DRAFT

This manual is based on the
GSP-1720 Satellite Data/Voice Module,
henceforth referred to as
GSP-1720 Satellite Data/Voice Module, or GSP-1720.
Software or hardware changes may
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Globalstar GSP-1720 Integrator Reference Manual

GS-07-1211

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REVISION HISTORY

	Release Date	Notes
Rev. A	February 2007	First Production Release

ABOUT THIS MANUAL

This *Globalstar GSP-1720 Satellite Data/Voice Module Integrator's Reference Manual,* also referred to as the *Integrator's Reference Manual*, provides the information needed to install and use the GSP-1720 Satellite Data/Voice Module, also referred to as the GSP-1720 and/or Module in this document.

Who Should Use This Manual

This manual is intended for the following users:

- People who set up the module on a bench for development and testing
- Application developers who create software applications that work with the GSP-1720 module
- Developers and integrators who service-program modules to make them work with Globalstar Service Providers
- Integrators who incorporate GSP-1720 module hardware into commercial products (for example, oil pipeline monitors)
- Field technicians who install those products incorporating the GSP-1720 module

Getting Started on page 1-1 includes a roadmap pointing different users to relevant sections in this manual.

How This Manual Is Organized

This following table summarizes how information is organized in this manual.

Chapter	Description
Chapter 1. Getting Started	Introduction to the GSP-1720 module.
Chapter 2. Quick Bench Set-Up	Quick instructions for connecting and powering up the module and sending commands via HyperTerminal.
Chapter 3. Service-Programming Modules	Coordinating with Service Providers and re-programming default module parameters.
Chapter 4. Making Calls	Quick tutorial on setting up a PC for packet data, making mobile-originated packet data calls, and using module ports. Overview of making mobile-originated and mobile-terminated voice calls.
Chapter 5. Developing Module Applications	Developing software applications that work with module features.
Chapter 6. AT Command Reference	Developer's reference for AT commands, syntax, and values.
Chapter 7. Integrating GSP-1720 Modules into Products	Hardware descriptions of the module and antenna, mounting guidelines, and environmental specifications.
Chapter 8. Troubleshooting	Suggested solutions for module problems.
Appendix A. RF Certification/ Restrictions	Certification compliance and RF restrictions for the module and antenna.
Appendix B. Warranty	QUALCOMM warranty information for the GSP-1720 module.
Appendix C. Product Support	How to contact QUALCOMM for technical support.
Appendix D. Specification Summary	Quick reference list of hardware specifications for the GSP-1720 module and antenna.

Chapter	Description
Appendix E. 22-Pin Molex Connector Specification	Reference to specifications for the connector.

Notational Conventions

The following table shows the notational conventions that convey specific types of information in this manual.

Convention	Description
`Commands, parameters, values, filenames, directory locations`	Items shown in `courier` typeface indicate commands, parameters, filenames, and directory locations.
`<Non-literal elements>`	Items shown within angle brackets and `<courier>` indicate non-literal elements for which you type a substitute.
Menu items and buttons	Menu items, commands, and buttons appear in **bold sans serif**.
Dialog box and window titles	Dialog box and window titles appear in **bold sans serif**.
Book titles and section references	Book titles and section references appear in *italics*.
 **Steps**	This symbol identifies "how-to" procedure. Follow these steps to accomplish a specific task.
 **Note**	This symbol identifies related information that deserves emphasis.
 **Tip**	This symbol identifies a shortcut or information that you might find handy.

Convention	Description
 **Caution**	This symbol identifies a potentially hazardous situation which, if not avoided, could damage equipment or property.
 **Warning**	This symbol and **bold text** identify potential danger, which, if not avoided, could cause serious injury or death.

Abbreviations and Acronyms

AC	Alternating Current
API	Application Programming Interface
AT	Attention
CCA	Circuit Card Assemblies
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CD-ROM	Compact Disc Read-Only Memory
CE	Community European
CFR	Code of Federal Rules
CP	Control Port
CTS	Clear To Send
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communications Equipment
DM	Diagnostic Monitor
DN	Directory Number
DNI	Do Not Install
DNS	Domain Name Server
DP	Data Port
DSR	Data Set Ready

DTE	Data Terminating Equipment
DTR	Data Terminal Ready
EIRP	Equivalent Isotropic Radiated Power
ESD	Electrostatic Discharge
ESN	Electronic Serial Number
FAX	Facsimile
FCC	Federal Communications Commission
FDX	Full-Duplex
GAI	Globalstar Air Interface
GEO	Geostationary-Earth-Orbit
GMT	Greenwich Mean Time
GND	Ground or Signal Common
GPS	Global Positioning System
GW	Gateway
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
ISP	Internet Service Provider
IWF	Interworking Function (Gateway)
LCD	Liquid Crystal Display
LEO	Low-Earth-Orbit
LNA	Low Noise Amplifier
MCC	Mobile Country Code
MCX	Miniature Coaxial Connector
MEO	Medium-Earth-Orbit
MNC	Mobile Network Code
MPE	Maximum Permissible Exposure
MSIN	Mobile Station Identification Number
MSS	Mobile Satellite System
NAM	Number Assignment Module
ODU	Outdoor Unit

OSPL	Overall Sound Pressure Level
PC	Personal Computer
PDF	Portable Document File
PDT	Pacific Daylight Time
PLS	Position Location Service
POS	Point of Sale; or Position
PPP	Point-to-Point Protocol
PST	Pacific Standard Time
PSTN	Public Switched Telephone Network
PT	Pacific Time
QA	Quality Assurance
RF	Radio Frequency
RFR	Ready For Receive
RI	Ring Indicator
RLSD	Received Line Signal Detector
RMA	Return Material Authorization
RSSI	Received Signal Strength Indicator
RTS	Ready To Send
RTU	Remote Termination Unit
Rx	Receive
RxD	Receive Data
SCADA	Supervisory Control and Data Acquisition
SLIP	Serial Line Internet Protocol
SMA	Subminiature type "A" Connector
SMS	Short Messaging Service
SMT	Surface Mount Technology
SP	Service Provider
SPC	Service Programming Code
TCP	Transmission Control Protocol

TCXO	Temperature Compensated Crystal Oscillator
TSS	Technical Support Specialist
TTL	Transistor Transistor Logic
Tx	Transmit
TxD	Transmit Data
UCT	Universal Coordinated Time
URL	Uniform Resource Locator
UT	User Terminal
UTC	Universal Time Coordinated
UTPST	User Terminal Program Support Tool
VPN	Virtual Private Network
VSWR	Voltage Standing Wave Ratio

Related Documentation

Globalstar UT Program Support Tool User's Guide, 80-98225-2.

Globalstar User Terminal Service Programming Guide, 80-98482-2.

Cautions and Warnings

Warning

Before working with the module hardware or power connections, remove rings, watches, and other metallic objects that could cause electrical shock or burns.

Caution

Use proper electrostatic discharge (ESD) equipment and procedures to avoid damage to the module.

Caution

Any changes or modifications to this equipment not expressly approved in this document could void your warranty and your authority to operate this equipment.

1 GETTING STARTED

Welcome to the *Integrator's Reference Manual* for the GSP-1720 Satellite Data/Voice Module.

The GSP-1720 offers data communication and voice solutions for Remote Monitoring and Supervisory Control and Data Acquisition (SCADA) applications in locations such as power substations, telecommunication concentration nodes, oil and gas wells, pipes, and offshore facilities.

Whether you are an application developer, system integrator, or service provider this *Integrator's Reference Manual* contains information you need.

	Go to:
n Bench-set up, connect, and power-up the GSP-1720 and get HyperTerminal to talk to the module	Chapter 2
n Service-program modules to work with your Service Provider (SP) and within the Globalstar system	Chapter 3
n Set up your computer for packet data and make a simple packet data call	Chapter 4
n Develop market-specific application software to work with the GSP-1720 (using packet data or asynchronous data)	Chapter 5
n Understand modem AT commands	Chapter 6
n Troubleshoot module problems	Chapter 7
n Mount GSP-1720s and antennas for market-specific products (including all hardware and environmental specifications)	Chapter 8

GSP-1720 Module Overview

The GSP-1720 Satellite Data/Voice Module delivers digital data communications wherever Globalstar data service is available, using QUALCOMM's patented CDMA technology and the Globalstar Communications System.

The GSP-1720 handles the following call types:

- *Packet* — over the Internet or other TCP/IP packet-switched network
- *Asynchronous* — routed through the Public Switched Telephone Network (PSTN) to a destination module
- *Voice* — mobile originated and mobile terminated.

Tip Globalstar packet data service has a lower overhead and faster connection time than asynchronous data does. If a SCADA application does not specifically need asynchronous data, it should use packet data instead.

Integrators directly integrate the GSP-1720 into a market-specific product, to resell to a business/industrial customer.

Note For information about buying bulk modules talk with Globalstar or one of it's Service Providers.

Typical Module SCADA Applications

In remote settings or difficult-to-access sites, acquiring and responding to process control and alarm data can be challenging and costly. The GSP-1720 Satellite Data/Voice Module provides real-time, low cost, bi-directional data communication solution applications in remote locations for fixed or mobile use.

The GSP-1720 lets you retrieve data automatically from remote sites. Unmanned sensors connected to the GSP-1720 can monitor remote operations and initiate alert notifications.

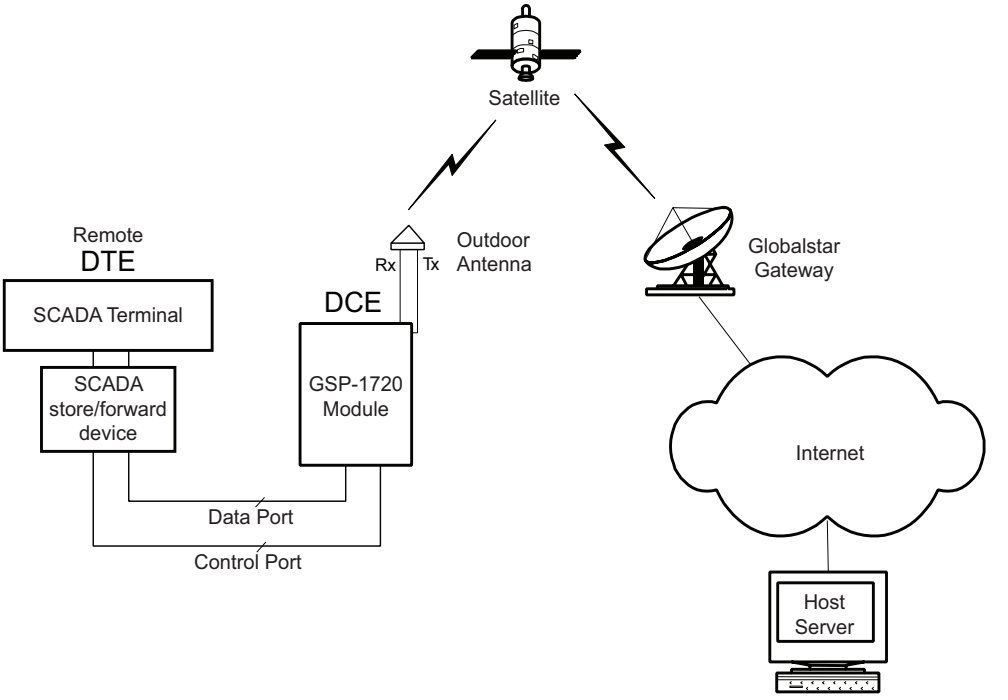
Table 1-1 lists some typical Remote Monitoring and Supervisory Control and Data Acquisition (SCADA) applications.

Table 1-1. Typical GSP-1720 Module Applications

Electric Utility Industry	Remote Security Systems Monitoring
Oil and Gas Wells, Tanks, Pipelines, Offshore Platforms	Energy Management
Water Treatment Plants	Retail Point of Sale (POS) Transactions
Remote Inventory Management	Remote Banking
Electronic Billboards	Agriculture
Highway Traffic Monitoring	Aircraft Weather/Messaging for Commercial and General Aviation

Figure 1-1 depicts a typical use of the GSP-1720 for a SCADA application using packet data.

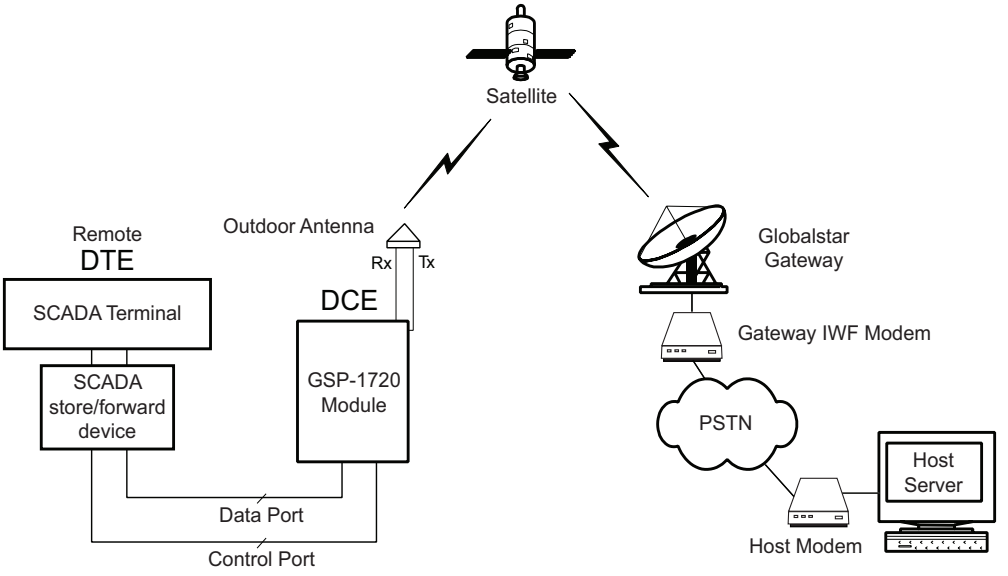
Figure 1-1. Typical Module SCADA Application Using Packet Data



For packet data connections, the GSP-1720 essentially functions as a "node" on the Internet and, with its static or dynamically assigned IP address, can be addressed in real time as often as necessary to maintain application control over the remote devices.

Figure 1-2 depicts a typical use of the GSP-1720 for a SCADA application using asynchronous data.

Figure 1-2. Typical Module SCADA Application Using Asynchronous Data



For asynchronous data connections, the GSP-1720 can dial or be dialed by a host modem, connecting through the Globalstar Satellite Communications System and the PSTN.

You can think of the GSP-1720 in Figure 1-1 and Figure 1-2 as a 9600 bps full duplex satellite modem. The module uses typical Hayes AT commands (see Chapter 6, *AT Command Reference*). Standard serial and USB interfaces facilitate ease of use and application integration.

For either packet or asynchronous connections, system integrators provide the host application (server), which uses the GSP-1720 to communicate with a custom SCADA application on data terminating equipment (DTE) at a remote site. The host application manages the field processing of data and reports process exceptions, performance reports,

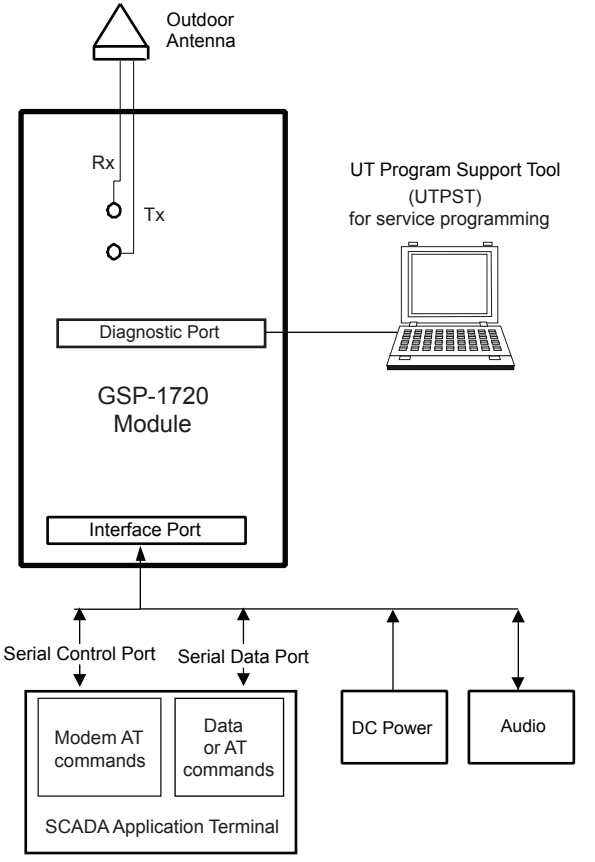
alarm conditions—in short, any data needed from the remote site.

For example, in the electric utility industry, a SCADA application using the GSP-1720 could remotely turn on a pump, close a switch, open a gate, request a new meter reading, monitor line voltage, or report on power outages.

Conceptual Overview

Figure 1-3 depicts a conceptual overview of the GSP-1720 Satellite Data/Voice Module, including its ports and antenna.

Figure 1-3. Conceptual Diagram of GSP-1720



Globalstar offers the GSP-1720 without a mechanical enclosure, anticipating that system integrators will integrate and package the module with the end-user's application.

The GSP-1720 is powered by an external power source provided by the user.

System integrators provide antenna cables (SMA to SMA connectors), to meet customer antenna-cable length needs and which meet Globalstar specifications.

A single 22-pin Molex (male) connector is used for the user interface port. The 22-pin Molex cable carries DC power, as well as the Data and Control RS-232 signals, between the SCADA application (DTE) and the module (DCE). It is also possible to use a USB cable to interface to the data port of the GSP-1720.

A Diagnostic port on the module allows network provisioning (service programming) and software upgrades. A standard USB cable can be used to connect to the Diagnostic Port.

Integrators who are packaging modems into end-user products will need to supply mounting enclosures and customized cables. For details, see *Integrating Modules into Products* on page 8-2.

2 QUICK BENCH SET-UP

This chapter tells how to quickly set up the GSP-1720 Satellite Data/Voice Module on a test bench, and includes the following topics:

- Connecting hardware components as appropriate for a bench setup
- Providing power to the module
- Setting up HyperTerminal to talk to the module and query its status, using AT commands

Keep in mind that the quick bench setup shown in this chapter differs from the setup you might use to develop applications, integrate modules permanently into other products, or for field installation.

For example, in the quick bench setup, you communicate with the module by typing AT commands into HyperTerminal, whereas a SCADA application will communicate with the module using AT commands embedded within its code.

To connect to the module ports and antenna, you need to build cables that meet the specifications documented in this manual.

Note Examples in this chapter assume you are connecting a Windows PC to the module.

Caution For your safety and to avoid potential damage to the equipment, observe the *Cautions and Warnings* on page xxiv.

Connecting Hardware Components

The setup process for the GSP-1720 includes:

- A quick tour of the module
- Instructions for connecting the module cables
  - Connecting the Interface cable (Data port, Control port, power, and audio) to the module and to your PC
  - Connecting the antenna cables (Tx, Rx) to the module
  - Connecting the Diagnostic cable to your PC
- Connecting and mounting the antenna
- Mounting the module (optional)
- Grounding the system
- Providing power to the module
- Setting up HyperTerminal to talk to the module and testing your connection

Tip A Windows PC is recommended for module bench setup and application development. Modules must be service programmed using the Globalstar UT Program Support Tool, which is a Windows software application.

A Quick Tour of the Module

Compare the GSP-1720 to Figure 2-1. This illustration shows the connectors and components you will use in the following sections.

Caution When handling the module, observe precautions necessary to avoid damage by electrostatic discharge (ESD).

