via:

- debug menus on the Logger port
- QCP protocol on the MTS port
- API calls made by a user's application.

To view the current values of the QCFG parameters from the Logger port, connect a Terminal Emulation program to the Logger port with the following settings:

Baud rate: 115200 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None.

Type the following to obtain the output below:

“**U**” “**C**” “**v**”

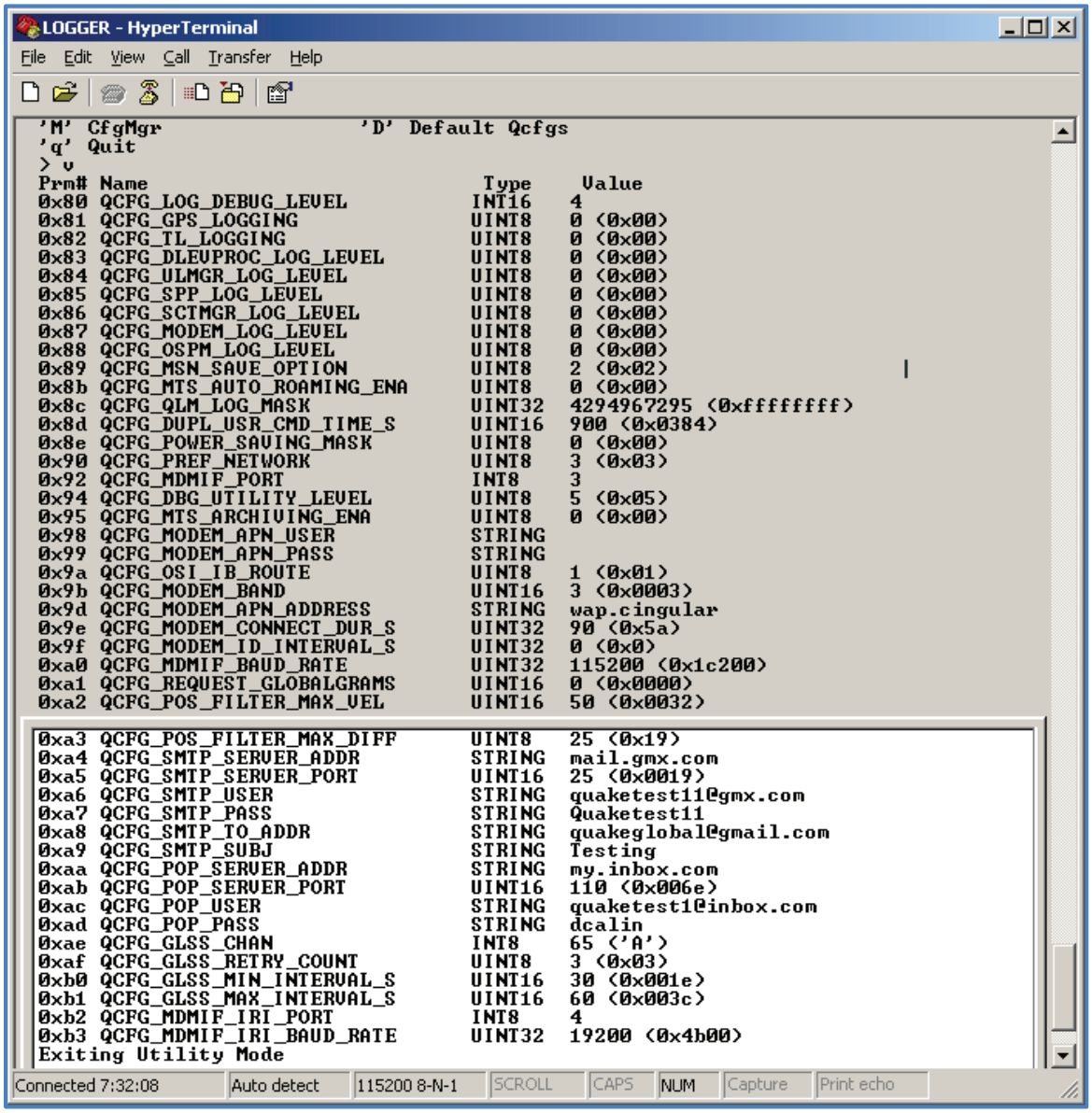

Figure 7-1: QCFG parameter list

7.2.1 Changing QCFG parameters

7.2.1.1 Change via the Logger port

To change QCFG parameters via the Logger port, type **'U' 'C' 's'.** You will be prompted for the parameter's number in hex, which you can see from viewing the parameter list above in Figure 7-1. You will then be prompted for the parameter's new value as either a text or a numeric value. See the example below:

```
U
***Utility Mode enabled*** (will expire in 20 Secs)
C
NOTE: Please conduct a controlled power down to ensure changes to
configuration parameters are committed to flash memory.
CHOOSE FROM THE FOLLOWING:
'g' Get Param              's' Set Param
'd' Default Orbcomm Cfgs   'v' View Qcfgs
'M' CfgMgr                 'D' Default Qcfgs
'q' Quit
> s
ENTER PARAMETER NUMBER> 0xa2
ENTER QCFG VALUE> 50
Exiting Utility Mode
```

Note: After changing any parameters, it is necessary to type **'d' 'R'** on the Logger port to perform a controlled power down/reboot, which includes saving the configuration parameters to non-volatile memory (NVM).

Without the controlled reboot, the new values of the parameters are lost after a power cycle on the modem.

Note: See Appendix D - Debug and utility menus for more information on the debug (d) and utility (U) commands.

7.2.1.2 Change via QCP on the MTS port

QUAKE Communication Protocol (QCP) mode is used on the MTS port. It has a number of uses besides configuring parameters. See Chapter 6 for more information on QCP. To change the value of a numeric QCFG parameter, connect a Terminal Emulation program to the MTS port with the following settings:

Baud rate: 4800 bps
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None.

Now type:

AT+QKEFCN CFG_setNumericQCP, parmName, parmValue

This will change the parameter and save it to memory. See the example in the screen below, where the parameter **QCFG_SMTP_SERVER_PORT** is given the value 25:

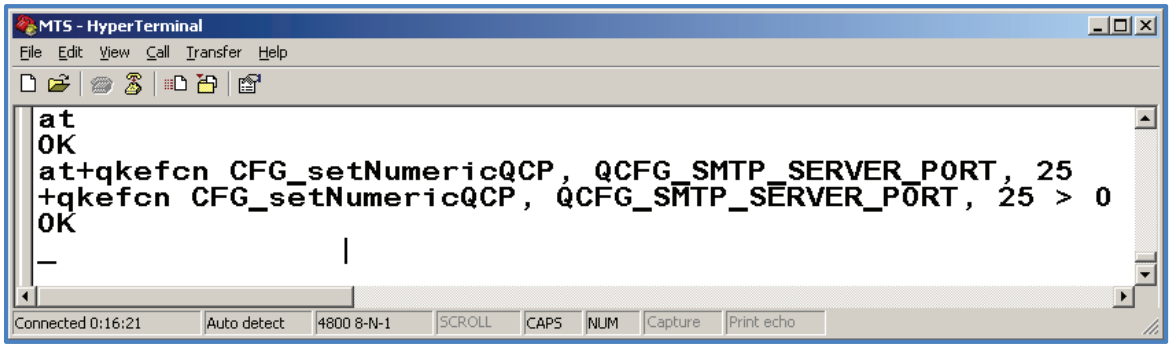

Figure 7-2: Using QCP to change a numeric parameter

To change the value of a string parameter, type:

AT+QKEFCN CFG_setStringQCP, parmName, parmValue

This will change the parameter and save it to memory. See the example in the screen below, where the parameter **QCFG_SMTP_SERVER_ADDR** is given the value "mail.gmx.com":

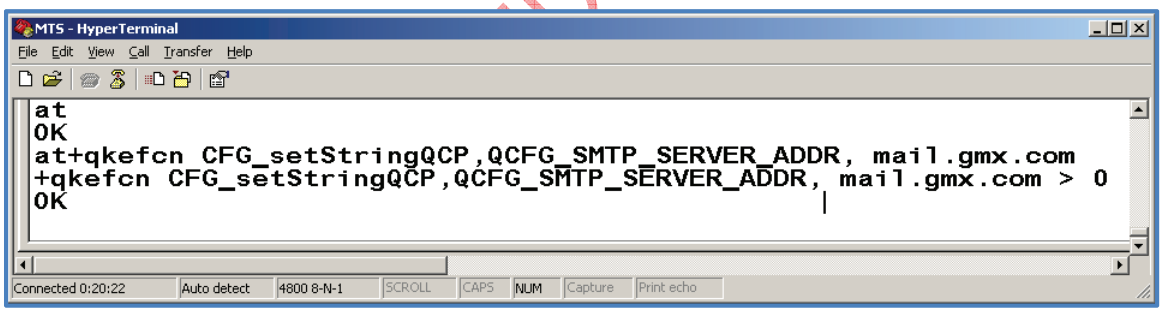

Figure 7-3: Using QCP to change a string parameter

7.2.1.3 Change via API calls from a user application

QCFG parameters can also be modified from a user application using the functions:

- `CFG_write()`
- `CFG_read()`.

See the Q4000/QPRO API for more information on these functions.

7.2.2 GPRS network parameters

GPRS uses the following QCFG parameters:

Table 7-1: GSM parameters

Parm #	Name	Description	Default Value	Min	Max
0x9d	QCFG_MODEM_APN_ADDRESS	Network provider name	ORBCOMM.t-mobile.com		
0x98	QCFG_MODEM_APN_USER	User login name (if required)	[None]		
0x99	QCFG_MODEM_APN_PASS	User password (if required)	[None]		
0x9e	QCFG_MODEM_CONNECT_DUR_S	If there is no data exchange within this timeout period (seconds), the connection is closed. 0 for no timeout.	90	0	65535

Note: For T-Mobile/ORBCOMM QCFGs, these settings are pre-set to ensure proper network connection.

7.2.3 SMTP and POP (email) server parameters

A valid email account is required on an SMTP server that supports **standard SMTP protocol without SSL or SMPTA**. This includes webmail sites such as www.inbox.com and www.gmx.com. Email attachments are not supported via SMTP and POP. It is possible to send binary data using MIME-encoding. Table 7-2 lists the SMTP parameters.

Note: www.google.com email does NOT use standard SMTP protocol and will not work with the Q4000/QPRO.

Table 7-2: SMTP parameters

Parm #	Name	Description	Default Value	Min	Max
0xa4	QCFG_SMTP_SERVER_ADDR	Address of SMTP mail server	[None]		
0xa5	QCFG_SMTP_SERVER_PORT	SMTP port (usually 25)	25	0	65535
0xa6	QCFG_SMTP_USER	SMTP account user name	[None]		
0xa7	QCFG_SMTP_PASS	SMTP account password	[None]		
0xa8	QCFG_SMTP_TO_ADDR	Default email address to which to send messages	[None]		
0xa9	QCFG_SMTP_SUBJ	Default subject of email	[None]		

In order to receive unsolicited GSM/GPRS messages on the modem, such as parameter updates, the following QCFG parameters must have valid values:

Table 7-3: POP parameters

Parm #	Name	Description	Default Value	Min	Max
0xaa	QCFG_POP_SERVER_ADDR	Address of POP server	[None]		
0xab	QCFG_POP_SERVER_PORT	POP server port (usually 25)	25	0	65535
0xac	QCFG_POP_USER	POP account user name	[None]		
0xad	QCFG_POP_PASS	POP account password	[None]		

8 Installing the IAR Integrated Development Environment

Code for the Q4000/QPRO modem is developed on the IAR Systems Embedded Workbench. This is a fully Integrated Development Environment (IDE) containing an optimized C compiler, assembler, linker, text editor and associated tools. QUAKE software follows open industry standards whenever possible to allow existing 'C' code to port over easily.

If you have purchased a Development Kit from QUAKE you will be provided with a temporary license key for the IAR IDE. Included with the installation material is the IAR dongle shown below. It is not necessary to have this plugged in during the following installation.

Figure 8-1: IAR dongle

Follow these steps to install the IAR workbench:

Install the software using the CD that was provided. IAR provided a "welcome letter" with the package. On that "welcome letter" there is a license number and a quickstart key. Both of these are needed in order to complete the initial installation.

1. Select the autorun application, and then unzip the files.

Name	Type	Compressed size	Passwo...	Size	Ratio	Date modified
autorun	File folder					
doc	File folder					
dongle	File folder					
drivers	File folder					
ewarm	File folder					
license-init	File folder					
windows	File folder					
autorun	Application	170 KB	No	348 KB	52%	12/8/2009 1:58 PM
autorun	Setup Information	1 KB	No	1 KB	17%	11/19/2008 2:14 PM