Connecting the Module Cables

For the GSP-1720 to work, you must connect several cables:

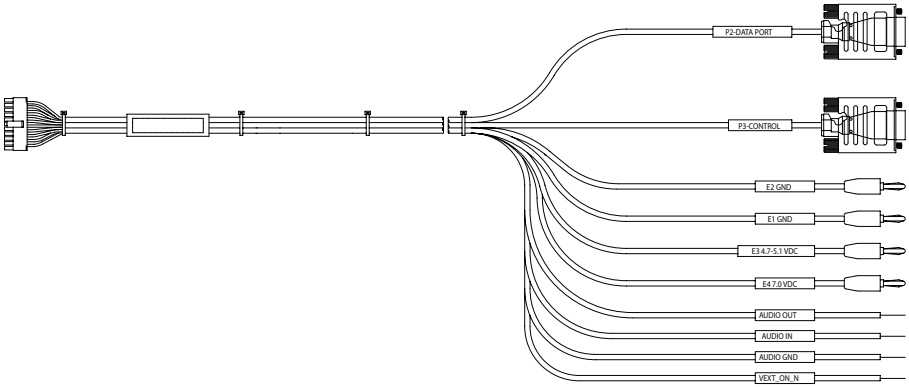
- Module interface cable — connects the Data port to a PC, connects the Control port to a PC (optional), and connects power leads to a DC power supply.

- Antenna cables — connect the transmit (Tx, J2) and receive (Rx, J1) leads to the Tx and Rx connectors on the antenna.
- Diagnostic cable — connects the Diagnostic port to a PC running the Globalstar UT Program Support Tool (UTPST) for module service programming.

Connecting the Module Interface Cable

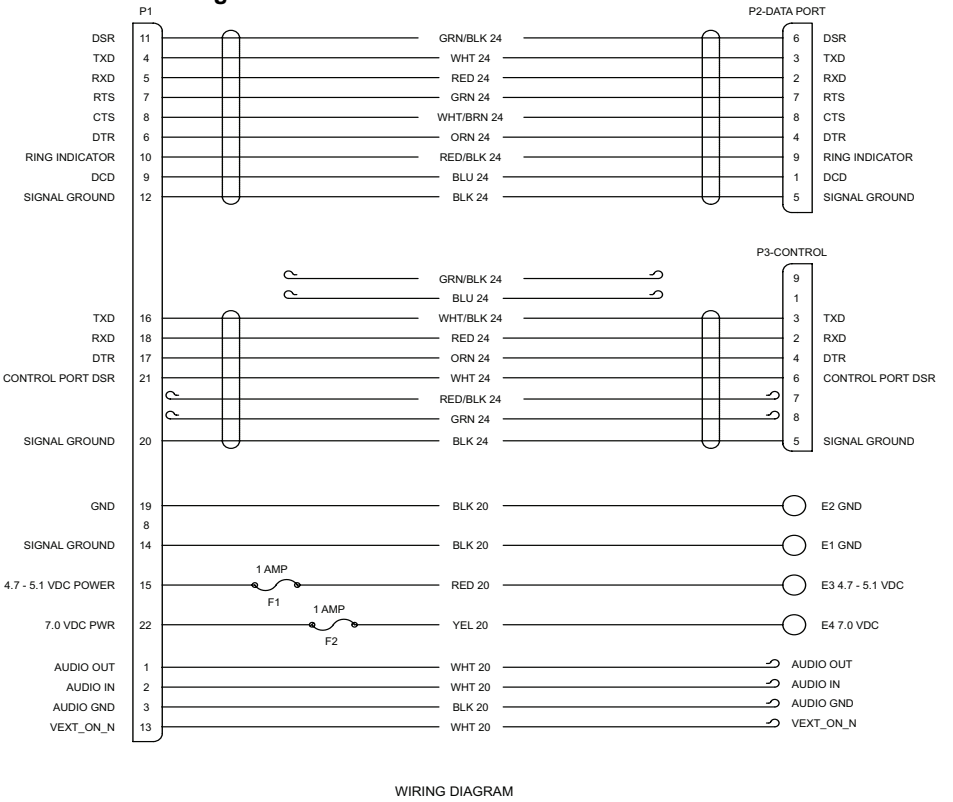
The module interface cable splits out the P2-Data Port and P3-Control Port, the DC power connectors (DC POWER, SIG GND, and VEXT_ON_N), and audio leads, as shown in Figure 2-1 and Figure 2-2.

Figure 2-1. Module Interface Cable



Note Integrators can purchase a Module Interface Cable from Globalstar or build their own Module Interface Cable.

Figure 2-2. Module Interface Cable Pinout



WIRING DIAGRAM

Steps

TO CONNECT THE INTERFACE CABLE TO THE MODULE

n Connect the interface cable (Figure 2-1*)* to the interface port on the module.

Do not connect power yet.

Steps

TO CONNECT THE INTERFACE CABLES TO YOUR PC

1. On the interface cable (Figure 2-1), connect the Data port connector (labeled "P2-DATA PORT") to COM 1 or another available serial COM port on your PC.

   The Data port transmits packet (PPP) or asynchronous data. You can also use it to send AT commands to the module. You will see an example of how this works in Chapter 4.

2. On the interface cable (Figure 2-1), connect the Control port connector (labeled "P3-CONTROL") to COM 2 or another available serial COM port on your PC (or a different PC, if desired).

   You can use the Control port to send AT commands to the module, without interrupting data flow on the Data port. You will see an example of how this works in Chapter 4. The Control port can also receive SMS messages; for information, see *Short Messaging Service (SMS)* on page 5-14.

Note

If you need to extend the interface cables to reach your PC(s), you can use straight RS-232 9-pin serial cables (with no crossovers). For maximum RS-232 extension cable lengths, see the TIA/EIA-232-E specification.

Connecting Antenna Cables

Note

For antenna cable specifications, see *Antenna Cable Specifications* on page 8-16. Care should be taken to use cables that are within the specification.

Integrators must supply custom antenna cables for their module applications.

Steps

TO CONNECT THE ANTENNA CABLES TO THE MODULE

1. Plug the cable marked "Tx" into the transmit (Tx) connector (**J2**) on the module, as shown in Figure 2-1.
2. Plug the Rx cable into the receive (Rx) connector (**J1**) on the module, as shown in Figure 2-1.

Connecting the USB Cable

The Diagnostic port lets you Service-program GSP-1720s, using the Globalstar User Terminal Program Support Tool (UTPST). For more information about the UTPST, see *UTPST Overview* on page 3-2.

When the cable is plugged in, Windows will prompt for installing the new driver. Point Windows to the host USB driver INF file supplied by Globalstar.

Steps

TO CONNECT THE USB CABLE

A standard USB cable can be used to connect to the Diagnostic port.

Connecting the Antenna

Since the antenna communicates with Globalstar satellites, it must be positioned outdoors where it has a clear view of the sky, clear down to the horizon in all directions, unimpeded by tall obstacles such as buildings and trees.

Steps

TO MOUNT THE ANTENNA

1. Locate the antenna outdoors where it has a clear view of the sky.

   The antenna must have a clear view of the sky to get a strong signal.
2. Plug the antenna cable that you labeled "Tx" into the transmit connector (also labeled Tx) on the antenna.

Make sure the other end of the cable is connected to the J2 connector on the module.

Caution You must be careful to connect the Tx connector on the antenna to the Tx connector on the module, and the Rx connector on the antenna to the Rx connector on the module. Crossing the Tx and Rx cables can damage the module.

3. Plug the other antenna cable into the receive (Rx) connector on the antenna.

Note For complete details about sealing the antenna to a flat mounting surface, or for information about mounting antennas on poles, see *Mounting Antennas at the Field Site* on page 8-17.

Mounting the Module

For quick bench set-up, you probably do not need to mount the module to a surface or in an enclosure, as it would be mounted in an integrator's product for use in the field.

If you do wish to fasten the module to a rigid structure, use mounting holes to tighten.

For details, see *Module Mounting Guidelines* on page 8-14. For details on acceptable environmental conditions for the module, see *Environmental Specifications* on page 8-19.

For a tip on how to mount the module and antenna using a box, see *Connecting the Antenna* on page 2-6.

Grounding the System

You have several options for grounding the module; see *Grounding* on page 8-12.

Caution The RF connector ground is the same as the signal and power ground. Incorrectly wiring these grounds could cause ground loops in the final installation.

Providing Power to the Module

The GSP-1720 requires input DC power of 4.7 V to 5.1 V, 1 Amp (maximum), with a maximum of 50 mV peak-peak ripple and noise.

You can power your bench module by using a DC power supply connected to the Interface cable — this allows you to monitor exact power levels.

The use of a fuse is strongly recommended in the DC power supply. A fuse with a minimum melting I^2t rating of 0.02 A^2 seconds will be sufficient. For complete details about DC power requirements and power supply impedances, see *DC Power* on page 8-9.

Note

The following power-on procedure is suitable for a bench setup. However, if you are developing module applications, follow the power-on process explained in *Power-On* on page 8-12.

Steps

TO POWER THE MODULE USING A DC POWER SUPPLY

1. Obtain an optional DC power supply, making sure that it meets the specifications described at the beginning of this section.
2. On the Module Interface cable (shown in Figure 2-1), locate the VEXT_ON_N (pin 13).

   The VEXT_ON_N pin is designed to power on the GSP-1720 whenever it is grounded. Electrically isolating the lead prevents it from grounding and inadvertently resetting the module.
3. Plug the DC POWER (red) and SIG GND (black) leads from the Module Interface cable into your DC power source.
4. Turn on the power supply.

   You are now ready to use the module.
5. There are 2 LEDs:

   - Power (PWR) turns on when power is present

- Software Heartbeat (SWHB) blinks when the module is running

Setting Up HyperTerminal to Communicate to the Module

To communicate with the module you will need HyperTerminal or a similar program on your computer. If you are using an operating system other than Windows, you can use any application that can communicate with a serial port.

Note

For bench setup, you probably want to run HyperTerminal on the computer connected to the Control port of the module. For testing purposes, you can run two different HyperTerminal sessions, one connected to the Control port and one connected to the Data port.

Steps

TO SET UP HYPERTERMINAL AND CONNECT TO THE MODULE

1. Set up HyperTerminal with the correct port and speed information for the appropriate port (or both ports, if you have two HyperTerminal sessions).

Table 2-1. Default Port Configuration

Port	Set to:
Diagnostic Port	USB
Data Port	RS-232
Control Port	None

The following are the recommended HyperTerminal settings for the Control and Data ports:

Name	Control port: GSP1720_Control Data port: GSP1720_Data
Connect using	Computer COM port connected to module Control port or Data port
Bits per second	Control port: 9600 (fixed) Data port: 19200 (range of 300 to 38400)
Data bits	8
Parity	None
Stop bits	1
Flow control	Control port: None Data port: Hardware (default and recommended, but can vary from None to Software)

2. In HyperTerminal, click **OK** to accept the settings.

   HyperTerminal automatically attempts to connect to the module. Once it has connected you should see the following within a few seconds:

   ```
   SELF TEST RESULT: OK
   ```

   Note: The `SELF TEST RESULT` message appears only during module power-up. If the module is already powered up, proceed to step 3.

3. Type `AT` and press **Enter**.

   If the HyperTerminal port connection is correctly configured, the module should respond with:

   ```
   OK
   ```

Tip You can connect to the module at any time by clicking HyperTerminal's **Connect** button.

Testing the Module Setup

To ensure that the module was set up correctly and that the ports are working, you can check the following:

- Control port baud rate
- Data port baud rate

Steps

TO CHECK THE BAUD RATE ON THE CONTROL PORT

1. Look at the Status bar at the bottom of the HyperTerminal window.

   It should read "9600 8-N-1." The Control port has a fixed baud rate of 9600. Be sure HyperTerminal is configured accordingly.

2. To confirm that HyperTerminal can communicate with the module, type `AT` and press **Enter**.

   The module should respond with:

   `OK`

Note

Control port should be enabled.

Steps

TO CHECK THE BAUD RATE ON THE DATA PORT

n From HyperTerminal (probably on the Control port), type:

`AT+IPR?` and press **Enter**.

The module should respond with the following:

`+IPR: 19200` (or whatever the current baud rate is)

19200 is the default setting for the Data port; it has a range of 300 to 38400. If you change the baud rate setting for the module's Data port, be sure to configure HyperTerminal accordingly.

Note You can enter `AT+IPR?` on either the Control port or the Data port, but it always responds with the baud rate of the Data port.

Note Control port should be disabled.

Resetting or Powering Off the Module

This section suggests some procedures suitable for resetting or powering off your bench module.

If you are developing module applications, you should consider additional issues for these topics, in the following sections: *Power-Off* on page 8-12 and *Hard Power Reset* on page 8-12.

Steps

TO RESET THE MODULE

1. On the Module Interface cable (shown in Figure 2-1), locate VEXT_ON_N (pin 13).
2. Raise the voltage to the VEXT_ON_N pin for 2 seconds, then ground the pin to reset the module.

Steps

TO POWER OFF THE MODULE

1. If you are running a HyperTerminal session, disconnect from the module by clicking HyperTerminal's **Disconnect** button.
2. Disconnect or close all other applications accessing the module's serial ports (such as another HyperTerminal session or the Globalstar User Terminal Program Support Tool [UTPST]). It is not necessary to physically unplug the Module Interface cable or Diagnostic cable from the module.
3. You can now safely disconnect the power supply from the module. Another option is to raise the voltage on the Power Enable Pin (pin 3).

Where to Go Next

Now that the GSP-1720 has power and you can communicate with it, here is where to go next:

	Go to:
n Service-program the module to work within the Globalstar system and with your Service Provider	Chapter 3
n Check whether the module has Globalstar service n Make a packet data call from the module, over-the-air	Chapter 4
n Develop software applications to work with GSP-1720 features, including Data and Control ports, Short Messaging Service, Globalstar alerts, position location determination, packet data, IP addressing, asynchronous data, mobile-originated and mobile-terminated data calls	Chapter 5
n Refer to syntax, descriptions, and values for supported AT commands	Chapter 6
n Integrate GSP-1720 s into market-specific products n Refer to a hardware description of the module, including mechanical descriptions, specifications, user interfaces, port signaling and pinouts, and grounding n Mount modules in enclosures n Mount antennas on-site n Refer to module hardware and environmental specifications	Chapter 7

3 SERVICE-PROGRAMMING MODULES

GSP-1720 Satellite Data/Voice Modules work within the Globalstar satellite system, using “airtime” offered by a Service Provider (SP). To operate, each GSP-1720 must be service programmed, meaning that certain key parameters (such as the Globalstar IMSI) must be configured to work with the SP.

For service programming, you connect the module’s Diagnostic port to a Windows XP PC, using a USB cable. On the PC, you run the Globalstar User Terminal Program Support Tool (UTPST).

This chapter discusses how to coordinate with your SP to service-program GSP-1720s, including the following topics:

- UTPST overview
- Using the UTPST
- Re-programming default parameters
- Bulk-programming modules
- Upgrading module software

This chapter does not discuss how to install the UTPST software, nor does it provide complete details on how to use the UTPST.

Note

For detailed UTPST information, see the *Globalstar UT Program Support Tool User’s Guide (*80-98225-2). For details about all service programming parameters, see the *Globalstar User Terminal Service Programming Guide* (80-98482-2).

UTPST Overview

The Globalstar User Terminal Program Support Tool (UTPST) lets you view, change, and save information pertaining to a Globalstar User Terminal (module or phone). You can:

- Configure system settings (that is, service program), either directly via the UTPST's graphical user interface, or by writing scripts that access the UTPST's Scripting API.
- Save configuration settings to a UTPST file or open them from a file.
- Configure and generate summary data files.
- View module information or statistics.
- Upgrade module software.

Note To order Globalstar User Terminal Program Support Tools, contact Globalstar or one of its Service Providers.

Using the UTPST

This section tells how to connect the Diagnostic cable to a module in preparation for using the UTPST.

Steps

TO CONNECT A MODULE TO A PC FOR USING THE UTPST

n Connect a USB cable to the Diagnostic port on the module and to an available USB port on your PC, as shown in *Connecting the USB Cable* on page 2-6.NEED 1-6 HERE

Steps

TO INSTALL, RUN, AND USE THE UTPST

n See the *Globalstar UT Program Support Tool User's Guide (*80-98225-2) instructions.

Note Connecting the UTPST to a module requires you to enter a valid six-digit Service Programming Code (SPC). Use the default SPC (six zeros: `000000`) unless you have been given another one.

Re-programming Default Parameters

A GSP-1720 leaves the factory with a default set of service programming parameters. Before the module can be activated in the field, you must re-program some of those defaults with valid activation values for the module's particular Service Provider (SP), country, and Gateway.

Caution The first time you use the UTPST, or before you re-program any values, make a backup copy of the UTPST parameter file.

Refer to Table 3-1 for a list of key parameters you must set, then ask your SP for the values to program.

All parameters not mentioned in Table 3-1 are set either to a factory default value or to a value specified by the Service Provider. The module will operate with those default values, but you could also re-program them, as desired, if your Service Provider so directs.

Tip For more information about all service programming parameters, including defaults and value ranges, see the *Globalstar User Terminal Service Programming Guide* (80-98482-2).

Table 3-1. Service Programming Parameters You Must Set

Parameter / Default	Description	Action Required for the Module to Operate
Globalstar IMSI (Mobile Country Code component) Factory default: Unprogrammed	The 3-digit Mobile Country Code (MCC) component of the Globalstar International Mobile Subscriber Identity (IMSI). The MCC component of the IMSI is generally the same as the Home Service Provider MCC (but could be different based on the activating SP's requirements).	Re-program this parameter from the factory default setting to a valid MCC, in accordance with the activating SP's instructions. Where in UTPST: *Globalstar NAM* dialog
Globalstar IMSI (Mobile Network Code component) Factory default: Unprogrammed	The 1- to 3- digit Mobile Network Code (MNC) component of the Globalstar IMSI. The MNC component of the IMSI is generally the same as the Home Service Provider MNC (but could be different based on the activating SP's requirements).	Re-program this parameter from the factory default setting to a valid MCC in accordance with the activating SP's instructions. Where in UTPST: *Globalstar NAM* dialog
Globalstar IMSI (Mobile Station Identification Number (MSIN) Factory default: Unprogrammed	The mobile station identification number (MSIN) component of the Globalstar IMSI.	Re-program this parameter from the factory default setting to a valid MSIN in accordance with the activating SP's instructions. Where in UTPST: *Globalstar NAM* dialog
Globalstar Home Gateway Channel Factory default: Unprogrammed	The home gateway channel on which the module should look for service. Can be a value from 1 through 124.	Re-program this parameter from the factory default setting to a valid Home Gateway channel in accordance with the activating SP's instructions. Where in UTPST: *Globalstar NAM* dialog

Table 3-1. Service Programming Parameters You Must Set (continued)

Parameter / Default	Description	Action Required for the Module to Operate
Globalstar Home Gateway ID Factory default: Unprogrammed	A numerical identifier representing the Globalstar Home Gateway.	Re-program this parameter from the factory default setting to a valid Home Gateway ID in accordance with the activating SP's instructions. Where in UTPST: *Globalstar NAM* dialog
Globalstar Home Service Provider Mobile Country Code (MCC) Factory default: Unprogrammed	The 3-digit mobile country code (MCC) representing the Home Service Provider. Typically, the Globalstar Home Service Provider MCC is the same as the MCC component of the Globalstar IMSI (but could be different based on the SP's requirements).	Re-program his parameter from the factory default setting to a valid Globalstar Home Service Provider MCC. Where in UTPST: *Globalstar NAM* dialog
Globalstar Home Service Provider Mobile Network Code (MNC) Factory default: Unprogrammed	The 1- to 3-digit mobile network code (MCC) representing the Home Service Provider. Typically, the Globalstar Home Service Provider MNC is the same as the MNC component of the Globalstar IMSI (but could be different based on the SP's requirements).	Re-program his parameter from the factory default setting to a valid Globalstar Home Service Provider MNC. Where in UTPST: *Globalstar NAM* dialog

Bulk-Programming Modules

If you need to service-program modules in bulk, for instance to be shipped with a system integrator's market products, you have several options to accomplish this, as shown in Table 3-2.