Figure 8-2: IAR zip file contents screen

2. Select the (unzipped) autorun application.

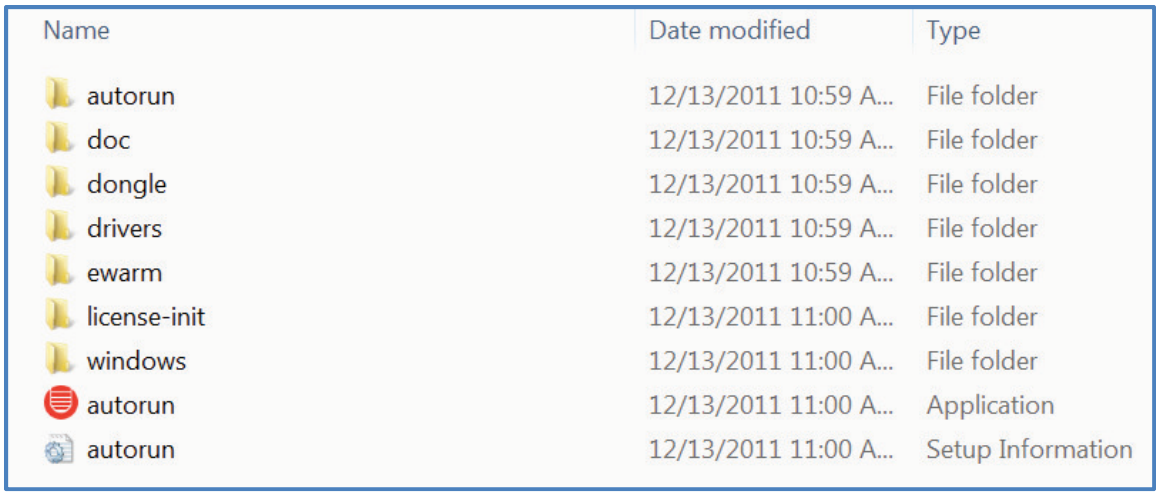

Figure 8-3: IAR unzipped files screen

3. Select Install IAR Embedded Workbench® and follow the installation wizard.

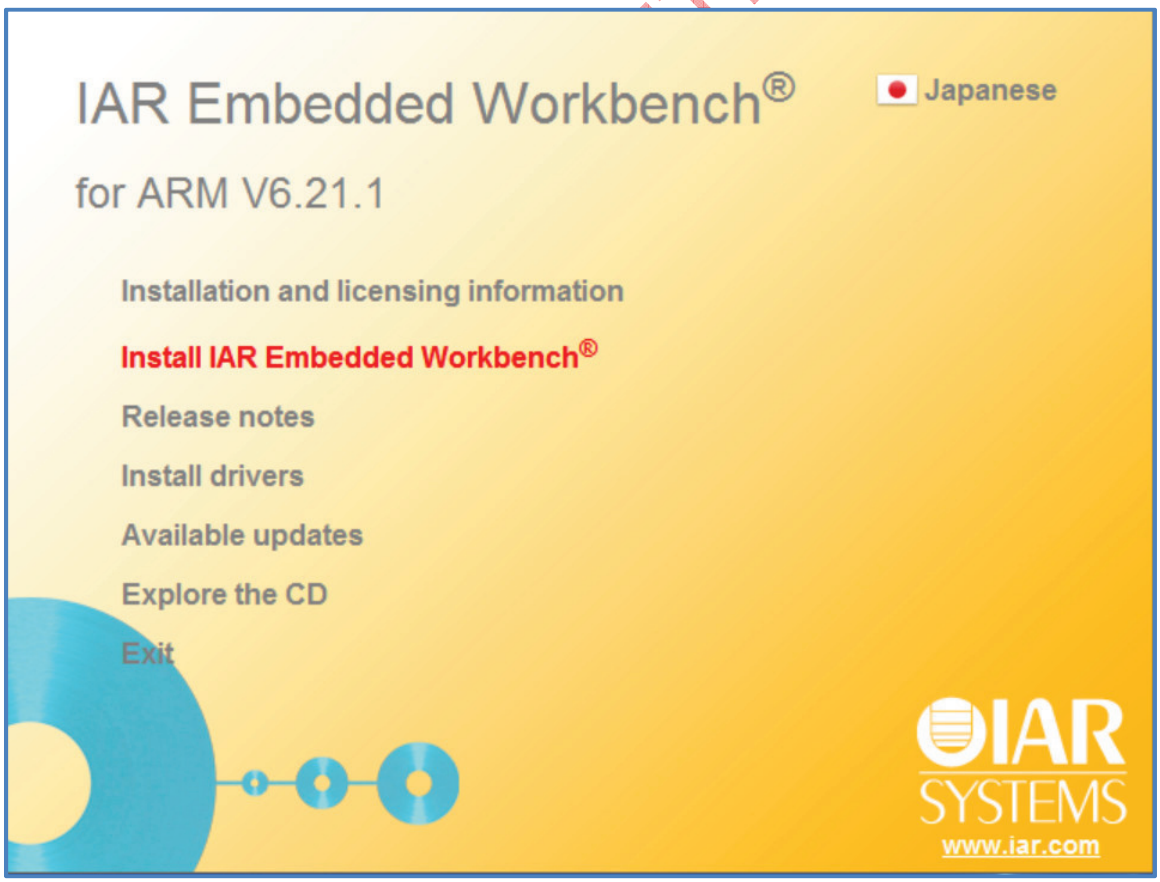

Figure 8-4: IAR Workbench Welcome menu

The installer opens a window asking you to remove the IAR dongle from your computer if it has been plugged in at the time of installation.

Figure 8-5: IAR dongle driver installation

4. Remove the IAR dongle if it is plugged in, then click . Yes .

5. When the installation is complete:
   - plug in the dongle
   - click Finish .

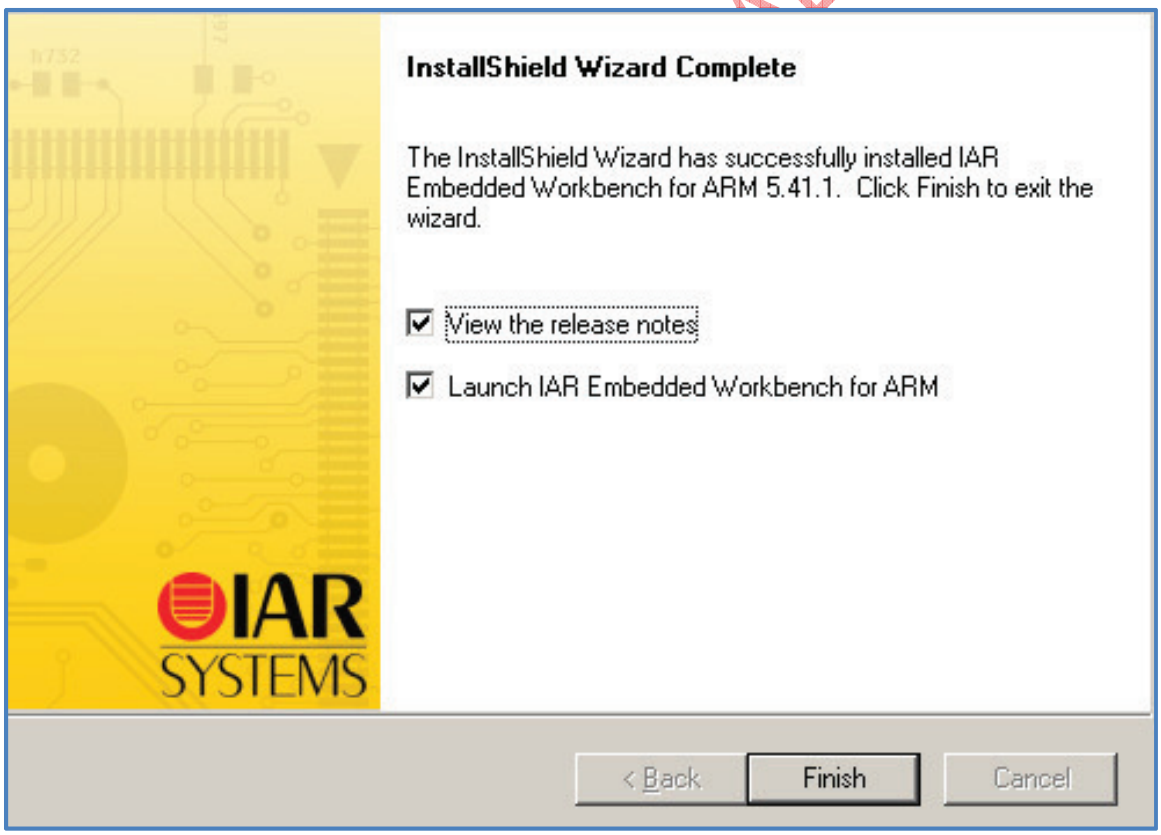

Figure 8-6: IAR Workbench installation complete

6. The IAR Workbench will start.

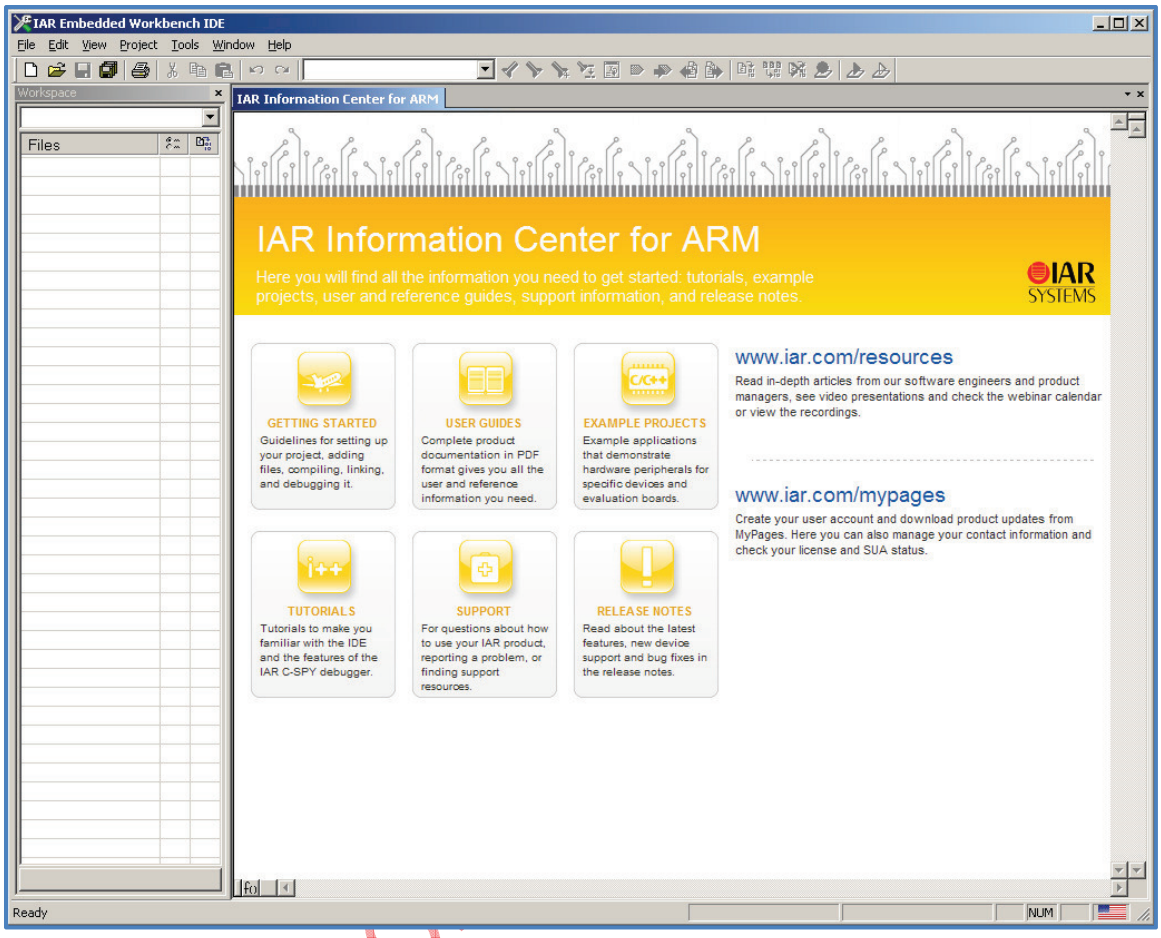

Figure 8-7: IAR Information screen

Once the installation is finished you need to complete the registration. The registration can be done at: www.iar.com/register. The information that you provide in the registration is needed in order to have IAR generate a permanent license key for the software and a MyPages account for you.

Note: The MyPages page at www.iar.com can be used to download different versions of the IAR IDE.

Figure 8-8: IAR registration screen

- After the registration is submitted, IAR will need to process it before you can have access to MyPages. This process generally takes 1-2 business days. Once IAR completes the registration you will receive an email with the permanent license key.
- With the permanent license key, go directly to the MyPages login screen: www.iar.com/mypages and enter your email address into the "**Don't have an account?**" box. The system will automatically email your login and password information to you. Using that, you will be able to log in and have access to download any available version.

Figure 8-9: IAR MyPages screen

Note:

The version of the IAR Workbench used by QUAKE Global is **5.41.2**.

It is important to update to 5.41.2 if your IAR installation CD is another version. Once you have access to MyPages this can be downloaded from the IAR website at www.iar.com. Be sure to:

- first - modify your version to 5.41 from the initial version that IAR approved in your license
- then - download the 5.41.2 patch.

9 Communicating with the modem

9.1 Sending email to the modem

Email messages may be sent to the modem from any of the configured networks. Satellite networks have mechanisms to pass messages to the modem without being polled, but to receive unsolicited messages over GSM/GPRS requires that the user application have some sort of polling mechanism.

The modem can detect some special emails to download new foundation software or reboot (see Chapter 10 Over the Air (OTA) software update). The user application has access to configuration parameters for SMTP and POP addresses, usernames and passwords. The Internet Service Provider (ISP) should provide information on setting up accounts for SMTP and POP, similar to personal email.

Note: **The maximum email buffer size is 48K bytes**. If a message is larger than that, the modem deletes it from the server to avoid the infinite loop that would result from trying to retrieve a message that is too large. It then displays the following message on the Logger port:

Can't allocate enough memory for message, deleting

9.1.1 ORBCOMM

To send an email to a modem using the Orbcomm network, address the email to ModemNx1@orbcomm.net, where ModemN is the serial number of the modem shown on the modem's white label, and **x1@orbcomm.net** is the format of an Orbcomm email using Gateway 1, within the western hemisphere. For emails using Gateway 120 or within the eastern hemisphere, the address would be built using **x1@orbcomm2.net**.

Figure 9-1**Error! Reference source not found.** is an example of an email to modem "qwaketest029."

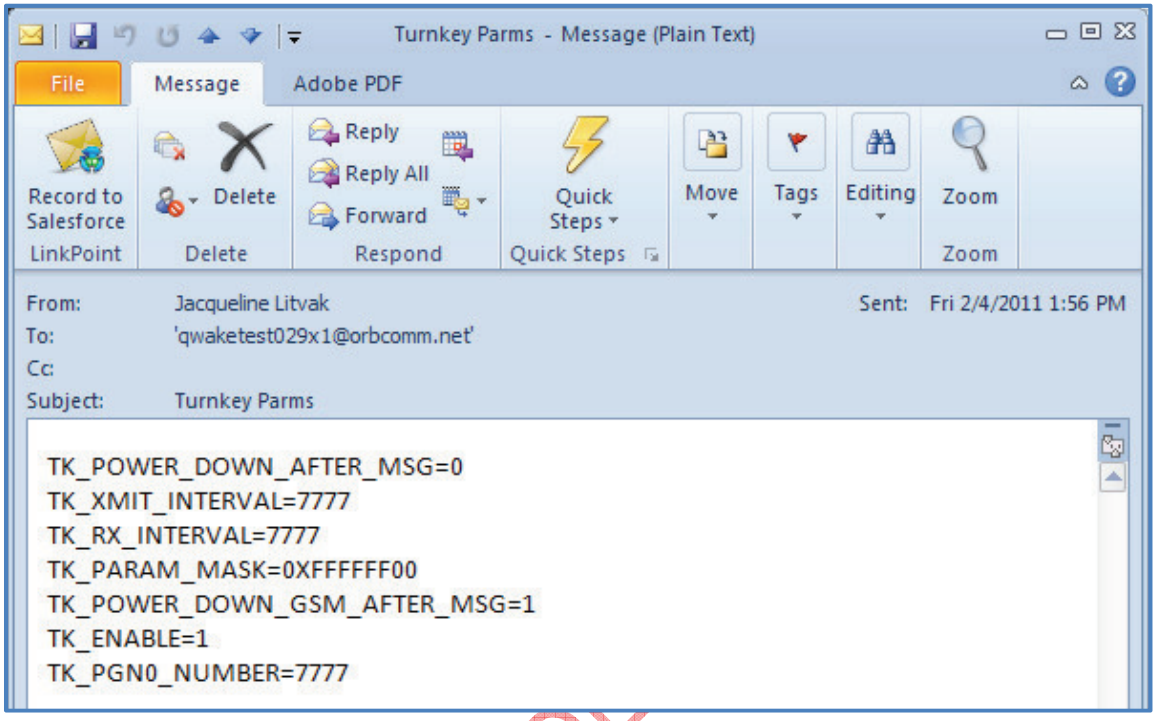

Figure 9-1: Orbcomm email to a modem

9.1.2 Iridium

Iridium emails to a modem are always sent to the same address: data@sbd.iridium.com. The subject of the email MUST be the modem's **IMEI** number, which is printed on the modem's white label. Data to the modem are sent as a file attachment to the message. Figure 9-2 is an example of the email.