Table 3-2. Bulk Service-Programming Options

Programming Option	For More Information
Program each module individually, using the UTPST's graphical user interface.	See the *Globalstar UT Program Support Tool User's Guide*, (80-98225-2), Chapter 5, "Configuring Phone Settings"; and the *Globalstar User Terminal Service Programming Guide* (80-98482-2).
Customize the supplied generic PST file, K2_generic.pst, located in the UTPST's installation directory.	
Use another process as required by the activating Service Provider.	Ask your Service Provider for details.

Caution Using the PST file from one module to program other modules will invalidate the calibration data. Care must be taken to preserve calibration data when using scripts to service program modules.

Upgrading Module Software

Sometimes it might be desirable or necessary to upgrade the software on a GSP-1720. All Globalstar-specific code, user interface code, and module code resides in the application software.

Once you obtain a software upgrade file from Globalstar Technical Support, you can use the UTPST to load it onto the module.

Steps

TO DETERMINE THE MODULE'S CURRENT SOFTWARE VERSION

1. Connect your PC to the module as described in *Using the UTPST* on page 3-2 and run the UTPST.
2. In the UTPST's **Phone** menu, select **Show Phone Information**.

   The Phone Information dialog appears, including the UT Software Version Information, for example, "R7.1.1.4.1"

Steps

TO UPGRADE MODULE SOFTWARE

1. Obtain a software upgrade file from Globalstar Technical Support. To contact Technical Support, see Appendix C.
2. Connect your PC to the module and run the UTPST.
3. Follow the procedures documented in the *Globalstar UT Program Support Tool User's Guid*e, Chapter 8, "Upgrading Phone Software."

Programming Module Port Configuration

As described in Chapter 2, Quick Bench Set-Up, the default port configuration is:

- Diagnostic port set to USB
- Data Port set to RS-232
- Control Port disabled

However, the integrator has the flexibility to configure ports in different combinations. This allows flexibility to configure the port according to their requirements or needs.

Diagnostic Port

The Diagnostic port can only be USB. However, a QUALCOMM Proprietary driver or Microsoft Windows driver option could be used for the USB port.

Steps

TO USE THE QUALCOMM PROPRIETARY DRIVER FOR THE DIAGNOSTIC PORT

1. Set NV_UI_SERIAL_INTERFACE NV to UI_SERIAL_INTERFACE_DATA_AND_DMI.

   This could be done by setting the AT$QCDMI command to 0 (AT$QCDMI=0<cr>) or use UI menu (Menu 4, 00, 000000, 9) to set the preference to **Data+DMI** option.

Note

The default configuration for the Diagnostic port is to use the Microsoft Windows USB driver. The UI menu can be accessed using the **Phone emulation** option in the UTDM application.

2. Reset the module and connect a standard USB cable to the module. Windows will prompt for installing the new USB driver. Point Windows to the QUALCOMM USB driver supplied by Globalstar.

   The Diagnostic port will show up as a "QUALCOMM Diagnostic Port" in the Windows device manager.

For more information on the installation process and the QUALCOMM USB driver, see Chapter 4 of the USB Host Driver for Windows 2000/Windows XP User Guide, 80-V4609-1 Rev H document.

Steps

TO USE THE MICROSOFT WINDOWS DRIVER FOR THE DIAGNOSTIC PORT

1. Set NV_UI_SERIAL_INTERFACE NV to UI_SERIAL_INTERFACE_DMI_ONLY.

   This can be done by setting the AT$QCDMI command to 2 (AT$QCDMI=2<cr>) or use UI menu (Menu 4, 00, 000000, 9) to set the preference to **DMI only** option.

2. Reset the module and connect a standard USB cable to the module. Windows will prompt for installing the new

USB driver. Point Windows to the USB driver INF file supplied by Globalstar.

The Diagnostic port will show up as a “Communication Port” in the Windows device manager.

Data Port

Three different options can be used for Data port. Each option is described in the following sections.

Steps

TO USE THE MICROSOFT WINDOWS USB DRIVER FOR THE DATA PORT

1. Set NV_UI_SERIAL_INTERFACE NV to UI_SERIAL_INTERFACE_DATA_ONLY.

   This can be done by setting the AT$QCDMI command to 1 (AT$QCDMI=1<cr>) or use UI menu (Menu 4, 00, 000000, 9) to set the preference to **Data only** option.

2. Reset the module and connect a standard USB cable to the module. Windows will prompt for installing the new USB driver. Point Windows to the USB driver INF file supplied by Globalstar.

   The Data port will show up as a “Communication Port” in the Windows device manager. HyperTerminal can be used to issue AT commands.

Steps

TO USE THE QUALCOMM USB DRIVER FOR THE DATA PORT

1. Set NV_UI_SERIAL_INTERFACE NV to UI_SERIAL_INTERFACE_DATA_AND_DMI.

   This can be done by setting the AT$QCDMI command to 0 (AT$QCDMI=0<cr>) or use UI menu (Menu 4, 00, 000000, 9) to set the preference to **Data+DMI** option.

2. Reset the module and connect a standard USB cable to the module. Windows will prompt for installing the new

USB driver. Point Windows to the QUALCOMM USB drivers supplied by Globalstar.

The Data port will show up as a module in the Windows device manager. HyperTerminal can be used to issue AT commands.

Steps

TO USE THE SERIAL PORT

1. Set NV_UI_SERIAL_INTERFACE NV to UI_SERIAL_INTERFACE_DMI_ONLY.

   This can be done by setting the AT$QCDMI command to 2 (AT$QCDMI=2<cr>) or use UI menu (Menu 4, 00, 000000, 9) to set the preference to **DMI only** option.

2. Reset the module. Connect the Data port to the PC using a standard RS-232 cable.

Control Port

The Control port always uses the RS-232 port. Connect the Control port to the PC using a standard RS-232 cable.

Note

To use Control port to process AT command, NV_SDVM_AUX_PORT_USE, the NV item should be set to AUX_PORT_IS_CTL.

Note

The AT$QCCTL command can be used to set the control port configuration. For details, see *Display Current Memory Usage ($QCMEM)* on page 6-75.

Table 3-3. Port Configuration

Port Configuration	Diagnostic Port	Data Port
DATA + DMI Option	USB (QUALCOMM USB Driver)	USB (QUALCOMM USB Driver)

Table 3-3. Port Configuration

Port Configuration	Diagnostic Port	Data Port
DATA Only Option	None	USB (Microsoft Windows USB Driver)
DMI Only Option	USB (Microsoft Windows USB Driver)	RS-232 (Data Port)

Table 3-4. Control Port Configuration

AUX_PORT_NONE	Data port should be used for AT command
AUX_PORT_IS_CTL	Control port should be used for AT command
AUX_PORT_IS_NMEA	Control port can be used for NMEA sentences

Note

The SDVM supports NMEA 0183 Version 2.30. The module provides to the Gateway the position information contained in the NMEA sentences. This improves the Gateway's position determination computation. When the auxiliary port is configured for NMEA, its configuration is: baud rate=4800, data bits=8, parity=none, and stop bits=1. Since the module is a DCE and most GPS devices are usually DCEs, a NULL modem may need to be inserted between the module and the GPS device. The module only parses the following NMEA sentences:

- Global Positioning System Fix Data (GGA)
- Recommended minimum specific GPS/Transit data (RMC)
- Track made good and ground speed (VTG)

4 MAKING CALLS

This chapter provides a quick tutorial that demonstrates making packet data calls from the GSP-1720 Satellite Data/Voice Module, including the following topics:

- Checking module status
- Making packet data calls from a data port
- Making mobile-originated and mobile-terminated voice calls

This chapter assumes that you have connected your module as described in Chapter 2 and configured necessary service programming parameters as described in Chapter 3.

In addition, examples in this chapter assume you have a Windows PC connected to the module, where Windows deals with the TCP/IP and PPP protocols. When you develop embedded SCADA applications, you can use off-the-shelf protocol stacks or write your own.

Note For more detailed information about making packet data calls, see *Using Packet Data* on page 5-18. For information about making asynchronous data calls, see *Using Asynchronous Data* on page 5-26.

Note The examples in this section assume the Data port is being used for AT commands and the Control port is disabled.

Checking Module Status

As you test a GSP-1720 and develop applications for it, you will often find it helpful to check the module's status.

The `AT$QCSTATUS` command provides important information about the module, including whether it can "see" the

Globalstar Gateway, how strong the Globalstar signal is, whether the module has registered with the Gateway, and the current call state.

In this case, you will be able to tell whether the module has been connected and service programmed properly, and thus has Globalstar satellite service to the Gateway.

Steps

TO CHECK MODULE STATUS

1. Open a HyperTerminal session connected to the Data port as described in *Setting Up HyperTerminal to Communicate to the Module* on page 2-9, then type:

   `AT$QCSTATUS` **<Enter>**

   The module should respond with a status report similar to the following:

```
SERVICE AVAILABLE: YES
SERVICE MODE:GLOBALSTAR
PROVIDER:<your Service Provider's name>
GATEWAY:<your Gateway's number>
RSSI:<a number from 1 to 4>
REGISTRATION:<YES>
ROAMING:<NO>
CALL STATE:<IDLE>
CALL TYPE:
CALL DURATION:<0 or duration of last/current call>
CALL NUMBER:<number>

OK
```

Table 4-1. AT$QCSTATUS Response Description

Service Status	Brief Description
SERVICE AVAILABLE	YES if the module has acquired Globalstar service; otherwise NO.
SERVICE MODE	Current service mode (e.g., Globalstar).
PROVIDER	Current Service Provider.
GATEWAY	Gateway number (in decimal).
RSSI	Received signal strength, from 0 (no signal) to 4 (strong signal).

Service Status	Brief Description
REGISTRATION	Current registration status of the module with the Gateway: NO (not registered) or YES (registered)
ROAMING	YES if roaming. NO otherwise.
CALL STATE	Current call state, e.g., IDLE.
CALL TYPE	Service Option being used in the current call (such as Voice, TIA_PPP, TIA_ASYNC, Markov, Loopback; or blank when no call is in progress).
CALL DURATION	Duration of the ongoing call or the last completed call.
CALL NUMBER	Most recently called or currently calling number.

If the module and antenna have been set up and service programmed correctly, SERVICE AVAILABLE should say YES, RSSI should show a signal strength number other than 0, and REGISTRATION should be YES. If the module has service and is registered, you can make packet data calls. If not, see Chapter 7, *Troubleshooting*.

Tip

For more information about the module status elements returned by the AT$QCSTATUS command, see *Service Status ($QCSTATUS)* on page 6-64.

Making Packet Data Calls

This section shows how to make mobile-originated packet data calls from the GSP-1720 by sending an AT command from HyperTerminal to the Data port.

In the process, you get a brief introduction to using the module's Data and Control ports.

Tip

For complete details about making calls and understanding module port arbitration issues, see *Developing Module Applications* on page 5-1.

Making a Call from the Data Port

You can make a data call by entering AT commands in HyperTerminal connected to the module's Data port. You will be able to see the packets streaming, just as a demonstration that the module can make a packet data call.

Steps

TO MAKE A PACKET DATA CALL USING AT COMMANDS ON THE DATA PORT

1. Make sure HyperTerminal is set up on the PC connected to the module's Data port, as described in *Setting Up HyperTerminal to Communicate to the Module* on page 2-9.
2. In HyperTerminal, initiate the call on the Data port by typing `ATD#777`.

   #777 is a special number that tells the module to establish a packet data call. HyperTerminal responds with `CONNECT`. You will see random characters streaming on the screen, with an initial tilde "~" character to indicate that this is packet data.

Making Voice Calls

Making Mobile Originated Voice Calls

AT commands can be used to make mobile originated voice calls.

Steps

TO MAKE MOBILE ORIGINATED VOICE CALLS

1. Type `AT$QCSTATUS` **<Enter>**.

   Make sure module is not on call (`CALL STATE` in the command response should be `IDLE`).

2. Type `AT+CDV=<dial string>` **<Enter>**.

   `<dial string>` is the number the module is calling.

3. To terminate the call type `AT+CHV` **<Enter>**.

Making Mobile Terminated Voice Calls

AT commands can be used to make mobile terminated voice calls.

Steps

TO MAKE MOBILE TERMINATED VOICE CALLS

1. `RING` indication appears on Hyperterminal when the module receives an incoming voice or data call.
2. Type `AT$QCSTATUS` **<Enter>**.

   Make sure the module is receiving a voice call (`CALL STATE` and `CALL TYPE` must be used to determine that the incoming call is a voice call).
3. Type `AT$QCCAV` **<Enter>**.

   The AT command answers the incoming voice call.
4. To terminate the call type `AT+CHV` **<Enter>**.

Note

ATS0 (Auto Answer) command does not auto answer voice calls.

5 DEVELOPING MODULE APPLICATIONS

This chapter discusses developing market-specific software applications to work with the GSP-1720 Satellite Data/Voice Module, particularly Remote Monitoring and Supervisory Control and Data Acquisition (SCADA) applications.

A GSP-1720 functions as a 9600 bps full duplex satellite modem. Applications communicate with the module using standard Hayes Modem AT commands, or initialization strings.

This chapter includes the following topics:

- Recommended development tools
- SCADA application components
- Packet/asynchronous data overview
- Module application scenarios
- Working with module features (including using Data and Control ports, Globalstar satellite service, Short Messaging Service, Globalstar alerts, and position location determination)
- Using packet data (including networking software and PPP sessions, IP addressing, mobile-originated and mobile-terminated packet data calls, and roaming)
- Using asynchronous data (including mobile-originated and mobile-terminated asynchronous data calls, accessing packet data over an asynchronous connection, and roaming)
- Typical modem initialization strings

Note For complete reference information about all modem-supported AT commands, including syntax, descriptions, default values, and results returned, see Chapter 6, *AT Command Reference*.

Recommended Development Tools

The following tools are recommended for developing GSP-1720 applications:

- A Windows computer
- HyperTerminal (or any program that talks to a serial port) for testing AT command strings
- Perl — however, you can use whatever programming language you choose (for example, C)

SCADA Application Components

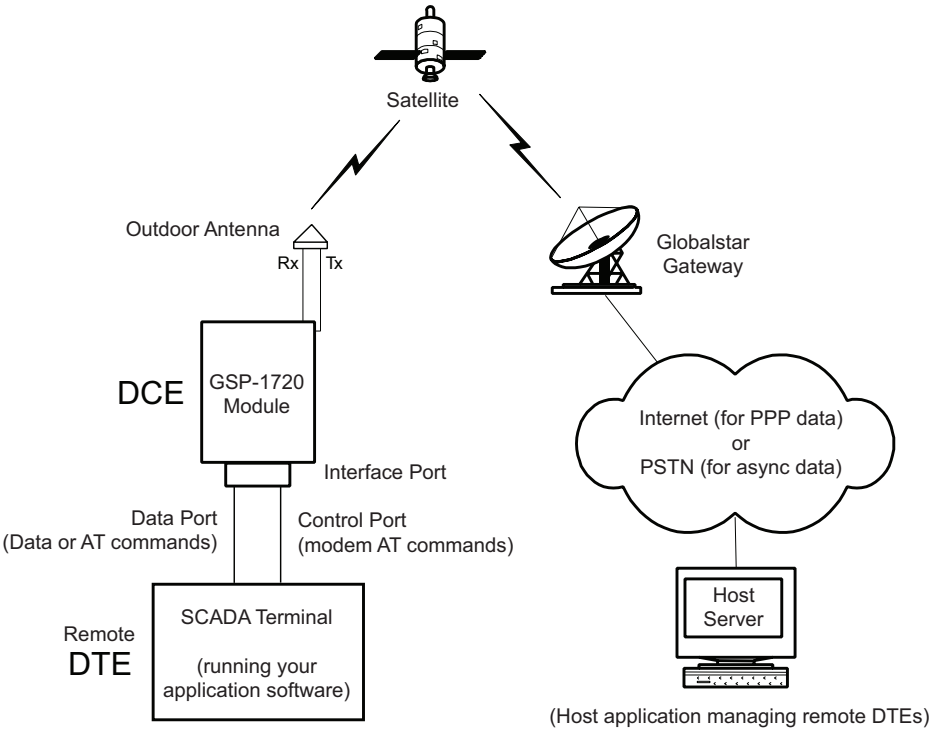
Working with a GSP-1720, a SCADA application can retrieve process control and alarm data automatically from remote sites, using unmanned sensors to monitor operations and initiate alert notifications.

Figure 5-1 shows the basic components of a SCADA system integrator application that sits on top of the module's software, where:

- The module serves as the DCE (data communications equipment) at the remote site.
- Your SCADA application serves as the DTE (data terminating equipment) at the remote site, communicating with software in the module through AT commands sent to either the module's Control or Data ports.
- Data flows to and from the module over-the-air, using the Globalstar satellites and Gateways connected to the Internet (for packet data) or to the PSTN (for asynchronous data).

- A host application (server) manages remote sites (DTEs); for example a host application might manage data from numerous remote oil or gas wells.

Figure 5-1. DCE-DTE Application Components



Packet/Asynchronous Data Overview

The GSP-1720 handles both *packet* and *asynchronous* data connections. For a particular SCADA application, one may be more suitable than the other. Table 5-1 compares the two types of data.

Tip Globalstar packet data service has a lower overhead and faster connection time than asynchronous data does. In general, if a SCADA

application does not specifically need asynchronous data, use packet data instead.

For more details about implementation issues specific to one type of data or the other, see *Using Packet Data* on page 5-18 and *Using Asynchronous Data* on page 5-24.

Table 5-1. Packet vs. Asynchronous Data

	Asynchronous Data
Connects through a Globalstar Gateway to the Internet.	Connects through a Globalstar Gateway and the PSTN to a remote host modem.
Packet data is transmitted over the Internet to a host server.	Asynchronous data is transmitted to a dial-up modem or modem bank, which must be supplied by the host.
Typically establishes connection within 2-3 seconds.	Typically establishes connection in approximately 30-60 seconds, due to modem negotiation and training time.
No long distance charges apply, because a connection is made directly to the Internet.	PSTN long distance charges may apply.
Degradation of service (in the transmission of packets) could occur, depending on Internet connections and routing.	Degradation of service could occur, depending on the quality of lines over the PSTN. (A noisy PSTN line can lower the data transmission rate or introduce errors into the data stream.)
May require a VPN and software to get past firewalls.	May be able to directly connect inside a firewall.
Mobile-terminated calls require either a static public IP address, or a static private IP address and VPN tunnel to the Gateway (see *Mobile-Terminated Packet Data Calls* on page 5-22).	Mobile-terminated calls can be achieved by having the host modem dial the phone number of the GSP-1720.

Module Application Scenarios

Depending on the requirements of your SCADA or system integrator application, you can configure the GSP-1720 to

work in many different ways, using many different features. The following are sample scenarios for how the module might work in a SCADA setting:

- **Scenario 1** — A periodic application:
  - No auto-answer.
  - Application powers on the module periodically (perhaps once a day), queries host for data, then turns off.
  - Application powers on the module periodically and sends data to the host.
  - Useful where power usage is critical, perhaps due to limited battery charge.
- **Scenario 2** — Asynchronous data application:
  - The SCADA application keeps the GSP-1720 powered up to accept incoming calls.
  - A modem at the host server dials the GSP-1720, which toggles the Ring Indicator (RI).
  - The SCADA application decides whether to answer the asynchronous call.
- **Scenario 3** — Full-time packet data on-demand:
  - The module can both generate data or accept it from the Gateway (see *Mobile-Originated Packet Data Calls* on page 5-21 and *Mobile-Terminated Packet Data Calls* on page 5-22).
  - Since the application developer is responsible for security issues, the application might want to query for a password or answer calls only at certain times.