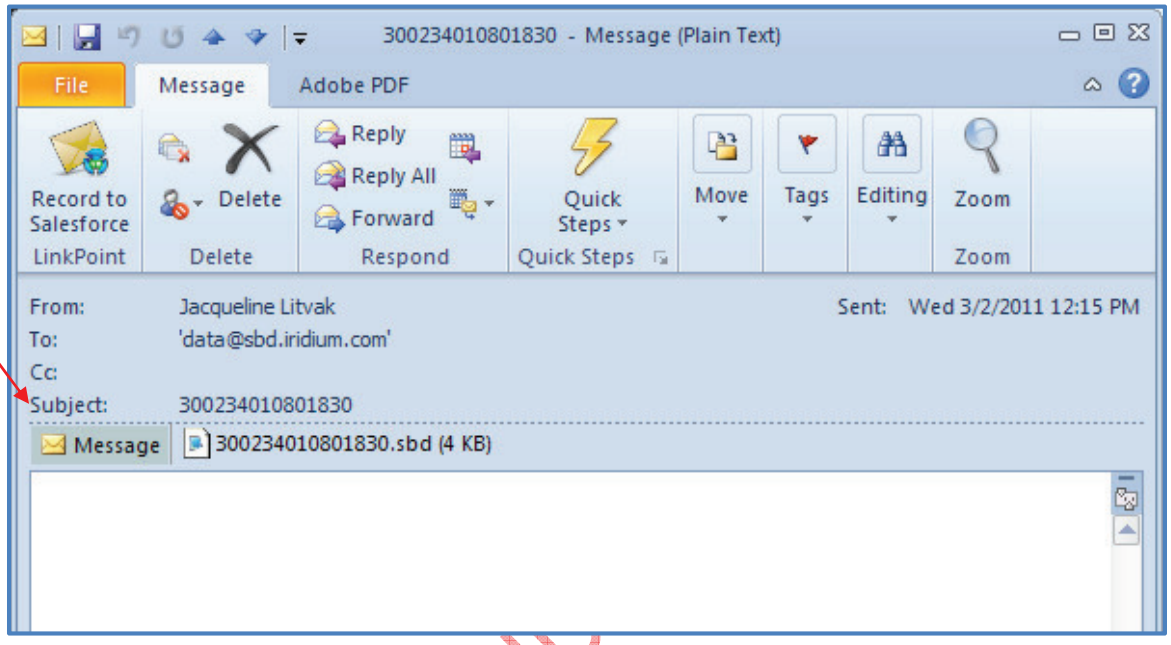

Figure 9-2: Iridium email to a modem

The data file attachment may have any name, but it must have a **.sbd** file extension.

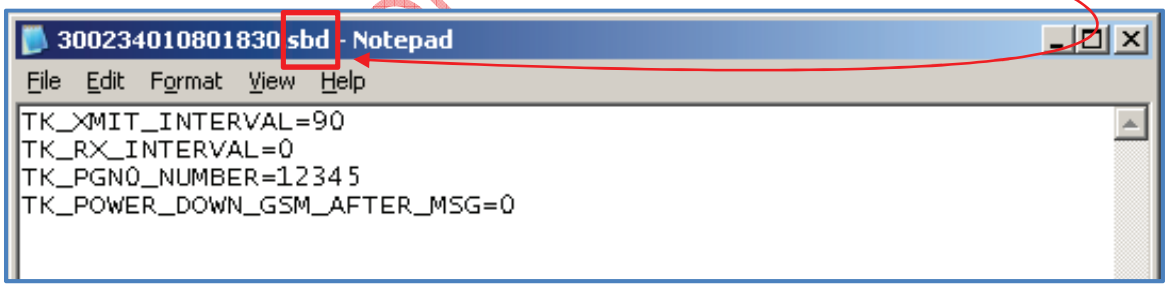

Figure 9-3: Data file attachment for a modem-terminated message

9.1.3 GSM/GPRS

Email to a modem using GSM/GPRS has an address specified by the configuration parameters and the network being used. For example, with the configuration parameters shown below, an email from the gmx.com server to a modem would have the format **username@gmx.com.**

Table 9-1: SMTP and POP configuration parameters

Name	Value (Hex)	Sample Values
QCFG_MODEM_APN_ADDRESS	0x9D	orbcomm.t-mobile.com
QCFG_SMTP_USER	0xA6	username@gmx.com
QCFG_SMTP_PASS	0xA7	Password
QCFG_POP_USER	0xAC	username@gmx.com
QCFG_POP_PASS	0xAD	Password
QCFG_SMTP_SERVER_ADDR	0xA4	mail.gmx.com
QCFG_POP_SERVER_ADDR	0xAA	pop.gmx.com
QCFG_SMTP_TO_ADDR	0xA8	username@quakeglobal.com
QCFG_SMTP_SUBJ	0xA9	This is a test subject...

9.2 Sending SMS messages to the modem

SMS messages may be sent to the modem from the GPRS/GSM network. To determine the SMS number of a modem, it is necessary to send the command TERR_getInfo () after the GPRS/GSM module has been powered on. The format of the TERR_getInfo command is described in the Application Programming Interface (API). The parameter to the command must be `REQ_INFO_TERR_SMS_NUMBER`.

Note: It is important to put the modem's SMS number on a DO NOT CALL list to avoid receiving spam mails.

10 Over the Air (OTA) software update

10.1 Introduction

The Q4000/QPRO can update its foundation, application or configuration parameters over a GSM/GPRS network without the need to physically connect the modem to a terminal. The firmware update request is initiated by sending an unsolicited POP email or satellite message to the modem. With the correct subject line in the message, it will bypass the application and direct the foundation to begin an FTP transfer via GSM/GPRS.

To update the application software running in the modem requires specialized user application code to process the request and possibly download the software via FTP. This process is demonstrated in sample application DemoAppREMOTE in Section 12.4.3.

Note that the update requests may be made via satellite or GSM/GPRS, but FTP is used to transfer software over GSM/GPRS. When the modem is rebooted, it runs the new code. The reboot command may also be sent to the modem via satellite or GSM/GPRS.

10.1.1 Requirements

- A mechanism to initiate the update by using one of the following:
  - An email account that can be used to send emails over its SMTP server.and an email account to receive email over the POP server.
  - Sending A satellite message.to the modem.
  - Sending an SMS message.to the modem.
- An FTP server with write access. Information for the server, username, password and port are needed.

10.1.2 Process details

When the QUAKE modem receives an email message, it examines the subject line of the message for a special string that instructs it to begin a foundation update. The modem then parses the body of the email to extract information such as:

- remote location to connect
- file name
- file size, etc.

Upon extraction of the necessary information, the modem initiates an FTP connection to a remote server via GSM/GPRS, and downloads the requested software.

Assuming the downloaded image is correctly compressed and encrypted, the QUAKE foundation decompresses and decrypts it the next time it powers on.

The email to initiate the foundation update:

- must be **Plain Text** (not HTML or Rich Text).
- must have the subject line: **FIRMWARE UPDATE.**
- should contain the following tokens in the email body:
  - **Server:** name of the FTP server
  - **Port:** port of the FTP server
  - **Username:** used to access the FTP server
  - **Password:** used to login to the FTP server, or valid text for anonymous access
  - **File:** full path and file name of the file that is to be downloaded
  - **Retry:** number of times to retry download if it fails. If 0, no retries are attempted.

The configuration parameters in Table 10-1 must be configured for foundation update OTA to work.

Table 10-1: QCFG OTA parameters

Name	Number (Hex)	Value
QCFG_MODEM_APN_ADDRESS	0x9d	ORBCOMM.t-mobile.com
QCFG_MODEM_CONNECT_DUR_S	0x9e	90
QCFG_MODEM_ID_INTERVAL_S	0x9f	0
QCFG_MDMIF_BAUD_RATE	0xa0	115200
QCFG_REQUEST_GLOBALGRAMS	0xa1	0
QCFG_POS_FILTER_MAX_VEL	0xa2	50
QCFG_POS_FILTER_MAX_DIFF	0xa3	25
QCFG_SMTP_SERVER_ADDR	0xa4	<your smtp server>
QCFG_SMTP_SERVER_PORT	0xa5	25
QCFG_SMTP_USER	0xa6	<user name>
QCFG_SMTP_PASS	0xa7	<password>
QCFG_SMTP_TO_ADDR	0xa8	<default TO address>
QCFG_SMTP_SUBJ	0xa9	FIRMWARE UPDATE
QCFG_POP_SERVER_ADDR	0xaa	<your pop server>
QCFG_POP_SERVER_PORT	0xab	110
QCFG_POP_USER	0xac	<user name>
QCFG_POP_PASS	0xad	<password>

10.1.3 Steps

1. Place the new firmware image on the FTP server.
2. Send an email similar to the following. The email type must be Plain Text.

```
TO: (SMTP/POP account) test11@server.com
SUBJECT: FIRMWARE UPDATE  (this is case-sensitive!)
BODY:
   Server:yourftpserver.net
   Port:21
   Username:user@yourftpserver.net
   File:/firmware.bin
   Password: password
   Retry:2 <hit enter twice>
```

3. The modem receives the update email by receiving a modem-terminated satellite message or by checking the POP account. There must be an application running if POP email is used to update the foundation. For debugging purposes iIt is possible to check the POP email account by executing a command from the Logger port. Make sure that the GSM/GPRS module is powered up before receiving a message from the POP email server.

4. Once the firmware file has been downloaded to the modem, the modem must be rebooted to install the firmware. To cause a modem reboot:
   - place “RESTART MODEM” in the subject line of a POP email
   - place “RSTR” in the subject line of an ORBCOMM message.

10.1.4 Output

Table 10-2 lists the common status emails sent by the modem after completing the firmware update process.

Table 10-2: Common OTA status emails

Email Content	Explanation
OK (No error)	Firmware has been successfully downloaded and stored in modem. However, if the downloaded firmware is incorrectly compressed and encrypted, it will not be started by boot loader.
Modem is busy serving previous request	Another firmware update process is ongoing.
FTP is currently busy	Modem's FTP module is being used by another module.
FTP request timeout	Timeout value expired before firmware update completed.
FTP request failed	Firmware download failed
Invalid file size or file not found	Requested firmware not found in remote FTP server
Setting parameter on FTP server failed	Generic error for configuring FTP server failure
Connection to FTP server failed	Could not connect to FTP server
GSM context activation failed	GSM context could not be activated
FTP server address or credentials error	FTP server address, port, username or password is invalid.

11 Network Independent Message Manager (NIMM)

The Q4000 supports the ability to send messages independent of a specific network and independent of any particular protocol. This Network Independent Message Manager (NIMM) system consists of a single API to send messages for any configured network, and a mechanism to update the configuration file at any time.

Note: For in-depth information on the Network Independent Message Manager (NIMM), please refer to the *1135-3003 Q4000 Programmer Guide*.

11.1.1 Network configuration file

The network configuration file is an ASCII-based, comma separated text file containing network configuration data. It defines the order in which networks are attempted, including the protocol for that network. This file is stored at "***/tffs0/etc/NIMM.cfg***" in NVM. If the user wishes to override the built-in configuration, a custom configuration file may be created. NIMM reads this file once at startup.

Note: If parsing of the entire network configuration file fails, or the file is not present, all networks and protocols are used with **GPRS** as the default protocol.

The file contains the following information:

- network on which the data will be sent
- protocol to use for this network
- maximum size of a message for this network
- boolean value indicating that this network/protocol accepts binary content
- timeout value to indicate how long this network/protocol can hold a message before being forced to return it for other processing.

Some sample configuration data would be:

Network,	Protocol,	Max,	Bool,	Timeout
NETWORK_ORB,	ORB_REPORT,	18,	TRUE,	20000
NETWORK_TERR,	TERR_SMTP,	20000,	FALSE,	0

Lines starting with a double slash (//) are treated as comment lines and ignored.

Some networks support the concept of a timeout for a message. In particular, Iridium and Orbcomm may take longer than expected for message delivery if the network drops out of view during message transmission. In this case, NIMM tells the network delivery mechanism to drop the message and informs the application in order to allow it to reschedule the message.

11.1.1.1 Default network configuration file

The default configuration built into the modem uses the following entries:

Network	Protocol	Max Size	Accept Binary	Timeout (0 == Infinite)
NETWORK_TERR,	TERR_UDP,	UNLIMITED,	TRUE,	0
NETWORK_TERR,	TERR_TCP,	UNLIMITED,	TRUE,	0
NETWORK_TERR,	TERR_SMTP,	UNLIMITED,	FALSE,	0
NETWORK_TERR,	TERR_SMS,	168,	FALSE,	0
NETWORK_ORB,	ORB_REPORT,	6,	TRUE,	0
NETWORK_ORB,	ORB_DEFAULT_MESSAGE,	8192,	TRUE,	0
NETWORK_ORB,	ORB_MESSAGE,	8192,	TRUE,	0
NETWORK_ORB,	ORB_DEFAULT_REPORT,	6,	TRUE,	0
NETWORK_ORB,	ORB_GLOBAL_GRAM,	229,	TRUE,	0
NETWORK_IRI,	IRIDIUM_TEXT,	IRI_MAX_MO_BUF_LEN,	FALSE,	0
NETWORK_IRI,	IRIDIUM_BINARY,	IRI_MAX_MO_BUF_LEN,	TRUE,	0
NETWORK_INMR,	INMARSAT_TEXT,	INMR_MAX_MO_BUF_LEN,	FALSE,	0
NETWORK_INMR,	INMARSAT_BINARY,	INMR_MAX_MO_BUF_LEN,	TRUE,	0

Figure 11-1: Default network configuration file

If no configuration file is present, NIMM attempts to send messages in the following order:

```
NETWORK_TERR, TERR_UDP
NETWORK_TERR, TERR_TCP
NETWORK_TERR, TERR_SMTP
NETWORK_TERR, TERR_SMS
```

If the ORBCOMM modem is present in the modem, the next network tried is:

```
NETWORK_ORB, ORB_REPORT
NETWORK_ORB, ORB_DEFAULT_MESSAGE
NETWORK_ORB, ORB_MESSAGE
NETWORK_ORB, ORB_DEFAULT_REPORT
NETWORK_ORB, ORB_GLOBAL_GRAM
```

If the Iridium modem is present in the modem, the next network tried is:

```
NETWORK_IRI, IRIDIUM_TEXT
NETWORK_IRI, IRIDIUM_BINARY
```

If the Inmarsat modem is present in the modem, the next network tried is:

```
NETWORK_INMR, INMARSAT_TEXT
NETWORK_INMR, INMARSAT_BINARY
```

ORBCOMM and Iridium modems are exclusive to each other. Networks that are not available for a specific modem are not used. For example, on an Iridium modem, messages will not be sent to the ORBCOMM network.