Any of these scenarios might be appropriate, for example, for a SCADA application that monitors pipelines or gas wells, depending on how much data is generated on-site and how often the host application needs to access that data.

As these sample scenarios show, you can configure an application for the GSP-1720 in many ways, depending on factors such as the following:

- How you decide to use the module ports

- Which operating systems you use
- How you want your application to operate
- How the SP wants to handle billing
- Whether the application will use packet or asynchronous data connections

Working with Module Features

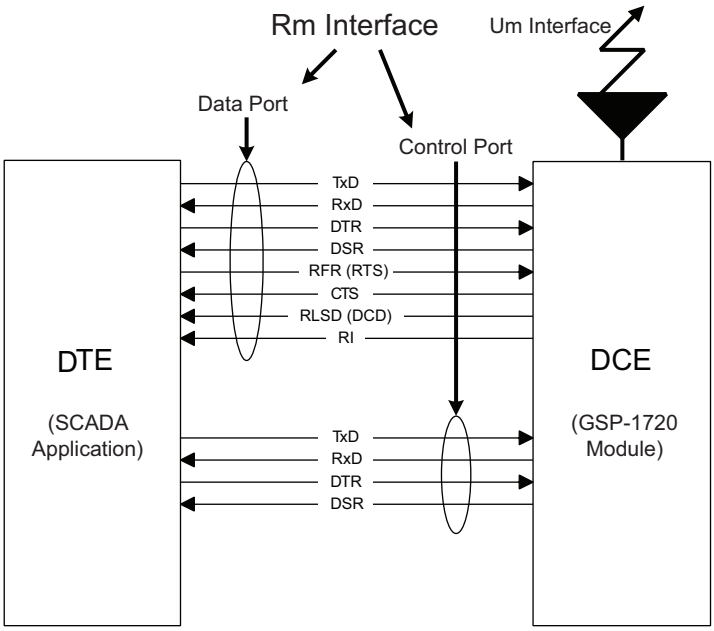
This section discusses key features of the GSP-1720 and how to use them programmatically in your application.

The features discussed in this section work with either packet data or asynchronous data. For packet-specific features, see *Using Packet Data* on page 5-18. For asynchronous-specific features, see *Using Asynchronous Data* on page 5-24.

Using RS-232 Data and Control Ports

The GSP-1720 has two serial ports: one for Data and one for Control. The Data and Control ports make up the *Rm interface*, which is the serial interface between the DTE (your application) and the DCE (GSP-1720), as shown in Figure 5-2.

Figure 5-2. DTE-to-DCE Rm Interface



The *Um interface* shown in Figure 5-2 is the dedicated wireless traffic channel between the GSP-1720 (DCE) and the Gateway Interworking Function (IWF).

Table 5-2 shows the signal lines for each port in Figure 5-2.

Note The module signal naming convention assumes that the module is the DCE and that the user application is the DTE.

Table 5-2. Port Signal Lines

Data Port	Control Port
GND - Signal Common	GND - Signal Common
TxD - Transmit Data	TxD - Transmit Data
RxD - Receive Data	RxD - Receive Data
DTR - Data Terminal Ready	DTR - Data Terminal Ready

Table 5-2. Port Signal Lines

Data Port	Control Port
DSR - Data Set Ready	DSR - Data Set Ready
RFR (RTS) - Ready for Receive	
CTS - Clear To Send	
RLSD (DCD) - Data Carrier Detected	
RI -Ring Indicator	

Note For a complete description of port hardware, including pinouts, see *Data and Control Ports* on page 8-6.

Data and Control Port Configurations

For a data application, you can set up the module to use different configurations of the Data and Control ports:

- **Data port only** — AT commands can be sent to the module only when there is no data session active (i.e., no data is coming across the port) or when a data session is active but the Data port is in Online-Command mode.
- **Control port only** — only AT commands can be sent to module (no data).
- **Data and Control ports** — the DTE can receive and transmit data on the Data port and, at the same time, communicate with the module on the Control port using AT commands.

The different Data and Control port configurations above are based on which ports are defined as active:

- A port is *active* if DTR is asserted on that port.
- A port is *inactive* if DTR is de-asserted on that port.

Using both the Data and Control ports allows more sophisticated communication with the module and thus better control of it, but requires that you understand the module's port arbitration behavior.

Note In this context, *port configuration* refers to which ports on the GSP-1720 are active, rather than to port baud rate, parity, etc.

Port Arbitration Behavior

This section describes the module port arbitration behavior for each of the following port configurations:

- Data port active only
- Control port active only
- Both Data and Control ports active

When a port configuration change occurs due to a DTR change, the AT command configuration parameters maintained by the AT command processor are not modified or reset to their default values. The parameters' current state will be associated with the newly activated port when the change occurs. An AT command in progress when DTR changes will be silently aborted.

Table 5-3 summarizes module port arbitration behavior.

Table 5-3. Port Arbitration Behavior

Control Port Active	Data Port Active	Port Behavior
No	Yes	The Data port processes all data and AT commands, including the following: ▪ Online-Command mode is supported on the Data port. ▪ All port configuration commands apply to the Data port as defined in *Port(s) Affected by AT Commands* on page 5-12. ▪ If a non-data call (e.g., Markov, Loopback) is already active when a call is attempted with the `ATD` command, the `BUSY` result is returned. If a data call is active, a `NO DIALTONE` result is returned. ▪ "Self Test" result "OK" is sent to the Data port. ▪ All data on Control port is ignored.

Table 5-3. Port Arbitration Behavior (continued)

Control Port Active	Data Port Active	Port Behavior
Yes	Yes	All AT commands are processed on the Control port. The Data port is used only for the transfer of packet or asynchronous data resulting from a data call. AT commands received on the Data port are ignored. n "Self Test" result "OK" is sent to the Control port. n `ATD#777` received on the Control port initiates a packet data call on the Data port. If a non-data call (e.g., Markov, Loopback) is already active when the call is attempted, a `BUSY` result is returned. If a data call is active, an `ERROR` result is returned. n `ATD<phone number>` received on the Control port initiates an asynchronous data call on the Data port. If a non-data call (e.g., Markov, Loopback) is already active when the call is attempted, a `BUSY` result is returned. If a data call is active, an `ERROR` result is returned. n Port configuration commands apply to the Data port and Control port as defined in *Port(s) Affected by AT Commands* on page 5-12. n Online-Command mode is not supported on the Data port. n The online escape sequence "+++" surrounded by guard time is ignored on both ports. n `ATH` received on the Control port terminates an active data call or special test call. It returns `OK` whether or not a call is active. n `ATO` received on the Control port returns `OK` if a call is active; otherwise, it returns `NO CARRIER`. n If the GSP-1720 has been configured with a static IP address a packet data call can be initiated on the Data port by sending a PPP packet; for details, see *Packet No Dial ($QCPKND)* on page 6-52.

AT Command Processing Modes

Data services AT command processing consists of three modes:

- **Command mode** — While in the Command mode, data service is inactive and the DCE processes AT commands received on the Rm interface.
- **Online mode** — Online mode is entered when a data connection is established and data service becomes active. While in the Online mode, the DCE does not recognize AT commands on the Rm interface, but does process in-band control data and software flow control data.
- **Online-Command mode** — During Online-Command mode, data service is in the active state, although data is not processed. The DCE processes all AT commands received on the Rm interface while in Online-Command mode.

Steps

TO ENTER ONLINE-COMMAND MODE FROM ONLINE MODE

n Use an in-band control data escape sequence, "+++" surrounded by guard time (see *Change from Online to Online-Command Mode (+++)* on page 6-42).
or
If AT&D1 is active, turn OFF the Rm interface DTR (circuit 108/2) signal (see *DTE Data Terminal Ready Behavior (&D)* on page 6-16 for details).CORRECT (&D)

n Note: Online-Command mode can not be used on the Data port during a packet data call.

Steps

TO TERMINATE A DATA CALL FROM ONLINE-COMMAND MODE

n Use the ATH command (see *Hook Control (H)* on page 6-22).

Steps

TO RE-ENTER ONLINE MODE FROM ONLINE-COMMAND MODE

n Use the ATO command (see *Return to Online Data Mode (O)* on page 6-23).

Port(s) Affected by AT Commands

Various AT commands modify port configurations or initiate actions on a port. Since the module has both a Data and Control port that can receive AT commands, the port affected by the received AT command is defined for each applicable port configuration. Port configuration is defined by which ports are active (DTR asserted).

Mapping the effects of an AT command to a particular port, or possibly ports, largely results from two factors: the AT command processor is single-threaded, and the Control and Data ports share a single instance of the AT command processor.

In this single instance of the AT command processor, a table defines default values and the state of each configurable parameter associated with each AT command. This default and configuration data for each command applies to one or both ports, depending on the port configuration. Most commands do not modify these configurable parameters.

Those commands that do modify parameters affect only the port processing the AT commands, with some exceptions. The exceptions are due primarily to the following unique attributes of the Data port:

- The Data port supports data (packet and asynchronous).
- The Data port supports configurable baud rate and handshake signals.

Port Activation (DTR) Changes during Operation

When DTR changes on the Data or Control ports, the following operational changes occur:

- Any AT command being processed on the Control or Data ports is terminated and the port that processes AT commands, based upon the arbitration rules (see *Port Arbitration Behavior* on page 5-9), is placed in a state to begin processing of a new AT command.
- If a call (data or special test call) is in progress, changes in DTR on the Control port will not terminate the call.

- If a call (data or special test call) is in progress, changes in DTR on the Data port will terminate the call if the port is configured to do so with `AT&D2`.

AT command configuration parameters maintained by the AT command processor are not modified or reset to their default values when a port configuration change occurs due to a DTR change. The current state of these parameters is associated with the newly activated port after the change occurs, as defined in Table 5-4.

Note For DTR signal timing requirements, see *Data and Control Ports* on page 8-6.

Port Use During Power On and Power Off

The Data and Control ports provide a feedback mechanism to inform the user when power on and power off are complete. The DSR signal is asserted on all active ports to inform the user that the module has completed its start-up sequence and is ready to process AT commands.

Note For complete details of the power on and power off process, see *Power-On* and *Power-Off* on page 8-12.

Globalstar Satellite Service

The GSP-1720 Satellite Data/Voice Module offers full duplex (FDX) transmit and receive capabilities at 9600 bps via the Globalstar satellite constellation, and uses QUALCOMM's CDMA digital technology for reliability.

The Globalstar Air Interface (GAI) is based on a modified (proprietary) IS-95A standard adapted for Mobile Satellite System (MSS) operations:

- Forward Link (Modem Receive): 2484.39 to 2499.15 MHz
- Reverse Link (Modem Transmit): 1610.73 to 1625.49 MHz

Short Messaging Service (SMS)

The GSP-1720 supports IS-637 Mobile Terminated Short Messaging Service (SMS). This is a separate feature from data (packet and/or asynchronous), and may be billed differently by the Service Provider.

Mobile-terminated SMS allows the host application to "send" numeric, alphanumeric, or binary messages to the GSP-1720. These messages are passed transparently out the Data or Control RS-232 ports to the DTE (SCADA application). The module makes no attempt to construct ASCII character data or to interperet incoming SMS messages. If "control" data is sent to the module via the SMS option, it will be passed along transparently to the DTE application.

The SMS feature is fully functional even if the GSP-1720 is active on a data call, because SMS can be accessed on the Control port. Therefore, the host application can send command and control information to the module either while it is in a data session, or idle (not in a call).

Note Check with your Globalstar service provider to see whether the SMS feature is available.

SMS Alerts

SMS "alerts" are asynchronous messages sent out of the Data or Control port to the DTE application upon receipt of the SMS message (see *Using RS-232 Data and Control Ports* on page 5-6 for a more detailed explanation).

Port configuration determines how SMS alerts are received:

- If the Control port is active, SMS alerts will be delivered to the Control port, even if a call is active.
- If the Control port is not active, the SMS alert will be queued until the data session is terminated, and will then be delivered to the Data port.

Once the DTE application receives an SMS alert, it is up to the application to read the SMS message, using the `AT$QCSMSP` command.

SMS Message Field Information

SMS messages can contain the following field information.

This information is stored by the GSP-1720 and can be accessed using the family of SMS commands which are discussed on page 6-53 and following:

- Length of SMS
- Read status (new/read)
- Lock status
- Call back number (if available)
- Type (alpha, numeric, voice mail — these are carrier-specific fields)
- Priority (urgent, normal)
- Time received
- Message content

SMS AT Commands

You can use the following SMS commands:

- Navigate through SMS messages (`AT$QCSMSM`).
- Delete SMS messages (`AT$QCSMSM`).
- Print/display current SMS message (`AT$QCSMSP`).
- Lock or unlock SMS messages (`AT$QCSMSL`).
- Turn on/off SMS alerting (`AT$QCSMSA`).
- Get information on SMS messages stored in memory (`AT$QCSMSI`).

Note

For more information, see *SMS Commands* on page 6-53.

Using SMS for Mobile-Terminated Calls

You can use SMS as a way to send messages from a host application to the DTE. For example, the host could send an SMS to the DTE to notify the DTE application it should initiate a call back to the host server.

Here is a brief description of how such a scenario might work:

- The module is idle.
- The host application sends a short SMS message to the module, perhaps using an email account on the Internet. (A sample email address might be "email@globalstar.com." This is an example only. Contact your Service Provider to get the latest SMS message address format for your module.)
- Your DTE application has set up the module to listen for SMS messages, in one of two ways:
  - By turning SMS alerting on (using AT$QCSMSA).
  - By having the DTE application poll for messages with a timer (using the AT$QCSMSI command).
- When the module gets an SMS alert, it notifies the DTE application.
- The DTE application queries the module for the SMS message (using AT$QCSMSP and/or AT$QCSMSM).
- The DTE application parses the message, looking for strings that tell it to connect to the host application.
- The DTE originates a data call (packet or asynchronous).

Once the call has been established, the module functions simply as a "pipe" for data between the host server and DTE applications.

Note

Also see *SMS Commands* on page 6-53.

Globalstar Service Alerts

Service alerts are sent on the Control port or queued (if only the Data port is connected and in use) whenever a service parameter changes:

- Fades — Gateway/satellite coverage is lost for any reason.

- Acquisition — Gateway/satellite coverage is acquired (entering service, leaving service, or changing Service Providers).
- Roaming status — when the module "roams" onto a Gateway outside the home service area (see your Service Provider for the scope of these areas).

Note For more information, see *Service Alert ($QCSA)* on page 6-63.

Service Status Message

The `AT$QCSTATUS` command gets the Service Status Message from the GSP-1720. This is a message detailing some of the information that would display on the LCD screen of the GSP-1700 Single-Mode Phone. The Service Status Message includes the following items:

- Service available (yes or no)
- Current service mode
- Current Service Provider name
- Gateway ID
- Received signal strength (RSSI bars on the phone display)
- Gateway registration status (yes or no)
- Roaming (yes or no)
- Current call state (in call/idle)
- Call type
- Call duration

Note For more information, see *Checking Module Status* on page 4-1 and *Service Status ($QCSTATUS)* on page 6-64.

Position Location Determination

The GSP-1720 has a "get position" AT command, AT$QCPLS, that provides a latitude and longitude location as well as a confidence value.

This command has a parameter to select between getting the current position (via making a new request) or returning the last stored position:

- If you select the current position and you are NOT in a call, the module returns "ERROR."
- If you select the stored position and there is no stored position (you have never done a position request), the module returns "ERROR."

Note For more information, see *Position Location Service ($QCPLS)* on page 6-68.

Using Packet Data

Globalstar and the GSP-1720 offer direct Internet connectivity by bridging the "last thousand mile" air gap using LEO satellites. This section details the capabilities offered by the GSP-1720 for user connectivity and packet data transmission.

The GSP-1720 lets the application device (DTE) connected to the module originate or receive a "packet data call." It establishes a PPP session, connects to the Internet, and then establishes a session with a host application at the remote end.

Note For a comparison of packet and asynchronous data, see Table 5-1 on page 5-4. For information about asynchronous data service, see *Using Asynchronous Data* on page 5-24.

Data Rate and Throughput

The GSP-1720 offers full duplex transmit and receive at a Data port rate of 9600 bps. Discounting packet data overhead bits, the measured effective "user" throughput (that is, customer data) averages 7400 bps for packet data.

Networking Software and PPP Sessions

The module uses PPP as the transport mechanism for data packets. Standard networking software establishes, manages, and tears down the PPP session. For example, the networking software is compatible with Dial-Up Networking (TCP/IP and PPP protocols) on Windows.

When you develop embedded SCADA applications, you can use off-the-shelf protocol stacks or write your own. Any standard RFC 1661 or RFC 1662 compliant stack should work.

Interoperability with Different Operating Systems

The GSP-1720 uses standard networking software to establish, manage, and tear down the PPP session. The module has been tested with the following standard operating systems:

- Windows
- Macintosh OS
- UNIX/Linux

IP Addressing for the GSP-1720

IP addressing and network implementation varies between Service Providers. Please check with the Service Provider(s) in your target service area(s) for implementations details.

The system integrator or Service Provider must choose either a dynamic or static Internet Protocol (IP) addressing scheme, depending on the intended use of the GSP-1720:

- If the module is expected to be mobile and roam between Gateway service areas, a *dynamic IP addressing* scheme

should be used. A new IP address may be assigned to the terminal equipment whenever a new packet data call is set up.

- If the unit is "fixed" in its position and no mobility is involved, either a *dynamic or static IP addressing* scheme can be used.

The difference is that in a "static" addressing scheme the user's application at a host site or server will always know the IP address of the remote DTE (SCADA application). In a "dynamic" addressing scheme, the IP address is not known until the remote SCADA application/module and the host/server are in an active session. In the "static" addressing scheme, either the SCADA application/module or the host/server can initiate a call/IP session.

Dynamic IP Addressing

A dynamic IP address pool in the Gateway is configured with private IP addresses. The IP address assigned to a dynamic IP user during call setup depends on the Gateway configuration. With a dynamically assigned IP address, the module can roam to another Gateway and re-establish Packet Data service by having the system automatically assign a new dynamic IP address.

With dynamic IP addressing, the module can initiate a call/IP session with the host/server. Once a session is established, the assigned IP addresses remain constant until the session is terminated.

Static IP Addressing

If the Globalstar Service Provider supports Static IP addresses, and if the GSP-1720 is appropriately configured, Static IP address can be assigned instead of dynamic IP addresses. With a static IP address, the server or host application can use a given specific IP address that is permanently assigned to the module.

Virtual Private Network Service for Static IP

Since a static IP addressing scheme requires the use of private IP addresses, a virtual private network (VPN; e.g., IPSec) or an IP-in-IP tunnel would have to be established between the host and the Globalstar Gateway, so the host can initiate IP sessions with the remote/SCADA unit.

Contact your network provider for help in establishing a VPN or dedicated line between your host server and the Gateway.

Virtual Private Network Service for Dynamic IP

When using dynamic IP addressing, an end-to-end VPN connection can be established between the remote/SCADA unit and the host/server.

Finding IP Addresses

If you need more information about your IP addresses, ask your Service Provider.

Mobile-Originated Packet Data Calls

The GSP-1720 lets the application device (DTE) connected to the module originate a packet data call.