Note: The default timeout for all networks is infinite.

12 Sample applications

The simplest approach to programming Q4000/QPRO modems is to use the sample 'C' code applications supplied at www.quakeglobal.com under Downloads/Application Files. These include the following:

- **Turnkey** - demonstrates the event-driven architecture of the Q4000/QPRO. This application can be used to send a message which can be modified by changing various configuration parameters.
- **QuickStart** – is a basic, minimal template for developing software embedded on the Q4000/QPRO.
- **DemoAppXXX** - highlights different aspects of the Q4000/QPRO's feature set.

These sample applications provide a starting point for building more complex custom applications. All the examples use QUAKE's event-driven architecture which is discussed in more detail in Chapter 14. When various events such as a POWER_ON or GPS POSITION_FIX occur, the foundation code detects the change and posts the event to the application. The application determines its response based on the type of event.

12.1 Accessing the QUAKE Application Programming Interface (API)

The QUAKE API gives information on all the function calls used in the sample applications. These are the building blocks for any user application. It is accessible from the API tab on the website. The downloadable version of the API is available by following these steps: go onto the QUAKE website: www.quakeglobal.com

- log in to your account
- select the Downloads tab
- select the "Application Files" link for your modem
- save, and then extract the zip file
- open the "API_Parser_Output" folder
- open the *index.html* file.

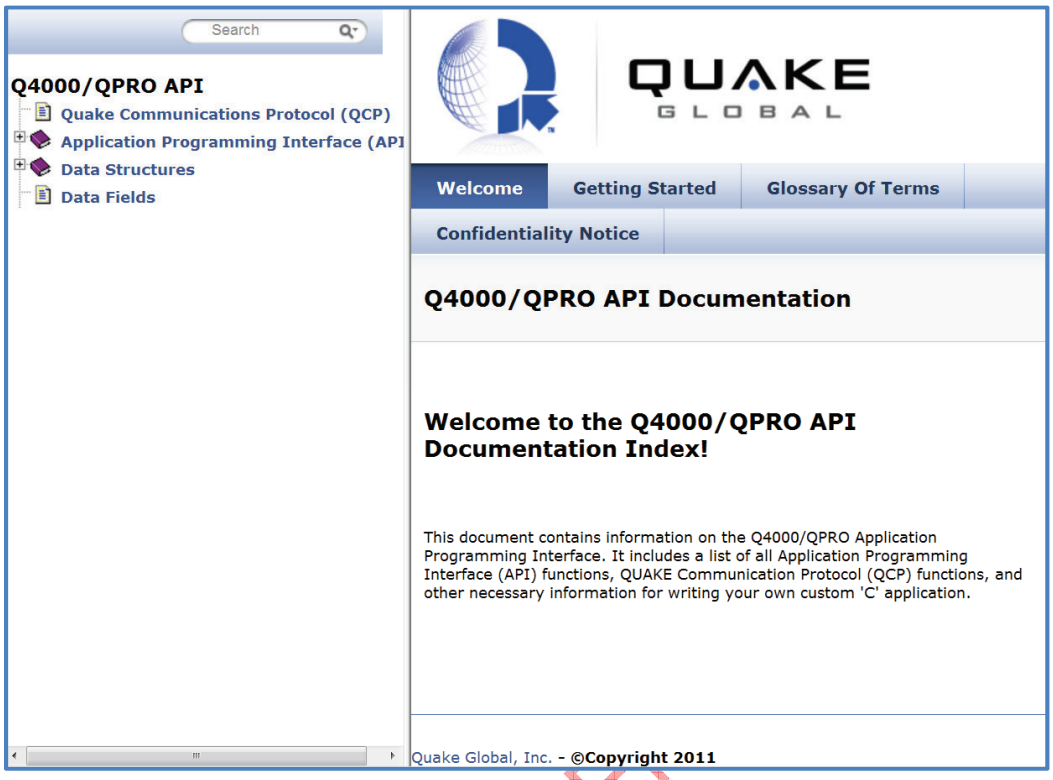

Figure 12-1: The QUAKE API documentation webpage

The API Function Reference lists all of the different types of calls, including those dealing with tasks, message transfers, GPS, serial interfaces and system time. The API_Parser_Output folder included in the Application Files download contains the same information that is on the website.

12.2 Turnkey application

The sample applications and associated documentation are available on the QUAKE Global website at www.quakeglobal.com:

1. Log in to the secure portion of the site using the user name and password provided to you.
2. Go to the DOWNLOADS page and select your satellite network's **Application Files**.
3. In the pop-up window, select the Save Button, and click OK to download the compressed file to your computer.
4. Unzip the files using a standard Zip program such as WinZip or 7-Zip.
5. Click Open to display the uncompressed downloaded files in the directory.

In the following examples, ORBCOMM application files were extracted.

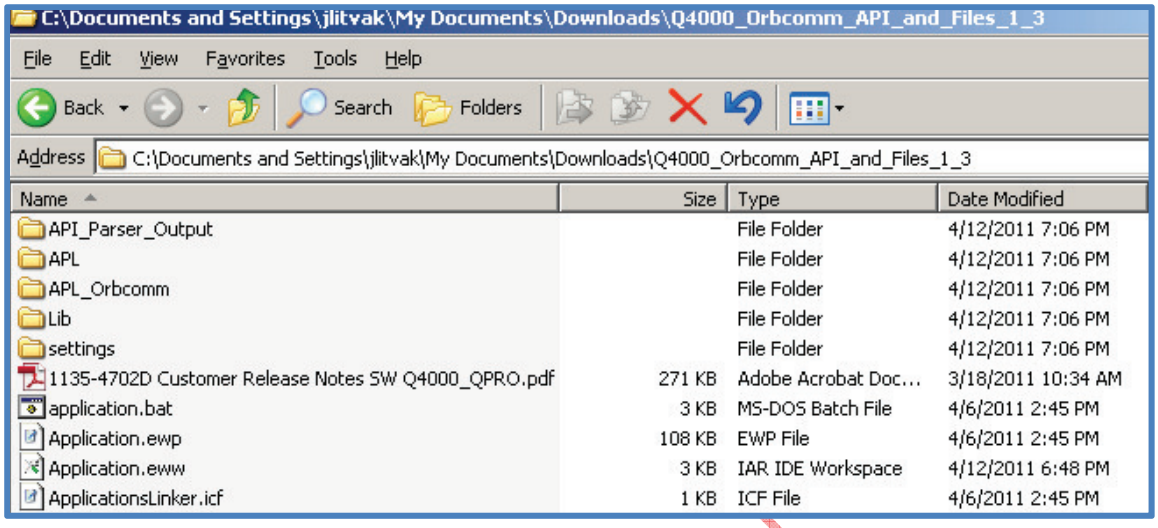

Figure 12-2: API_Files_and_Manual.zip

Note: You will see a folder for either APL_Iridium, APL_Orbcomm, APL_Inmarsat or APL_Globalstar, depending on your choice of satellite network. The following pages show examples using APL_ORBCOMM, but they also apply to the other satellite networks.