Steps

TO MAKE A MOBILE-ORIGINATED PACKET DATA CALL

n Use the `ATD#777` command.

The module returns `CONNECT` if the call has been established (for other result codes, see *Dial (D)* on page 6-20).

For another example, see *Making a Call from the Data Port* on page 4-4.

Steps

TO HANG UP A PACKET DATA CALL

METHOD 1

1. Lower DTR.

METHOD 2 (Data Port active, Control Port inactive)

1. Enter Online-Command mode by using the in-band control data escape sequence, "+++" surrounded by guard time (for details, see *Change from Online to Online-Command Mode (+++)* on page 6-42).
2. Use the `ATH` command

   or
   Use the `ATH777` command.

Mobile-Terminated Packet Data Calls

Note

Mobile-Terminated packet data calls are service provider specific. Contact your service provider to determine availability.

Some Globalstar Service Providers offer mobile-terminated packet data service. Check with your Service Provider to see if this service is offered in area(s) in which you plan to operate your GSP-1720. In Globalstar service areas where mobile-terminated packet data is supported, the GSP-1720 lets the application device (DTE) connected to the module receive a packet data call. It is the responsibility of the DTE application to keep the module powered up if it is to receive incoming packet data calls.

The following sections describe how the module itself would deal with incoming (mobile-terminated) calls. This information is provided for developers who wish to configure their applications for mobile-terminated calls, in preparation for future releases of the Gateway software.

Tip

As an alternative to mobile-terminated calls, the user's application could potentially be programed to receive an SMS message, then originate a call back to the host. For details, see *Using SMS for Mobile-Terminated Calls* on page 5-15.

Answering Calls Using the Data Port Only

The Data port uses both the RI and DTR signals. How the call is answered depends on whether DTR is high or low:

- DP_DTR high (asserted) — the module can be configured to auto-answer.
- DP_DTR low (de-asserted) — the module will not auto-answer, but your DTE application can detect RI and decide whether to answer the call by raising DP_DTR. On an incoming call, the module asserts RI and displays RING to the appropriate port (Data port in this case).
- Specific implementation details will depend on the needs of the user application.

The scenario could work like this:

- DMP_DTR is high (asserted), powering the module on.
- RI on the Data port asserts.
- DP_DTR is low (de-asserted), meaning the module will not auto-answer.
- Your DTE application decides to answer the call by asserting DP_DTR.

Different operating systems handle the DTR-DCD handshake differently. To configure it appropriately, you can use the `AT&D` and `AT&C` commands.

For more information, see *DTE Data Terminal Ready Behavior (&D)* on page 6-16 and *DCE Received Line Signal Detector Behavior (&C)* on page 6-15.

Answering Calls Using the Data and Control Ports

If your DTE application is using both the Data and Control ports, and if you have enabled auto-answer (ATS0=), how the call is answered depends on whether DTR is high (asserted) or low (de-asserted) on the two ports:

- DP_DTR asserted — the module will auto-answer.
- DP_DTR de-asserted but CP_DTR asserted — the module will not auto-answer, but your DTE application can detect RI and answer calls by raising DP_DTR. On an incoming

call, the module asserts RI on the Data port and displays RING to the Control port.

In this scenario, keeping DTR high on the Control port powers the module, while allowing you to leave DP_DTR low to prevent auto-answering.

Roaming and Packet Data Service

The GSP-1720 is capable of both "fixed" operation in one location (for example, a building, tank, pipeline, or well) or "mobile" operation for applications on trucks, rail cars, aircraft, or shipping containers.

For packet data service, roaming operation has the following characteristics:

- Roaming between Gateway service areas is supported. for all modems configured for Dynamic IP. However, there is no hard hand-off capability between separate Gateways. The PPP session will be dropped and will have to be re-established by the module.
- Once on a new Gateway, automatic re-registration will be performed and a new dynamic IP address will be assigned to the module.
- Roaming support for "static" IP addressing outside the "home" Gateway service area is not currently supported. Future design work to allow a DNS server to map IP addresses to IMSIs is envisioned, which would permit worldwide static IP address roaming.

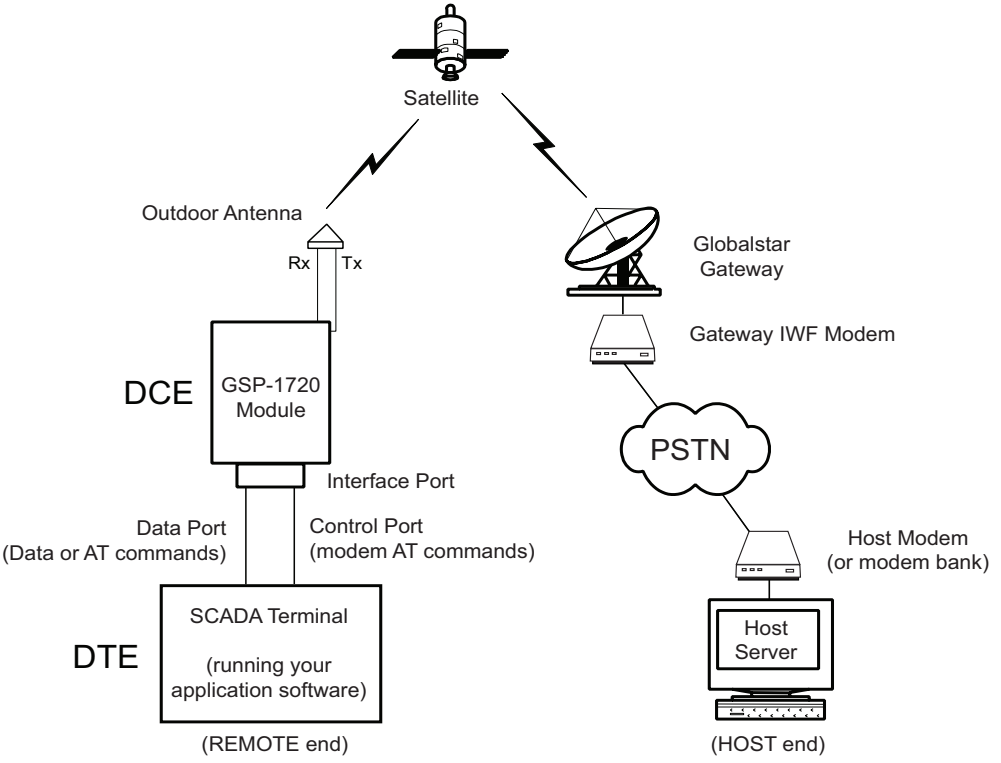
If service alerts are enabled, a service alert is sent out the Data/Control port whenever the Service Provider or Gateway changes. This includes the module changing from roaming to home service area and vice versa.

Using Asynchronous Data

The GSP-1720 lets the application device (DTE) connected to the module originate or receive an asynchronous data call. It can dial or be dialed by a modem at the host server, connecting through the Globalstar Satellite Communications System and the PSTN.

Figure 5-3 shows the various modems (the GSP-1720 DCE modem, the Gateway IWF modem, and the host modem) and other components involved in an asynchronous data call.

Figure 5-3. Asynchronous Data Call Components



Like most modems, the GSP-1720 allows you to customize asynchronous data connections, data compression, and so on. For details, see Chapter 6, *AT Command Reference*.

Note

For a comparison of asynchronous and packet data, see Table 5-1 on page 5-4. For information about packet data service, see *Using Packet Data* on page 5-18.

Data Rate and Throughput

For asynchronous data, the GSP-1720 offers full duplex transmit and receive at a Data port rate of somewhat less than packet data's 9600 bps, due to additional overhead for asynchronous data. Similarly, the measured effective "user" throughput (that is, customer data) is somewhat less than the 7400 bps (average) for packet data. Asynchronous connections require a longer set up time than packet data calls because of PSTN modem training time.

Tip

Globalstar packet data service has a lower overhead and faster connection time than asynchronous data does. If your SCADA application does not specifically need asynchronous data, use packet data instead.

Mobile-Originated Asynchronous Data Calls

The GSP-1720 lets the application device (DTE) connected to it originate an asynchronous data call.

Steps

TO MAKE A MOBILE-ORIGINATED ASYNCHRONOUS DATA CALL

- Use the `ATD<dial string>` command.

  The module returns `CONNECT` if the call has been established (for other result codes, see *Dial (D)* on page 6-20).

Steps

TO HANG UP AN ASYNCHRONOUS DATA CALL

1. Enter Online-Command mode by using the in-band control data escape sequence, "`+++`" surrounded by guard time (for details, see *Change from Online to Online-Command Mode (+++)* on page 6-42).
2. Use the `ATH` command.

You can also hang up an asynchronous data call by de-asserting DTR of the data port.

Note

Mobile-Terminated Asynchronous Data Calls

The GSP-1720 lets the application device (DTE) connected to it receive an asynchronous data call. It is the responsibility of the DTE application to keep the module powered up if it is to receive incoming asynchronous data calls.

Here is what happens during a mobile-terminated asynchronous call:

- The host server directs a host modem to call the GSP-1720 (DCE), using the Dial Number (DN) assigned to the GSP-1720 by the Service Provider.
- The incoming call toggles RI and displays RING to the appropriate port.
- The ATA command tells the GSP-1720 (DCE) to answer an incoming call (for details, see *Answer Incoming Call (A)* on page 6-18; also see *Automatic Answer (S0)* on page 6-24).
- How the module answers the call depends on how the ports are configured. Port behavior for incoming asynchronous calls is the same as for packet calls. For details, see *Answering Calls Using the Data Port Only* on page 5-23 and *Answering Calls Using the Data and Control Ports* on page 5-23.

Accessing Packet Data Over an Asynchronous Connection

Once an asynchronous connection has been established for the GSP-1720, it could be used to access packet data (using protocols such as PPP or SLIP).

If PPP is used on top of asynchronous data service, the DTE would be assigned an IP address. PPP would be required for Internet access using asynchronous data.

Protocols such as Z-modem or Y-modem or other proprietary protocols could be used to transfer data between the GSP-1720 and the host modem, without negotiating PPP.

If your SCADA application requires packet data over an asynchronous connection, here are some implementation suggestions:

- For PPP data, contact your Internet Service Provider to obtain necessary account information (whatever you would normally need for an Internet connection, such as an IP address, DNS information, and so on).
- Set up the asynchronous connections for the GSP-1720 as described in *Using Asynchronous Data* on page 5-24.

Roaming and Asynchronous Data Service

The GSP-1720 is capable of both "fixed" operation in one location (for example, a building, tank, pipeline, or well) or "mobile" operation for applications on trucks, rail cars, aircraft, or shipping containers.

For asynchronous or "dialed" data service, roaming operation has the following characteristics:

- A host server can call the asynchronous Dial Number and reach the module, regardless of which Gateway service area it is currently located in (just as voice GSP-1700 Single-Mode Phones can roam and be reached in any Gateway service area).
- Roaming within a Gateway service area is supported for both mobile-originated and mobile-terminated asynchronous data calls.
- Roaming between Gateway service areas is supported; however, if the module is in a call when it reaches the edge of a service area, the call will be dropped and must be re-established on the new Gateway.
- Once on a new Gateway, automatic re-registration will be performed and a new data call can be established.
- Static (or dynamic) IP addresses are not required for asynchronous data service as they are for packet data service.

If service alerts are enabled, a service alert is sent out the Data/Control port whenever the Service Provider or Gateway changes. This includes the module changing from roaming to home service area and vice versa.

Typical Modem Initialization Strings

Table 5-4 summarizes some typical GSP-1720 initialization strings discussed in this chapter and Chapter 4.

For complete details about these and other initialization strings, see Chapter 6, *AT Command Reference*.

Table 5-4. Sample Typical Modem Initialization Strings

To do this...	Send these commands or strings	Where to find more information
Default all modem settings	ATZ	*Reset to Default Configuration (Z)* on page 6-15
Make a packet data call	ATD#777	*Dial (D)* on page 6-20
Make an asynchronous data call	ATD<phone number>	*Dial (D)* on page 6-20
Make a Markov test call	ATD#627568	*Dial (D)* on page 6-20
Make a Loopback test call	ATD#56672225	*Dial (D)* on page 6-20
Hang up a packet data call or hang up an asynchronous data call	ATH	*Hook Control (H)* on page 6-22
Hang up a packet data call mode active; or hang up an asynchronous data call	ATH777	*Hook Control (H)* on page 6-22
Check modem status (Globalstar service, signal strength, registration, current call state and so on)	AT$QCSTATUS	*Service Status ($QCSTATUS)* on page 6-64
Enable SMS Alerting	AT$QCSMSA	*SMS Alert ($QCSMSA)* on page 6-59
Read SMS messages	AT$QCSMSP	*SMS Print ($QCSMSP)* on page 6-54
Enter Online-Command Mode while a data call is progress on the Data port, then re-enter Online mode	+++ (surrounded by guard time) ATO	*Change from Online to Online-Command Mode (+++)* on page 6-42; *Return to Online Data Mode (O)* on page 6-23
Enable Globalstar service alerts	AT$QCSA	*Service Alert ($QCSA)* on page 6-63

Table 5-4. Sample Typical Modem Initialization Strings

To do this...	Send these commands or strings	Where to find more information
Get current position of the modem	`AT$QCPLS`	*Position Location Service ($QCPLS)* on page 6-68
Allow the modem to mix packet and asynchronous data calls, by handling packets based on the previous dialed data call type	`AT$QCPKND=2`	*Packet No Dial ($QCPKND)* on page 6-52

6 AT COMMAND REFERENCE

This chapter provides describes the AT command set for the GSP-1720 Satellite Data/Voice Module. The AT command set is the control interface between the Data Terminal Equipment (DTE) and Data Communications Equipment (DCE).

For a handy quick reference to all AT commands, see the tables at the beginning of this chapter:

- Table 6-1, "Operational AT Commands" — lists the AT Commands recognized by the module software.
- Table 6-2, "Non-Operational AT Commands" — lists commands that are recognized, but not supported, by the module. For example, because the module has no speaker, the command to set speaker volume will neither set the volume nor return an ERROR. The command is accepted, but performs no action.

Reference sections in this chapter contain complete details for each AT command, organized into the following groups:

AT Command Quick Reference Tables

For many commands listed in Table 6-1 and Table 6-2, the entries for "Value Range," "No Value Definition," or "Factory Default" have no valid value. These entries have different symbols in place of values:

- A dash "-" character means that, for this command, the value is either not present or not allowed.
- A caret "^" character means that no current value state (or Power-On state) is kept internally.
- An asterisk "*" character means you should consult a footnote for this entry.

Table 6-1. Operational AT Commands

AT Command	Brief Description (reference page)	Value Range	No Value Definition	Factory Default
E	Echo OFF|ON (p. 6-9)	[0-1]	0	1
I	Request Identification Information (p. 6-9)	[0-2]	0	^
Q	Result Code Suppression (p. 6-11)	[0-1]	0	0
V	DCE Response Format (p. 6-13)	[0-1]	0	1
X	Result Code Selection Command (p. 6-14)	[0-4]	0	4
Z	Reset Default Configuration (p. 6-15)	[0-2]	0	^
&C	DCE RLSD (DCD) Behavior (p. 6-15)	[0-2]	0	1
&D	DTE DTR Behavior (p. 6-16)	[0-2]	0	2
&F	Set to Default Configuration (p. 6-17)	0	0	^
&W	Store active configuration in non-volatile memory (p. 6-17)	[1-2]	-	-

Table 6-1. Operational AT Commands (continued)

AT Command	Brief Description (reference page)	Value Range	No Value Definition	Factory Default
A	Answer Command (p. 6-18)	-	-	-
A/[1]	Repeat Last Command (p. 6-19)	-	-	^
D	Dial (p. 6-20)	*[2]	*[2]	*[2]
H	Hook Control (p. 6-22)	(0, 777)	0	^
O	Return to Online State (p. 6-23)	0	0	^
S0	Auto Answer Ring Count (0 disables) (p. 6-24)	[0-255]	-	0
S3	Command Line Termination Character (p. 6-25)	[0-127]	-	13
S4	Response Format Character (p. 6-26)	[0-127]	-	10
S5	Command Edit Character (p. 6-26)	[0-127]	-	8
S6	Pause Before Blind Dialing Time (p. 6-27)	[2-10]	-	2
S7	Connection Completion Timeout (p. 6-28)	[1-255]	-	50
S8	Comma Dial Modifier Time (p. 6-28)	[0-255]	-	2
S9	Carrier Detect Threshold Timeout (p. 6-29)	[0-255]	-	6
S10	Carrier Loss to Disconnect Timeout (p. 6-30)	[1-255]	-	14
S11	DTMF Tone Duration and Spacing (p. 6-30)	[50-255]	-	95
S777	Silent Retry Timeout (p. 6-31)	[0-255]	-	150
+CMUX	Set Forward MUX Option (p. 6-32)	[1-2]	2	2
+CRM	Rm Interface Protocol Setting (p. 6-32)	[0-1]	0	0
+GSN	Read phone ESN (p. 6-32)	-	-	-
+ICF	Character Framing Settings (p. 6-33)	[(3-3), (0-3)]	3, 3	3, 3

Table 6-1. Operational AT Commands (continued)

AT Command	Brief Description (reference page)	Value Range	No Value Definition	Factory Default
+IFC	Local Flow Control Settings (p. 6-35)	[(0-3), (0-2)]	2, 2	2, 2
+IPR	Rm Interface Baud Rate Setting (p. 6-37)	(300, 1200, 2400, 4800, 9600, 19200, 38400)	*[3]	*[4]
+VTS	DTMF and Tone Generation (p. 6-38)	0-9, #, *	-	-
+CDV	Originate voice call (p. 6-39)	0-9, #, *	-	-
+CHV	Hang up voice call (p. 6-39)	-	-	-
$QCCAV	Answer voice call (p. 6-40)	-	-	-
~+++~[5]	Direct the DCE to change from online to online-command mode (p. 6-41)	-	-	-
+CFG	Set Remote Config String Command (p. 6-42)	*[6]	*[6]	*[6]
+DS	IWF (Interworking Function) Data Compression Control (p. 6-43)	([0-3], [0-1], [512-65535], [6-250])	3, 0, 2048, 6	3, 0, 2048, 6
+ES	IWF Error Control Selection (p. 6-45)	([0-4], [0-4], [0-6])	3, 0, 2	3, 0, 2
+MS	IWF Modulation Selection (p. 6-48)	*[6]	*[6]	*[6]
$QCPKND	Set Packet Data Reconnect Methods (p. 6-51)	[0-2]	0	0
$QCSMSM	SMS list traversal and manipulation (p. 6-52)	([0-3], [0-1])	0,0	-
$QCSMSP	Print formatted information for current SMS message (p. 6-53)	[0-1]	0	-
$QCSMSL	Lock current SMS message (p. 6-57)	[0-1]	1	-
$QCSMSA	Set Alert on new SMS message arrival (p. 6-58)	[0-1]	0	0

Table 6-1. Operational AT Commands (continued)

AT Command	Brief Description (reference page)	Value Range	No Value Definition	Factory Default
$QCSMSI	Send SMS message count information to DTE (p. 6-59)	-	-	-
$QCERR	Send formatted Error Log information to DTE (p. 6-60)	-	-	-
$QCCLR	Clear Error Log (p. 6-61)	-	-	-
$QCSA	Set Alert on Service change (p. 6-62)	[0-1]	0	0
$QCSTATUS	Send formatted Service Status to DTE (p. 6-63)	-	-	-
$QCTOD	Send formatted Time-of-Day to DTE (p. 6-66)	[0-1]	0	-
$QCPLS	Send formatted Position information to DTE (p. 6-67)	([0-1], [0-1])	0,0	-
$QCMSTATS	Send formatted Markov statistics to DTE (p. 6-70)	-	-	-
$QCMODE	Set Mode: Auto, Globalstar (p. 6-71)	[1-4]	1	1[7]
$QCDMI	Set the Port Configuration (p. 6-72)	[0-2]	-	-
$QCCTL	Set the auxiliary port functionality (p. 6-73)	[0,2]	-	-
$QCHFK	Route HFK Audio (p. 6-74)	[0-1]	-	-
$QCMEM	Display current memory usage (p. 6-74)	-	-	-
$QCTCP[8]	TCP Stack Changes (p. 6-76)	([0-1][9] [0-1500] [0-1500] [0-1500] [0-120000] [0-120000] [0-1000] [0-6000] [0, 1-100])		0 536 536 536 500 6000 100 6000 0
$QCVJ[8]	Use Van Jacobsen Header Compression (p. 6-78)	[0-1]	1	1

Notes for Table 6-1

[1] The A/ command is a special function that does not require the S3 command terminator character and causes the execution of the previously entered AT command.

[2] See the D command description for details on parameters.

[3] When no parameter value is sent with the +IPR command, the Data port default baud rate of 19200 is assumed.

[4] The default baud rate is set with the +IPR command itself. When the module is power-cycled, the Data port baud rate is reset to its power-up baud rate stored in non-volatile memory.

[5] The ~ character represents "guard-time" before and after the +++ escape sequence.

[6] This parameter is a quoted string, saved in the module and downloaded to the Gateway Interworking Function modem when establishing an asynchronous data call.

[7] The module will always power-on into Auto mode.

[8] This is an advanced AT command. Do not use it if you do not understand what it does.

[9] If <tcpmod> is equal to one, the values in the rest of the variables are put into effect. If <tcpmod> is set to zero, the rest of the values entered into the AT command are ignored, and the default values are restored to the internal variables.

Table 6-2. Non-Operational AT Commands

	Brief Description (reference page)	Value Range	No Value Definition	Power-On/ Reset Default
L	Monitor Speaker Loudness (p. 6-10)	[0-3]	0	^
M	Monitor Speaker Mode (p. 6-10)	[0-2]	0	^
P	Select Pulse Dialing (p. 6-11)	-	-	^
T	Select Tone Dialing (p. 6-12)	-	-	^

AT Commands Overview

Command Alphabet

The ASCII character set is the alphabet used for the AT command set. Only the low order seven bits of each character are considered significant.

Case Sensitivity

Although AT commands are specified in uppercase throughout this *Integrator's Reference Manual*, both uppercase and lowercase are valid. The module does not distinguish between uppercase and lowercase letters.

Command Line Format

AT command lines are made up of three parts: the prefix, the body, and the termination character.

The command line prefix consists of the letters `AT`. The command line prefix is followed by the body, which consists of one or more AT commands. Command syntax for each specific AT command within the body is as specified in this document, for example, `E` or `$QCSTATUS`.

Space characters can be used freely within the body for formatting purposes. Command lines are terminated with the termination character specified by S-register `S3` (see *Command Line Termination Character (S3)* on page 6-25). The default value of `S3` is the carriage return character `<CR>` (ASCII value of 13 decimal).

You can use an alternate command line prefix, which causes the previously entered command line (body and terminator) to be executed. This command line prefix consists of the letters `A/`.

Note No terminator is required after entering the / character to begin command line execution.

Command Syntax

For AT command syntax in this chapter, the following definitions apply:

- Words enclosed in <angle brackets> identify parameters that can be specified as part of the command.
- Syntactical elements enclosed in [square brackets] are optional and may be omitted from the command line.
- Syntactical elements enclosed in {brackets} are required and must be specified as part of the command.
- The use of | between syntactical elements indicates that only one of the elements may be specified as part of the command. For example, the command syntax for S3{=<value>|?} must be either S3=<value> or S3?.
- The + and $ characters are used to identify extended AT commands. + and $ denote standard and manufacturer-specific extended commands respectively.
- A semicolon (;) is used to concatenate additional commands (basic or extended) after an extended command.

Basic AT Commands

This section defines the basic AT commands that the GSP-1720 currently supports and the functionality provided by each. For all basic AT commands that require a <value> parameter, if <value> is not present then a 0 is assumed by the receiver.

The basic AT commands described in this section return one of two possible result codes, which are listed in Table 6-3. Any commands with exceptions to this have separate result code tables in their sections.

Results Returned

Table 6-3. Result Codes for Basic AT Parameter Commands

Result Code	Condition
OK	The command was correctly recognized and processed with any required <value> being set.
ERROR	The command was unrecognized, the <value> parameter was out of range, or some syntactical error was encountered.

Command Echo (E)

Syntax

E[<value>]

Description

Determines whether or not the DCE echoes characters received from the DTE during the Command and Online-Command modes.

Valid Values

0	DCE does not echo characters.
1	DCE echoes characters.

Power-On/Reset Default Value(s)

1

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Get Info (I)

Syntax

I[<value>]

Description

This read-only command returns three different manufacturer information strings, depending on the <value> of the parameter sent.

Valid Values

0	MODEL NUMBER: 216
1	MODEL: GSP-1720 Satellite Data/Voice Module
2	BUILD: <associated software build string (version information)>

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Monitor Speaker Loudness (L)

Syntax

L[<value>]

Description

Controls the DCE speaker loudness. The module has no concept of a monitor speaker. Therefore, this command is recognized, but does nothing.

Valid Values

0	Lowest speaker volume
1	Low speaker volume
2	Medium speaker volume
3	High speaker volume

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Monitor Speaker Mode (M)

Syntax

M[<value>]

Description

Controls when the DCE speaker is on. The module has no concept of a monitor speaker. Therefore, this command is recognized but does nothing.

Values

0	Speaker is always off and never turned on.
1	Speaker on until carrier has been detected.
2	Speaker is always on when OFF-Hook.

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Select Pulse Dialing (P)

Syntax

P

Description

Causes subsequent dialed digits to be signaled using pulse dialing. This command is recognized but does nothing.

Valid Values

None.

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Result Code Suppression (Q)

Syntax

Q[<value>]

Description

Determines whether or not result codes are transmitted from the module (DCE) to the DTE. When result codes are suppressed, no result is transmitted to the DTE.

Note

Because the module depends on the `CONNECT` result code returned by the Gateway IWF (for asynchronous data calls), this command is not transmitted as part of the remote configuration.

Valid Values

`0`	DTE transmits result codes.
`1`	Result codes are suppressed and not transmitted.

Power-On/Reset Default Value(s)

`0`

Results Returned

Result Code	Condition
`OK`	The command was correctly recognized and processed with any required `<value>` being set.
`ERROR`	The command was unrecognized, the `<value>` parameter was out of range or some syntactical error was encountered.
(none)	No result codes are transmitted when `<value>` is set to 1.

Select Tone Dialing (T)

Syntax

`T`

Description

Causes subsequent dialed digits to be signaled using DTMF tones. This command is recognized but does nothing.

Valid Values

None.

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

DCE Response Format (V)

Syntax

V[<value>]

Description

Determines the contents of the DCE header and trailer transmitted to the DTE with result codes and information responses. It also determines whether result codes are transmitted in numeric or alphabetic format. The text portion of information responses is not affected by the setting of this parameter.

The following table shows the effect of setting this parameter on the format of information text and result codes. The values <S3> and <S4> represent the ASCII value of the S3 and S4 registers respectively.

	V0	V1
Information Responses	<text><S3><S4>	<S3><S4> <text><S3><S4>
Result Codes	<numeric code><S3>	<S3><S4><verbose code><S3><S4>

Values

0	DCE transmits limited headers and trailers and numeric result codes.
1	DCE transmits full headers and trailers and alphabetic result codes.

Power-On/Reset Default Value(s)

1

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Result Code Selection Command (X)

Syntax

X[<value>]

Description

Determines whether or not the DCE transmits particular result codes to the DTE when connecting asynchronous data services. This command is recognized but does nothing locally. Normally it controls whether or not the DCE verifies the presence of dial tone and/or busy signal on the line. However, it is used only to allow a non-default value to be sent to the Gateway IWF modem.

Values

0	CONNECT result code is given upon entering online data state. Dial tone and busy detection are disabled.
1	CONNECT <text> result code is given upon entering online data state. Dial tone and busy detection are disabled.
2	CONNECT <text> result code is given upon entering online data state. Dial tone detection is enabled, and busy detection is disabled.
3	CONNECT <text> result code is given upon entering online data state. Dial tone detection is disabled, and busy detection is enabled.
4	CONNECT <text> result code is given upon entering online data state. Dial tone and busy detection are both enabled.

Note In result codes, <text> is defined by the module hardware and is not user-specifiable.

Missing Parameter Default Value(s)

0

Power-On/Reset Default Value(s)

4

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Reset to Default Configuration (Z)

Syntax

```
Z[<value>]
```

Description

Sets all module (DCE) parameters to their factory defaults or the profiles stored in non-volatile parameter storage. This command *does not* change the Rm interface baud rate (set via the `+IPR` command) and the module call mode (set via the `$QCMODE` command). Factory defaults are specified by Globalstar.

If the module is in Online mode, the data call is terminated and the module returns to Command mode. See *Set to Factory-Defined Configuration (&F)* on page 6-17 for more details on resetting the default baud rate and mode.

Values

`0`	Resets parameters to their factory defaults.
`1`	Resets parameters to Profile 1 (stored in non-volatile memory).
`2`	Resets parameters to Profile 2 (stored in non-volatile memory).

Power-On/Reset Default Value(s)

None.

Results Returned

`OK` or `ERROR`; see Table 6-3 on page 6-9 for details.

DCE Received Line Signal Detector Behavior (&C)

Syntax

```
&C[<value>]
```

Description

Defines how the DCE controls RLSD (circuit 109) in relation to detection of the received line signal from the far end.

Valid Values

0	DCE always places RLSD in ON state.
1	DCE places RLSD in ON state when connection is active and places in OFF state otherwise.
2	DCE winks RLSD by briefly placing RLSD in the OFF state and then back ON when a data call ends. This is a Globalstar-specific value.

Power-On/Reset Default Value(s)

1

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

DTE Data Terminal Ready Behavior (&D)

Syntax

&D[<value>]

Description

Defines how the module (DCE) responds when the DTE changes DTR (circuit 108/2) from ON to OFF state when a connection is active.

Valid Values

0	DCE ignores DTR state.
1	DCE transitions to from Online to Online-Command mode when DTR transitions from ON-to-OFF.
2	DCE closes connection (terminates call) when DTR transitions from ON-to-OFF.

Power-On/Reset Default Value(s)

2

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Set to Factory-Defined Configuration (&F)

Syntax

```
&F[<value>]
```

Description

Instructs the module (DCE) to set all parameters to their Globalstar-defined defaults. This command performs the same operation independent of whether or not <value> is specified. Globalstar-defined defaults are the default values for each AT command specified in this chapter.

This command sets the module baud rate to its power-on/reset default value (see *Set Rm Interface Command Baud Rate (+IPR)* on page 6-37), but does not reset the $QCMODE value to its power-on/reset value. (Compare the behavior of the Z command, *Reset to Default Configuration (Z)* on page 6-15.)

If the module is in Online-Command mode, the data call is released and the module returns to Command mode.

Valid Values

0	Resets module parameters, except <call mode> (set via $QCMODE), to their default values.

Power-On/Reset Default Value(s)

None.

Results Returned

OK or ERROR; see Table 6-3 on page 6-9 for details.

Store Current Configuration (&W)

Syntax

```
&W[<value>]
```

Description

Stores the current module settings in non-volatile memory. Stored values can be restored either at power-on or following the ATZ command.

Valid Values

1	Stores the active configuration in Profile 1 (non-volatile memory)
2	Stores the active configuration in Profile 2 (non-volatile memory)

Power-On/Reset Default Value(s)

None

Results Returned

Result Code	Description
OK	If a valid profile number is used and the configuration is stored in memory successfully.
ERROR	If a invalid profile number is used or if there is an error in storing the configuration in memory.

Basic Action Commands

This section defines the basic AT action commands for the module and the functionality provided by each.

Answer Incoming Asynchoronous Data Call (A)

Syntax

A

Description

Instructs the GSP-1720 (DCE) to answer an incoming asynchronous data call. The module establishes a connection with the Gateway IWF modem, transmits appropriate configuration data to the Gateway IWF modem, sends the A command to the Gateway IWF modem, telling it to connect to the host modem, and waits for the CONNECT (or other) result code.

Note Any additional commands that appear after the A command on the same command line are ignored.

Note This command can be aborted by DCE reception of any character on the Rm interface. The command is aborted only if the DCE receives the character prior to establishing the connection and sending the CONNECT result code.

Results Returned

	Description
OK	Command is aborted either by reception of an additional character from the DTE or by the DTE turning off DTR (circuit 108) for &D1 and &D2. Also returned if there is no incoming call to answer. Also returned if the incoming call is a voice call. In this case the "OK" does not mean the voice call was answered.
CONNECT	Connection is successfully established (call is active on traffic channel). This result code is transmitted when the DCD (circuit 109) is turned on.
NO CARRIER	The connection could not be established; service not activated, call cannot be completed, or service unavailable.
ERROR	Command was issued in Online-Command mode.

Repeat Last Command (A/)

Syntax

A/

Description

Although this command does not utilize the AT command prefix and is not an AT command, it is listed in the command section for ease of reference.

This prefix repeats execution of the last command line entered. If no command was entered previous to entering this command, the previous command line is considered to be empty and no action is taken.

Note Previous command line execution begins immediately after / is entered. It is not necessary to enter a termination character (carriage return; see *Command Line Termination Character (S3)* on page 6-25 for details) to begin execution of the previous command line body.

Results Returned

	Condition
OK	Previous command line is empty.
Result from re-execution of the previous command line.	Previous command line is not empty.

Dial (D)

Syntax

```
D<dial string>
```

Description

Originates a data call if the dial string is valid.

Note This command can be aborted by DCE reception of any character on the Rm interface. This command is aborted only if the DCE receives the character prior to establishing the connection and sending the CONNECT result code. The dial command can also be aborted by setting the DTR line from active to inactive when &D2 is set.

Valid Dial Strings

The dial string must be made up of valid dial string characters and dial modifiers. Valid dial string characters are:

```
#*0123456789ABCD
```

Valid dial string modifiers are

```
W!@$TP
```

Valid dial string modifiers may be included in the dial string, although they will be ignored. Any other characters within the dial string that are not recognized as dial string characters or dial string modifiers by the DCE will be ignored.

This allows characters such as hyphens and parentheses to be used in the dial string for phone number formatting purposes.

The module supports packet data, asynchronous data calls. If the dial string contains one of the dial numbers listed below in Dial String Values, a packet data call is initiated. All other valid dial numbers, except dial numbers 1-99, initiate an asynchronous data call and return the result code of the Gateway IWF modem.

Dial numbers 1-99 correspond to phone book entries and are translated into dial numbers stored in the specified location. If the specified phone book location is unused, no call is attempted and `NO DIALTONE` is returned. If the phone book entry exists, a call is attempted using the dial number stored. Valid phone book entries include the Dial String Values listed below.

If `ATD` is entered by itself, then the module attempts to call the previously called number (from the call history) if one exists.

Dial string modifiers and unrecognized characters included in this dial string are ignored as stated above.

Dial String Values

`#777`	Originate a packet data call.

Results Returned

Result Codes	Description
`CONNECT`	Connection is successfully established (call is active on traffic channel).
`NO CARRIER`	Service not activated — call cannot be completed, service unavailable, or user has released dial command.
`NO DIALTONE`	Service not available — module is not configured for service. Also returned if a mobile-terminated call (which sends unsolicited result code `RING` to the DTE) is answered with a `D<dial string>` command.

Result Codes	Description
BUSY	The module is currently on traffic and cannot originate a call, the called party is busy, or the IWF returned busy.
NO ANSWER	Returned only if the IWF modem (for asynchronous data calls) returns NO ANSWER.
ERROR	Invalid dial string received or a packet data call is already active.

Hook Control (H)

Syntax

H[<value>]

Description

Controls the "Hook State" of the module. Going "ON-Hook" (H, H0 or H777) while in Online-Command mode, is used to terminate an active data or test call. The "OFF-Hook" state is not recognized by the module, so H1 returns an ERROR result code.

The data call can be terminated in two ways: either in Online-Command mode using the H command, or in Online mode when the DTE sets its DTR line (circuit 108/2) inactive. The module must be configured with &D2 to allow the DTE to terminate a packet data call using DTR.

Note

H777 is used to release a packet data call and have the Gateway put the call into dormant mode. Dormant mode is not supported for asynchronous data calls. Therefore, for an asynchronous call, H777 will return an OK result code and release the data call, but will not attempt to go into dormant mode.

Valid Value(s)

0	Terminates the data call and returns to Command mode.
777	Terminates the data call as above, but instructs the Gateway to transition into dormant mode for packet data calls.

Missing Parameter Default Value(s)

0

Power-On/Reset Default Value(s)

N/A

Results Returned

See Table 6-3 on page 6-9 for details.

Return to Online Data Mode (O)

Syntax

O[<value>]

Description

Returns the module to Online mode from Online-Command mode.

Valid Value(s)

0	If in Online-Command mode, this command returns the phone to Online mode. Otherwise, the command returns NO CARRIER and takes no further action.

Missing Parameter Default Value(s)

0

Power-On/Reset Default Value(s)

N/A

Results Returned

	Condition
CONNECT	The command was correctly recognized and processed and the transition from Online-Command to Online mode was successful.
NO CARRIER	The command was correctly recognized and processed, but the connection was not successfully resumed.
ERROR	The command was not recognized, the <value> parameter was out of range or some syntactical error was encountered.

Basic S-Registers

This section defines the basic S-registers for the module and the functionality provided by each. Table 6-4 lists the result codes common to all recognized S-register commands.

Results Returned

Table 6-4. Common Result Codes for S-Register Commands

Result	Condition
OK	The <value> sent was recognized and supported. <value> is now the new value for the specified S-register.
ERROR	<value> is not recognized. The command is ignored and the specified S-register is left unchanged.
<value> OK	Sx? is used to query S-register x's current setting.

Automatic Answer (S0)

Syntax

S0{=<value>|?}

Description

The S0 parameter sets the number of rings before the module will auto-answer an incoming asynchronous data call only. This parameter does not autoanswer incoming calls.

Valid Value(s)

0	Automatic answering is disabled.
1-255	Number of rings before an incoming asynchronous data call is automatically answered.

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

0

Results Returned

See Table 6-4 on page 6-24 for result code details.

Command Line Termination Character (S3)

Syntax

S3{=<value>|?}

Description

Represents the value of the character recognized by the module as the command line termination character. When the module receives a command line from the DTE, this character indicates termination of the command line. This character is also transmitted by the module to terminate the result code.

If this value is changed in the command line, the response to that command line will use the new value.

Valid Value(s)

0-127	Range of ASCII characters that can be set as the command termination character

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

13	Carriage Return character

Results Returned

See Table 6-4 on page 6-24 for result code details.

Response Formatting Character (S4)

Syntax

```
S4{=<value>|?}
```

Description

Represents the value of the character transmitted as part of the response to commands. It is used in formatting the response and follows the `S3` character in responses when `V1` is in effect.

If this value is changed in the command line, the response to that command line will use the new value.

Valid Value(s)

0-127	Range of ASCII characters that can be set as the command result code termination character

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

10	New Line character

Results Returned

See Table 6-4 on page 6-24 for result code details.

Command Line Editing Character (S5)

Syntax

```
S5{=<value>|?}
```

Description

Represents the value of the character recognized by the module as the backspace character. When the module receives this character, it interprets it as a request to delete

the previous character in the command line currently being entered.