12.2.1 Compiling Turnkey

(If you have not yet installed the IAR Embedded Workbench IDE, see Chapter 8.) Double-click on the **Application.eww** file to open the IAR Embedded Workbench IDE.

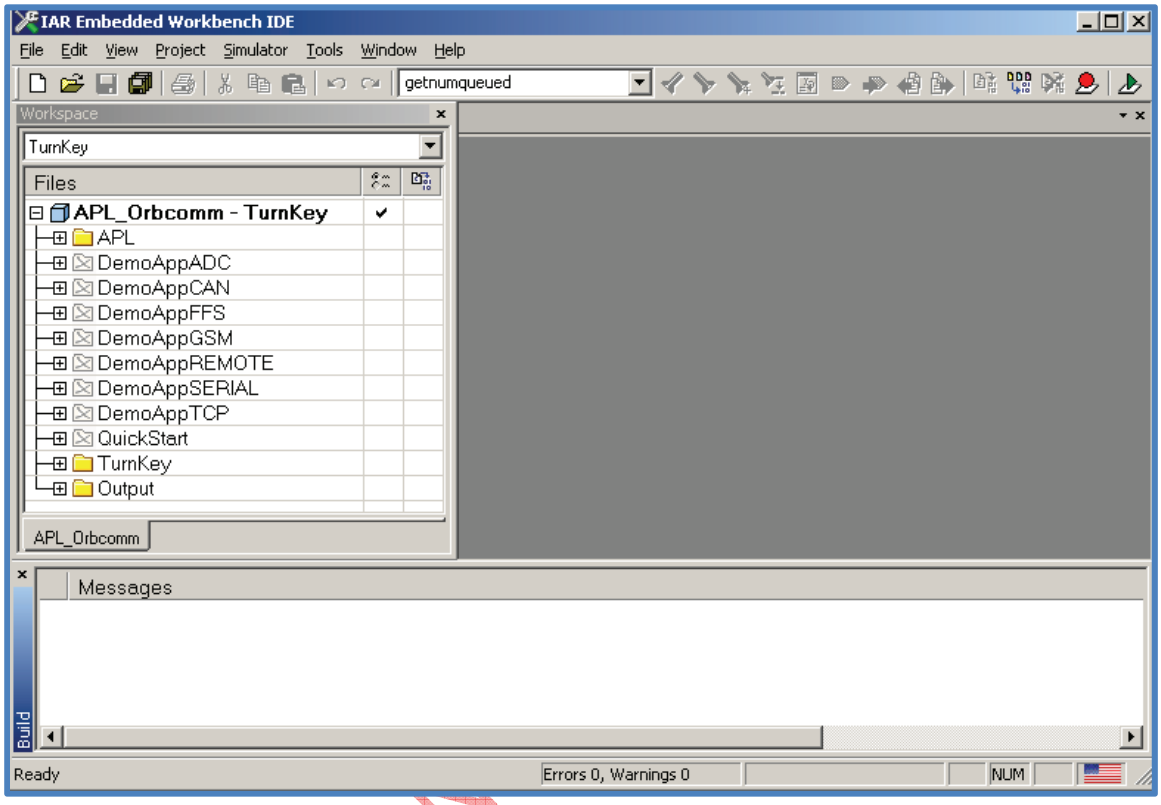

Figure 12-3: Turnkey application workspace in the IAR IDE

The files in this directory comprise an IAR compiled project that consists of a number of applications (Turnkey, DemoAppCAN, DemoAppFFS, etc.). Each of these applications demonstrates some capacity of the Q4000/QPRO product. The applications are supplied as templates for building custom applications in this project environment.

Note: It is not possible to create a new project environment in IAR and download a binary file from it. You must use the provided IAR project which contains the necessary parameters to load the Q4000/QPRO. Creating a new project and attempting to load the resulting binary file into the modem may cause unexpected behavior and may damage the modem.

We recommend that new customers begin with the Turnkey project. Before making any changes, build the project without modifying any of the code. This verifies that the IAR Workbench has been installed correctly.

To build the Turnkey project:

1. Select the **Project** drop-down menu and select **Make**, or use the F7 key as a shortcut to build the project.

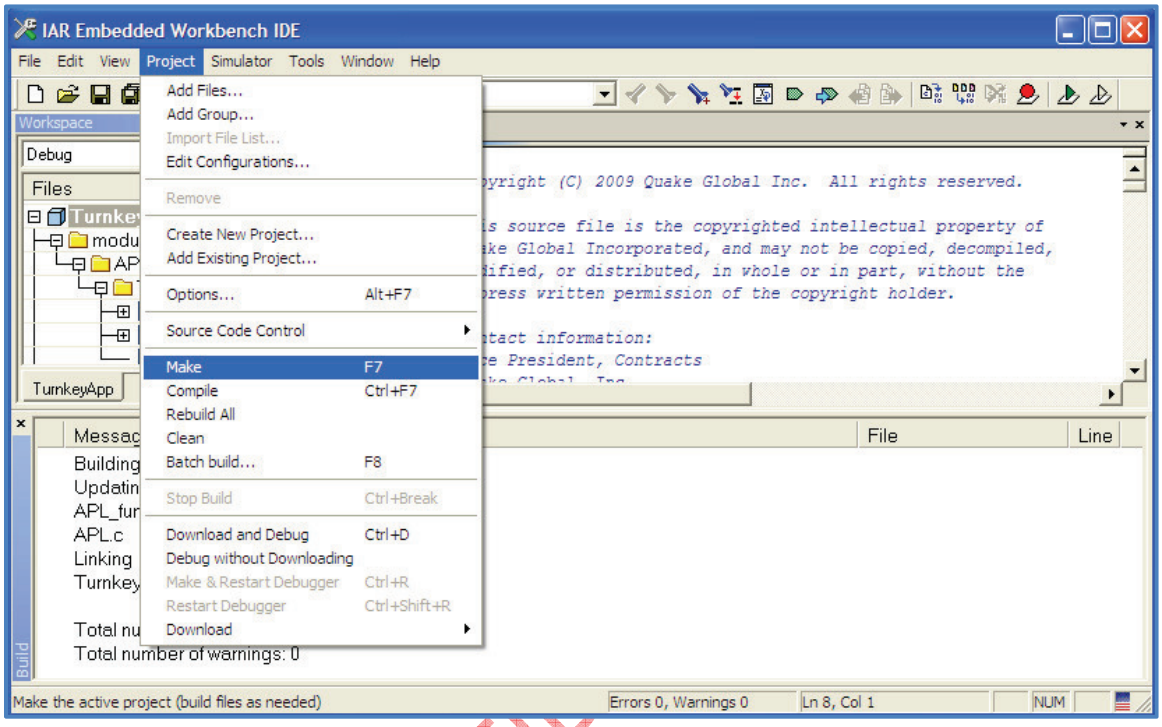

Figure 12-4: Project menu