Valid Value(s)

0-127	Range of ASCII characters that can be set as the line editing (backspace) character

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

8	Backspace character

Results Returned

See Table 6-4 on page 6-24 for result code details.

Pause Before Blind Dialing Time (S6)

Syntax

S6{=<value>|?}

Description

Represents the amount of time the DCE waits before dialing a valid Dial Number.

This parameter is valid only for asynchronous data services. It is sent to the Gateway IWF modem if different from the default value but is otherwise not used by the module.

Valid Value(s)

2-10	Number of seconds to wait before blind dialing

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

2	seconds

Results Returned

See Table 6-4 on page 6-24 for result code details.

Connection Completion Timeout (S7)

Syntax

```
S7{=<value>|?}
```

Description

Specifies the number of seconds to establish an end-to-end data connection. The module will disconnect the line if no connection is established within this time. See *Silent Retry Timeout (S777)* on page 6-31 for similar (Globalstar-specific) control.

This parameter is valid only for asynchronous data services. It is sent to the Gateway IWF modem if different from the default value but is otherwise not used by the module.

Valid Value(s)

1-255	Number of seconds to establish a connection or call will be disconnected

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

50	seconds

Results Returned

See Table 6-4 on page 6-24 for result code details.

Comma Dial Modifier Time (S8)

Syntax

```
S8{=<value>|?}
```

Description

Specifies the amount of time, in seconds, that the module pauses, during dialing, when a "," (comma) is encountered in the dial string. This command is recognized but does not function for data calls.

This parameter is valid only for asynchronous data services. It is sent to the Gateway IWF modem if different from the default value but is otherwise not used by the module.

Valid Value(s)

0	Disabled. Module does not pause when "," is encountered.
1-255	Number of seconds to pause.

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

2	seconds

Results Returned

See Table 6-4 on page 6-24 for result code details.

Carrier Detect Threshold Timeout (S9)

Syntax

```
S9{=<value>|?}
```

Description

Specifies the amount of time, in 0.1 second increments, that the module should wait before dropping DCD after the signaling carrier is lost.

This parameter is valid only for asynchronous data services. It is sent to the Gateway IWF modem if different from the default value but is otherwise not used by the module.

Valid Value(s)

0	Disabled
1-255	Number of tenths of a second delay

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

6	tenths of a second

Results Returned

See Table 6-4 on page 6-24 for result code details.

Carrier Loss to Disconnect Timeout (S10)

Syntax

```
S10{=<value>|?}
```

Description

Specifies the amount of time, in 0.1 second increments, that the DCE will remain connected before dropping DCD after the signaling carrier is lost.

This parameter is valid only for asynchronous data services. It is sent to the Gateway IWF modem if different from the default value but is otherwise not used by the module.

Valid Value(s)

1-254	Number of tenths of a second to wait
255	Disable timeout

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

14	tenths of a second

Results Returned

See Table 6-4 on page 6-24 for result code details.

DTMF Tone Duration and Spacing (S11)

Syntax

```
S11{=<value>|?}
```

Description

Specifies the duration and spacing, in milliseconds, of DTMF tones while dialing a valid voice number.

Valid Value(s)

50-255	Number of milliseconds of delay

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

95	milliseconds

Results Returned

See Table 6-4 on page 6-24 for result code details.

Globalstar-Specific S-Register Extensions

This section defines the GSP-1720-specific S-register extensions for the module and their functionality.

Silent Retry Timeout (S777)

Syntax

```
S777{=<value>|?}
```

Description

Represents the duration of the "call origination silent retry timer." This specifies the amount of time (in seconds) the module will attempt to originate a call before giving up and performing reacquisition of the Globalstar system.

Valid Value(s)

0–255	Silent-Retry timeout in seconds

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

150	seconds

Results Returned

See Table 6-4 on page 6-24 for result code details.

Extended Configuration AT Commands

This section defines the extended AT configuration commands for the module and the functionality provided by each.

Set Rm Interface Protocol (+CRM)

Syntax

+CRM[=<value>|?|=?]

Description

Sets the Rm interface protocol. When no <value> is specified, <value> is assumed to be 1.

+CRM? queries for the current setting of the <value>.

+CRM=? queries for the acceptable range of <value>.

Valid Value(s)

0	Asynchronous Data Services
1	Packet Data Services

Missing Parameter Default Value(s)

0

Power-On/Reset Default Value(s)

0

Results Returned

Result	Condition
OK	A valid <value> was received and processed.
ERROR	<value> is not supported.
+CRM:<value> OK	? is used to query current setting.
+CRM: (0-1) OK	=? is used to query acceptable range of <value> parameter.

Get Module User Terminal ESN (+GSN)

Syntax

+GSN[=<value>|?|=?]

Description

This read-only command returns the module's ESN only when the bare command (AT+GSN) is entered. All other legal syntax forms simply return an OK result code.

Valid Value(s)

N/A. This parameter is read only.

Missing Parameter Default Value(s)

N/A.

Power-On/Reset Default Value(s)

N/A.

Results Returned

	Condition
+GSN: OK	This is considered the OK response for any legal syntax that does not return the phone's ESN.
ERROR	An illegal syntax was entered.
+GSN: <Hex ESN> OK	ESN is all uppercase Hex character with no 0x prefix, or h or H suffix.

Set Character Framing (+ICF)

Syntax

+ICF[=<format>|=[<format>],[<parity>]|?|=?]

Description

Sets the module local serial port asynchronous character framing (start/stop bits) used for transmitting and receiving information between module and DTE on the Data port of the Rm interface.

Note This command has no effect on the configuration of the Control port of the module's Rm interface. The Control port has a fixed configuration of 8 data bits, 1 stop bit and no parity running at 9600 baud.

As shown in the syntax above, either <format> or <parity> can be optionally specified. If only one value is specified then

the other is left unchanged. If both values are left unspecified then both are reset to their power-on default values.

Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for any missing optional parameters.

`+ICF?` queries the current setting of `<format>` and `<parity>`. `+ICF=?` queries for the acceptable ranges of `<format>` and `<parity>`.

Valid Value(s)

`<format>`:

`3`	8 data bits, 1 stop bit and no parity

`<parity>`:

`0`	Even parity
`1`	Odd parity
`2`	Mark parity
`3`	Space parity

Missing Parameter Default Value(s)

See "Description" above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

`<format> = 3` (for format 3 parity value is ignored)

`<parity> = 3` (no parity is actual configuration)

Results Returned

Result	Condition
`OK`	`<format>` and/or `<parity>` are recognized and supported, and have been processed correctly.

Result	Condition
ERROR	A parameter value was out of range or a syntax error was encountered.
+ICF: <format>, <parity> OK	? is used to query current setting.
+ICF: (3), (0-3) OK	=? is used to query acceptable range of parameters.

Set Local Flow Control (+IFC)

Syntax

```
+IFC[=<DCE_by_DTE>|=[<DCE_by_DTE>],
[<DTE_by_DCE>]|?|=?]
```

Description

Controls the operation of local flow control between the module (DCE) and DTE:

- <DCE_by_DTE> specifies the method of flow control to be used by the DTE to control the flow of data from the module.
- <DTE_by_DCE> specifies the method of flow control to be used by the module to control the flow of data from the DTE.

Note This command has no effect on the configuration of the Control port of the module's Rm interface. The Control port's configuration is fixed with no flow control.

As shown in the syntax above, either <DCE_by_DTE> or <DTE_by_DCE> can be optionally specified. If only one value is specified then the other is left unchanged. If both values are left unspecified then both are reset to their power-on default values.

Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for any missing optional parameter.

+IFC? queries for the current settings of <DCE_by_DTE> and <DTE_by_DCE>. +IFC=? queries for the acceptable ranges of <DCE_by_DTE> and <DTE_by_DCE>.

Valid Value(s)

<DCE_by_DTE>:

0	No flow control
1	Software (XON/XOFF) flow control, stripping XON/XOFF characters from stream
2	Hardware (RFR/RTS) flow control
3	Software flow control, no stripping

<DTE_by_DCE>:

0	No flow control
1	Software XON/XOFF flow control, stripping XON/XOFF characters from stream
2	Hardware (CTS) flow control

Missing Parameter Default Value(s)

See "Description" above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

<DCE_by_DTE> = 2

<DTE_by_DCE> = 2

Results Returned

Result	Condition
OK	Parameters are recognized and supported, and have been processed correctly.
ERROR	A parameter value was out of range or a syntax error was encountered.
+IFC:<DCE_by_DTE>, <DTE_by_DCE> OK	? is used to query current setting.
+IFC: (0-3),(0-2) OK	=? is used to query acceptable range of parameters.

Set Rm Interface Command Baud Rate (+IPR)

Syntax

`+IPR[=<rate>|?|=?]`

Description

Specifies the baud rate at which the module communicates with the DTE over the Data port of the Rm interface (see Figure 5-2 on page 5-7). If `<rate>` is not specified, `<rate>` is set to the power-on/reset default value. When the module is power-cycled, the Data port baud rate is reset to its power-up baud rate stored in non-volatile memory.

The `+IPR` command does not affect the module's call mode (set by the `$QCMODE` command, as described on page 6-71).

`?` syntax queries for the current setting of the Data port baud rate. `=?` syntax queries for the acceptable range the `<rate>` parameter can be set to.

Note The module does not support automatic baud rate detection.

Valid Value(s)

`<rate>`:

300	300 baud (bits/second)
1200	1200 baud
2400	2400 baud
4800	4800 baud
9600	9600 baud
19200	19200 baud
38400	38400 baud

Missing Parameter Default Value(s)

See "Description" above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

See "Description" above for a discussion of power-on/reset defaults.

Results Returned

	Condition
OK	Parameters are recognized and supported.
ERROR	Parameters are not recognized or supported.
+IPR: <baudrate> OK	? is used to query current setting.
+IPR: ( ), (<baud> range) OK	=? is used to query acceptable range of parameters.

DTMF Generation (+VTS)

Syntax

+VTS=<DTMF>

Description

Allows the transmission of DTMF tones. This command is valid only when module is on a voice call.

Valid Values

<DTMF> A single ASCII character in the set 0-9, #, *

Missing Parameter Default Value(s)

N/A.

Power-On/Reset Default Value(s)

N/A.

Results Returned

	Condition
OK	If the DTMF tone has been generated.
ERROR	If an invalid character is used or if there was an error in generating the DTMF tones.

Voice Call Related Commands

Dial Voice Call (+CDV)

Syntax

+CDV=<dial string>

Description

Originates a voice call if the dial string is valid.

Valid Dial Strings

The dial string must be made up of valid dial string characters and/or dial modifiers. Valid dial string characters are: "#*0123456789".

Missing Parameter Default Value(s)

N/A.

Power-On/Reset Default Value(s)

N/A.

Results Returned

	Condition
OK	If the voice call was originated.
ERROR	If there is an error in processing dial string.

Hang Up Voice Call (+CHV)

Syntax

+CHV

Description

Terminates a voice call. If the module is in a voice call, call is terminated. Else the command is ignored.

Missing Parameter Default Value(s):

N/A.

Power-On/Reset Default Value(s):

N/A.

Results Returned

	Condition
OK	If the voice call was terminated or if there is no voice call in progress.
ERROR	If there is an error in terminating the call.

Answer Incoming Voice Call ($QCCAV)

Syntax

```
$QCCAV
```

Description

This command answers an incoming voice call. This command can be used in response to the RING indications of the incoming voice call. ATS0 (Auto answer) has no effect on incoming voice calls.

Note AT$QCSTATUS can be used to verify if the incoming call is voice call.

Power-On/Reset Default Value(s):

None

Missing Parameter Default Value(s):

N/A

Results Returned

	Condition
OK	If the incoming voice call was answered successfully.
ERROR	If there is an error in answering the call.

Online-Command Mode Commands

Online-Command mode allows the Online mode data stream to be interrupted so that AT commands are recognized and processed. An escape sequence, injected into the data stream, directs the module to enter Online-Command mode from Online mode.

All AT commands recognized in Command mode are also recognized in Online-Command mode. The H command and the O command are of particular use in Online-Command mode.

When the Control port is active, the +++ escape sequence and the O command return their normal success status, even though the Control port's operating mode has not changed from Command mode.

Change from Online to Online-Command Mode (+++)

Syntax

~+++~

Description

The escape sequence that directs the module to change from Online to Online-Command mode. Although this is not an AT command, it is necessary to support Online-Command mode and is, therefore, listed here for easy reference.

The ~ character indicates the "guard-time" both before and after the escape sequence. This "guard-time" is necessary to differentiate between the escape sequence +++ and any other string of three + characters inside the Online data stream.

EIA/TIA/IS-707A defines the length of the "guard-time" as "an appropriate time." The module defines the "guard-time" to be 1 second.

Note

The "+++" string is transmitted through to the host side, even if the escape sequence is recognized.

Valid Value(s)

N/A.

Missing Parameter Default Value(s)

N/A.

Power-On/Reset Default Value(s)

N/A.

Results Returned

	Condition
`OK`	Escape sequence recognized. Online-Command mode is active.
None. Continue in Online mode.	Escape sequence was not recognized.

Asynchronous Data through Gateway IWF Commands

These commands support asynchronous data connections. They have no effect locally. They are merely collected locally and sent to the Gateway IWF for processes at the beginning of an asynchronous data call.

Set Remote Config String (+CFG)

Syntax

```
+CFG[=<string>|?]
```

Description

Sets the remote configuration string sent to the IWF. The string, up to and including the termination character but excluding the quote ("") characters, is stored by the module and sent to the Gateway IWF prior to connecting an

asynchronous data call (either mobile-originated or mobile-terminated).

Each transmission of a +CFG command from the DTE replaces the contents of the previous string. The string may be up to 248 characters long.

+CFG? queries the current setting of the config <string>. +CFG=? is not a valid query and will return an ERROR result code.

Valid Value(s)

Any valid combination of AT commands used to configure the IWF modem of an asynchronous data call.

Missing Parameter Default Value(s)

N/A

Power-On/Reset Default Value(s)

"" empty string

Results Returned

Result Code	Condition
OK	A valid quoted <string> was received and processed.
ERROR	Badly formatted <string> or syntax is not supported.
+CFG: <string> OK	? is used to query current setting enclosed in quotes ("").

Data Compression Control Command (+DS)

Syntax

+DS[=[<dir>[,<comp_neg>[,<max_dict>[,<max_string>]]]]|?|=?]

Description

This extended-format compound parameter controls the V.42bis data compression function on the PSTN link between

the Gateway IWF and the host modem (if provided in the IWF). It accepts four numeric subparameters:

<dir>	Specifies the desired direction(s) of operation of the data compression function from the DTE point of view.
<comp_neg>	Compression negotiation specifies whether or not the DCE should continue to operate if the desired result is not obtained.
<max_dict>	Specifies the maximum number of dictionary entries which should be negotiated (may be used by the DTE to limit the codeword size transmitted, based on its knowledge of the nature of the data to be transmitted).
<max_string>	Specifies the maximum string length to be negotiated (V.42bis P2).

As shown in the syntax above, any of <dir>, <comp_neg>, <max_dict> or <max_str> may be optionally specified. If any parameter is left unspecified, its value is left unchanged. If all values are left unspecified then all are reset to their power-on default values.

Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for the missing optional parameter.

+DS? queries for the current parameter value settings.

+DS=? queries for the acceptable parameter ranges.

Valid Value(s)

<dir>:

0	Negotiated...no compression (V.42bis P0=0)
1	Transmit only
2	Receive only
3	Both directions, accept any direction (V.42bis P0=11)

<comp_neg>:

0	Do not disconnect if V.42bis is not negotiated by the remote DCE as specified in <dir>.
1	Disconnect if V.42bis is not negotiated by the remote DCE as specified in <dir>.

<max_dict>	512-65535
<max_string>	6-250

Missing Parameter Default Value(s)

See "Description" above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

<dir>	= 3
<comp_neg>	= 0
<max_dict>	= 2048
<max_string>	= 6

Results Returned

Result Code	Condition
OK	Parameters are recognized and have been processed correctly.
ERROR	A parameter value was out of range or a syntax error was encountered.
+DS: <dir>,<comp_neg>, <max_dict>, <max_string>	? is used to query current settings.
+DS: (0-3),(0-1), (512-65535),(6-250) OK	=? is used to query acceptable range of parameters.

Error Control Selection Command (+ES)

Syntax

+ES[=[<orig_rqst>[,<orig_fbk>[,<ans_fbk>]]]|?|=?]

Description

This extended-format compound parameter controls the manner of operation of the V.42 protocol on the PSTN link

between the Gateway IWF and the host modem (if provided in the IWF). It accepts three numeric sub-parameters:

<orig_rqst>	Specifies the initial requested mode of operation when the IWF is operating as the originator.
<orig_fbk>	Specifies the acceptable fallback mode of operation when the IWF is operating as the originator.
<ans_fbk>	Specifies the acceptable fallback mode of operation when the IWF is operating as the answerer.

As shown in the syntax above, any of <orig_rqst>, <orig_fbk> or <ans_fbk> may be optionally specified. If any parameter is left unspecified, its value is left unchanged. If all values are left unspecified then all are reset to their power-on default values.

Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for the missing optional parameter.

+ES? queries for the current parameter value settings.

+ES=? queries for the acceptable parameter ranges.

Valid Value(s)

<orig_rqst>:

0	Direct mode.
1	Initiate call with Buffered mode only.
2	Initiate V.42 without Detection Phase. If V.8 is in use, this is a request to disable V.42 Detection Phase.
3	Initiate V.42 with Detection Phase.
4	Initiate Alternative Protocol.

<orig_fbk>:

0	Error control optional (either LAPM or Alternative acceptable); if error control not established, maintain DTE-DCE data rate and use V.14 buffered mode with flow control during non-error-control operation.
1	Error control optional (either LAPM or Alternative acceptable); if error control not established, change DTE-DCE data rate to match line rate and use Direct mode.
2	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect.
3	Error control required (only LAPM acceptable); if error control not established, disconnect.
4	Error control required (only Alternative protocol acceptable); if error control not established, disconnect.

<ans_fbk>:

0	Direct mode.
1	Error control disabled, use Buffered mode.
2	Error control optional (either LAPM or Alternative acceptable); if error control not established, maintain DTE-DCE data rate and use local buffering and flow control during non-error-control operation.
3	Error control optional (either LAPM or Alternative acceptable); if error control not established, change DTE-DCE data rate to match line rate and use Direct mode.
4	Error control required (either LAPM or Alternative acceptable); if error control not established, disconnect.
5	Error control required (only LAPM acceptable); if error control not established, disconnect.
6	Error control required (only Alternative protocol acceptable); if error control not established, disconnect.

Missing Parameter Default Value(s)

See “Description” above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

<orig_rqst> = 3

<orig_fbk> = 0

<ans_fbk> = 2

Results Returned

Result Code	Condition
OK	Parameters are recognized and have been processed correctly.
ERROR	A parameter value was out of range or a syntax error was encountered.
+ES: <orig_rqst>, <orig_fbk>, <ans_fbk>	? is used to query current settings.
+ES: (0-4),(0-4),(0-6) OK	=? is used to query acceptable range of parameters.

Modulation Selection Command (+MS)

Syntax

+MS[=[<carrier>[,<automode>[,<min_rate>[,<max_rate>[,<min_rx_rate>[,<max_rx_rate>]]]]]]|?|=?]

Description

This extended-format compound parameter is used to control the manner of operation of the of the modulation capabilities in the IWF (if provided in the IWF). It accepts a single, user-definable, string parameter that contain the parameters listed above. This string is sent to the Gateway IWF during configuration by the module, but is otherwise not used locally.

Valid Value(s)

<string>	<user defined download string>

Missing Parameter Default Value(s)

""	empty string

Power-On/Reset Default Value(s)

""	empty string

Results Returned

Result Code	Condition
OK	Parameters are recognized and have been processed correctly.
ERROR	A parameter value was out of range or a syntax error was encountered.
+MS: <string>	? is used to query current settings.

Dormant Mode Commands

Dormant mode allows the module to disconnect the active data call, to save on over-the-air usage and charges, while allowing the Gateway to maintain the state of the current data call (e.g., assigned IP address). This allows for faster reconnects when more data packets need to be sent or received.

The dormant mode AT commands are +CTA and $QCPKND. Also see *DCE Received Line Signal Detector Behavior (&C)* on page 6-15.

Note Dormant mode is not available for asynchronous calls.

Set Dormant Mode Timeout Value (+CTA)

Syntax

+CTA[=<timeout>|?|=?]

Description

Sets/tests the number of seconds of inactivity (no incoming or outgoing PPP data) before the module times out the active data call and transitions to dormant mode.

This timeout is only valid while in Online mode of a data call. While in Online-Command mode, the +CTA idle timer is disabled. Upon re-entering Online mode the dormant mode timer is enabled and reset to restart the timeout period.

Valid Value(s)

0	Dormant mode timeouts are disabled. The Traffic Channel is not released during inactivity periods.
10-255	Release the Traffic Channel after <timeout> 1-second intervals have elapsed since last sending or receiving RLP data frames on the Um interface.

Missing Parameter Default Value(s)

0

Power-On/Reset Default Value(s)

0

Results Returned

Result	Condition
OK	<timeout> is supported and set as the dormant mode timeout period.
ERROR	<timeout> is not supported and the dormant mode timeout period is left unchanged.
+CTA: <timeout> OK	? is used to query current setting.
+CTA: (0, 10-255) OK	=? is used to query acceptable range of the <timeout> parameter.

Packet No Dial ($QCPKND)

Syntax

```
$QCPKND[=<mode>|?|=?]
```

Description

Modifies the behavior of the module when it receives a data packet on the data port, while *not* in a data call. This allows the module to originate (or not originate) a packet data call upon receipt of a packet without first receiving a Dial command. This feature is functional only for Static IP for dormant-mode packet data calls.

Select option `0` only if making Static IP packet data calls or in dormant mode. Select option `2` if mixing Static IP/dormant mode packet data calls and other types of data calls (e.g., asynchronous data). If you do not want dormant mode, select option `1`.

Valid Value(s)

`0`	Disable Packet No Dial. If a packet is received by the module while not in a data call, the module originates a packet data call in the current mode, even though a Dial command was not received. This value must NOT be used if Dynamic IP addressing is in use.
`1`	Enable Packet No Dial. If a packet is received by the module while not in a data call, the module discards the packet and does nothing.
`2`	Selective Packet No Dial. If the last data services call initiated with the Dial command was a packet data call, then upon receipt of a packet the module originates a packet data call in the current mode. If the last data services call was NOT a packet data call (for example it was an asynchronous call), then upon receipt of a packet the module discards the packet and does nothing. This value must NOT be used if Dynamic IP addressing is in use.

Missing Parameter Default Value(s)

`1 (change)`

Power-On/Reset Default Value(s)

`1 (change)`

Results Returned

	Condition
OK	<mode> is supported and the PPP behavior is set.
ERROR	<mode> is not supported and the PPP behavior is left unchanged.
$QCPKND: <mode> OK	? is used to query current setting.
$QCPKND: (0-2) OK	=? is used to query acceptable range if the <mode> parameter

SMS Commands

The following commands access the Short Messaging Services (SMS) of the module. SMS messages are stored in the module until the user has retrieved and deleted them. They are presented through this interface as a list, sorted in the order received. The application can navigate the list and manipulate the list (print, lock and erase messages) using the following AT commands.

SMS Move/Delete ($QCSMSM)

Syntax

$QCSMSM[=<move>|=[<move>],[<del>]|=?]

Description

Traverses the list of SMS messages, optionally moving in a specifiable direction and/or optionally deleting the current message before the move.

This command takes up to two optional arguments for movement direction (<move>) and delete current message before move (<del>). If left unspecified, the <move> is assumed to be forward with no <del>.

Values

<move>

0	Move to the next message in the list.
1	Move to the previous message in the list.
2	Move to the top of the list.
3	Move to the end of the list.

<del>

0	NO — Do NOT delete current message before movement.
1	YES — DO delete current message before movement.

Default Value(s)

0,0	Move to the next message and do not delete.

Power on Default

None.

Results Returned

Result Code	Description
OK	The move and/or delete operation was completed successfully.
ERROR	Incorrect syntax; unsupported <move> or <del> values; or the move or delete operation failed.

SMS Print ($QCSMSP)

Syntax

$QCSMSP[=<tformat>]

Description

Sends a formatted, multi-line string representing the contents of the current SMS message to the DTE. As in the $QCTOD command, an optional parameter can specify the format to be used when displaying the SMS message arrival time (see *Time of Day ($QCTOD)* on page 6-66).

Values

0	Same as Time-of-Day format '0'.
1	Same as Time-of-Day format '1'.

Default Value

0

Power on Default

None.

Results Returned

Result Code	Description
<formatted message> OK	If a current message exists then it will be formatted as described below with field definitions also given. The format of the message will be: INDEX:<Hexadecimal index> NEW:[<YES|NO>] LOCKED:[<YES|NO>] NUMBER:[<Call back #>] TYPE:[<Type>] PRIORITY:[<priority (4 levels)>] TIME:[<Time Stamp>] LENGTH:[<decimal length of message>] MESSAGE:[<Message Data>] OK Each field of the given format is defined in Table 6-5, "SMS Print Command Field Definitions," on page 6-55. This format was chosen to avoid confusion between message text and the OK. The LENGTH field specifies the number of 8-bit bytes in the MESSAGE field.
ERROR	Unrecognized or unsupported syntax; or there are no messages in the phone.

Format Field Definitions

See Table 6-5.

Table 6-5. SMS Print Command Field Definitions

Field Name	Description
INDEX:	This field is a unique 32-bit value (expressed in Hex) given to each SMS message stored. It allows the SMS messages to be sorted according to their arrival time and not their time stamp. See the TIME field for a description of the issues around time stamps. **NOTE:** Although the INDEX field is unique for SMS messages currently stored (it is initialized to a value one greater than the highest index currently stored), it can be repeated. **Example:** When the highest indexed SMS message is erased and the phone is immediately reset, then that index will be used again.
NEW:	The field indicates whether this message is a newly arrived (<NEW:YES>) message or one that has been previously read (<NEW:NO>). A message is marked read (<NEW:NO>) after the $QCSMP command is issued.
LOCKED:	This field indicates that the user has set the LOCK flag of the SMS message (See *SMS Lock ($QCSMSL)* on page 6-57 for details). The LOCK flag prevents a previously read message (<NEW:NO>) from being "autodeleted" from internal storage. Autodeletion is a mechanism by which old SMS messages are deleted without user intervention, when the SMS storage memory is full, to make room for a newly arrived message. **NOTE:** Locked messages (<LOCKED:YES>) can be manually deleted, by the user, without first unlocking the message (<LOCKED:NO>).
NUMBER:	This field is a sender- and application-specific "call back" phone number.

Table 6-5. SMS Print Command Field Definitions (continued)

Field Name	Description
TYPE:	This field represents the SMS message type. Possible values are: SMSI_CPT_95 SMSI_CMT_95 SMSI_VMN_95 SMSI_CMT_91_CLI SMSI_CMT_91_VOICE_MAIL SMSI_CMT_91_SHORT_MSG SMSI_AWI_95
PRIORITY:	This field represents the priority of the received SMS message. The IS-637 standard allows for four (4) levels of priority; 0 being the lowest and 3 being the highest.
TIME:	This field is a time stamp placed on the SMS message, either by the Message Center (that sent it) or by the module (if the message was received with no time stamp attached). If the Message Center attached the time stamp it will represent the time the message was initially sent. If, however, the module attaches the time stamp, it will represent the time the message was received (for storage). Although the IS-637 standard requires the message center time stamp to be specified in UTC, it is known that some Service Providers' message centers use local time. Because this condition cannot be detected and/or corrected automatically, a user-selectable (per NAM) switch was implemented to set whether the received time stamp was adjusted to UTC or not. **NOTE:** Whether the time stamp represents time sent or arrival time is not stored, and so cannot be determined by the user.

Table 6-5. SMS Print Command Field Definitions (continued)

Field Name	Description
LENGTH:	This field is the decimal count of the number of 8-bit bytes in the SMS message MESSAGE field.
MESSAGE	This field is the user data payload sent in the SMS message. Normally this field is text data such as a page or e-mail. However, for purposes of the Data Services it can contain application-specific binary data as well.

SMS Lock ($QCSMSL)

Syntax

$QCSMSL[=<lock>]

Description

Lock or unlock (that is, set or clear the LOCK flag of) the current SMS message. When a message is locked, it will not be "autodeleted."

"Autodelete" is a mechanism used to make room for newly arriving SMS messages, if storage memory is needed, by erasing OLD (previously read) text messages.

Note The user may delete locked messages without unlocking them.

Values

0	Unlock the current message (clear the lock flag).
1	Lock the current message (set the lock flag).

Default Value

1	Lock the current message.

Power on Default

N/A.

Results Returned

	Description
OK	The requested operation was successful.
ERROR	If an illegal value is detected or any error associated with changing the value of the LOCK flag.

SMS Alert ($QCSMSA)

Syntax

$QCSMSA[=<alert>|?|=?]

Description

This command sets whether the DTE is "alerted" of the arrival of a new SMS message. This "Alert" takes the form of sending an unsolicited result code (SMS) out the Rm interface to the DTE (much the same as a RING indication for incoming calls). The destination port for the SMS result code is the active AT command port.

Values

0	Asynchronous messaging will be turned OFF.
1	Asynchronous messaging will be turned ON.

Default Value

0

Power on Default

0

Results Returned

Result Code	Condition
OK	<alert> is recognized and supported.
ERROR	<alert> is not supported and ignored.

SMS Info ($QCSMSI)

Syntax

$QCSMSI

Description

Returns the current state of the SMS database. This state includes the counts of the list storage areas: NEW URGENT, NEW, OLD and VMN. The VMN count will always be 0 because any arriving VMN messages will not be stored.

Values

None.

Default Value

None.

Power on Default

None.

Results Returned

	Condition
<SMS Info> OK	The operation completed successfully (see below for details on format). Where <SMS Info> is a series of formatted lines indicating the current state of the SMS message database. The format is given below with field descriptions given in Table 6-6, "SMS Info Command Field Definitions," on page 6-60. TOTAL:<total saved> URGENT:<total new urgent> NEW:<total new> OLD:<total old> VMN:<total vmn> (always '0') LOCKED:<total locked> OK
ERROR	An unrecognized or unsupported syntax was entered.

Format Field Definitions

Table 6-6. SMS Info Command Field Definitions

	Description
TOTAL:	The total number of SMS messages saved in internal storage.
URGENT:	The total number of NEW SMS messages marked URGENT.
NEW:	The total number of NEW SMS messages not marked URGENT.
OLD:	The total number of OLD/Read messages.
VMN:	The total number of VMN messages (always '0').
LOCKED:	The total number of messages (OLD or NEW) that have been LOCKED against "autodelete."

Error Log Services Commands

Retrieve Error Log ($QCERR)

Syntax

```
$QCERR
```

Description

Returns the module's error log and build information.

Values

None.

Default Value

None.

Power on Default

None.

Results Returned

Description	
<Error Log Info> OK	If the requested operation was performed.
ERROR	An unrecognized syntax was entered.

Clear Error Log ($QCCLR)

Syntax

$QCCLR

Description

Clears the error log.

Values

None.

Default Value

None.

Power on Default

None.

Results Returned

Condition	
OK	The Error Log was successfully cleared.
ERROR	An unrecognized syntax was entered.

Service Status Commands

Service Alert ($QCSA)

Syntax

```
$QCSA[=<alert>|?|=?]
```

Description

Turns ON or OFF the unsolicited result code "alerting" the DTE of service changes. Changes may include items such as fade, acquisition, roaming, etc. This "Alert" takes the form of sending an unsolicited result code (`SERVICE`) out the Rm interface to the DTE (much the same as a `RING` indication for incoming calls). The destination port for the `service` result code is the active AT command port.

Values

`0`	Turns OFF service alert.
`1`	Turns ON service alert.

Default Value

`0`

Power on Default

`0`

Results Returned

Result Code	Condition
`OK`	`<alert>` is recognized and supported
`ERROR`	An unrecognized syntax or an invalid `<alert>` value was entered.

Service Status ($QCSTATUS)

Syntax

```
$QCSTATUS
```

Description

Returns the current status of the module. Information returned includes whether the module sees a Gateway, the signal strength (RSSI), registration status, current call state, roaming, and so on.

Values

None.

Default Value

None.

Power on Default

None.

Results Returned

	Condition
<Service Status> OK	The operation completed successfully (see below for format; see Table 6-7 for output values).
ERROR	An unrecognized or unsupported syntax was entered.

Where <Service Status> is a series of formatted lines indicating the Service State of the module. The format and description of the output elements are:

```
SERVICE AVAILABLE:<YES|NO>
SERVICE MODE:<mode>
PROVIDER:<provider>
GATEWAY:<gateway>
RSSI:<rssi>
REGISTRATION:<reg_status>
ROAMING:<YES|NO>
CALL STATE:<state>
CALL TYPE:<call_type>
CALL DURATION:<duration>
CALL NUMBER:<number>
OK
```

Table 6-7. Module Status Information

SERVICE AVAILABLE:	YES if the module has acquired Globalstar service; otherwise NO.
SERVICE MODE:	Current service mode: NO_MODE AUTOMATIC GLOBALSTAR DEEP_SLEEP SHUTDOWN SOFT_RESET LPM ANY_MODE RESELECTION_NEXT
PROVIDER:	Current Service Provider; or blank.
GATEWAY:	Gateway number in decimal; or -1.
RSSI:	Received signal strength, from 0 to 4: 0=no signal 4=strong signal
REGISTRATION:	Current registration status of the module with the Gateway: NO=not registered YES=registered
ROAMING:	YES if roaming. NO otherwise.
CALL STATE:	Current call state: IDLE SETUP_ORIG SILENTRETRY SETUP_TERM AUTORETRY CALLINPROG HPSE_RESUME MULTITONE TIMEPAUSE

Table 6-7. Module Status Information (continued)

CALL TYPE:	Service Option used in the current call: SIGNALING VOICE (not applicable for data modem) MARKOV LOOPBACK TIA_PPP TIA_ASYNC (or blank if no call is in progress)
CALL DURATION:	Duration of the ongoing call or the last completed call; or 0 if no call has been made since power up
CALL NUMBER:	Most recently called or currently calling number.

Special Calls and Services Commands

Time of Day ($QCTOD)

Syntax

```
$QCTOD[=<tformat|=?>]
```

Description

Exports the time of day as received from the Globalstar system. The application can use this to obtain an accurate time.

Values

0	Format type 0 [see below]
1	Format type 1 [see below]

Default Value

0

Power on Default

None.

Results Returned

	Condition
<Formatted TOD>	<tformat> was a valid format specifier. The TOD string has two possible formats:
OK	**NOTE:** The time is reported in UTC.
	Format 0: <YYYY>:<DOY> <HH:MM:SS>
	Format 1: <DD> <MM> <YYYY> <HH:MM:SS>
	The format fields have the following definitions: <YYYY> Year <DOY> Day of Year (starting with 0 for Jan 1) <HH> Hours, 24 hour format <MM> Minutes <SS> Seconds <DD> Day of month, same as standard calendar days <MM> Numeric month, starting at 1
ERROR	An unsupported syntax or <tformat> was entered. Or unable to report time because the system has not been acquired yet.

Position Location Service ($QCPLS)

Syntax

```
$QCPLS[=<position type>|=[<position type>],[<time format>]|=?]
```

Description

Returns the current position of the module and the time (in UTC) that the position information was acquired. $QCPLS=? queries for the acceptable ranges of <position type> and <time format>.

Note If additional characters are received on the same port while this command is processing, the command will be aborted.

Note

As shown in the syntax above, either `<position type>` or `<time format>` can be optionally specified. If only one value is specified then the other is left unchanged. If both values are left unspecified then both are reset to their power-on default values. Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for the missing optional parameter.

Values

`<position type>`

`0`	Request the current position.
`1`	Get the last position successfully obtained.

`<time format>`

`0`	TOD format '0' (See *Time of Day ($QCTOD)* on page 6-66.)
`1`	TOD format '1' (See *Time of Day ($QCTOD)* on page 6-66.)

Default Value(s)

`<position type>`

`0`

`<time format>`

`0`

Power on Default

None.

Results Returned

	Condition
N: DDD MM SS W: DDD MM SS	<position type> was a valid position type specifier. The format of position is given as DEGREES (DDD), MINUTES (MM) and SECONDS (SS) for both Longitude (N:) and Latitude (W:) coordinates.
TIME:<time of position>	The time of the position measurement (TIME:) is also returned to the DTE and follows the format of the Time of Day (TOD) return value (specified in *Time of Day ($QCTOD)* on page 6-66). The requested format is specified using the second <time format> parameter to the command.
ERR:<positioning error>	The positioning error (i.e., estimated accuracy) of the returned position. (ERR:) is specified in units of distance rather than percent. The possible return values are:
OK	< 300m (meters) < 1km < 2km < 5km < 10km < 20km < 100km
ERROR	An unsupported syntax was entered. Or unable to determine the current position, or there is no previous position to fetch.

Markov Statistics ($QCMSTATS)

Syntax

$QCMSTATS

Description

Returns the statistics from the last Markov call, or the current statistics from a Markov call in progress.

Values

None.

Default Value

None.

Power on Default

None.

Results Returned

	Condition
<Markov Stats>	The statistics of the previous Markov call (or current call if one is in progress).
OK	**Note:** The statistics may not be saved over a power-down or reboot of the module. The format of the <Markov Stats> return strings is as follows (all returned statistics are in Hex): <Markov Stats> MARKOV RATE: BIT FRAMES: BAD FRAMES: TOTAL FRAMES: TOTAL FRAMES: EXPECTED/RECEIVED RATE: (expected rates frames are on the vertical axis; received rate frames are on the horizontal axis, going from zero to full in each case) GOOD FRAMES: (frame rate order: zero quarter half full) ERASURES: (frame rate order: zero quarter half full) If no current <Markov Stats> are available (either from a previous or current call) for whatever reason, the <Markov Stats> table is filled with zeros.
ERROR	An unsupported syntax was entered.

Set Mode ($QCMODE)

Syntax

$QCMODE[=<mode>|?|=?]

Description

This command sets the module's call mode. It does not affect the Rm interface baud rate (set by the +IPR command, as described on page 6-37).

Note When the module is powered up, the module call mode is set to 1 (auto-detect mode). However, when the module is reset by the Z command, the current call mode is left unchanged. Resetting with the &F command does reset the call mode.

Values(s)

1	Auto-detect Mode
2	Globalstar Only Mode

Note Since the GSP-1720 is single-mode (Globalstar only), "Auto-detect Mode" has the same effect as "Globalstar Only Mode." The GSP-1600 Tri-Mode Phone has two additional modes: digital cellular and analog cellular.

Missing Parameter Default Value(s)

1

Power-On/Reset Default Value(s)

1

Results Returned

Result	Condition
OK	<mode> is supported and Call Mode is set.
ERROR	<mode> is not supported and Call Mode is left unchanged.
$QCMODE:<mode> OK	? is used to query current setting.

Result	Condition

`$QCMODE:(1-2)`
 	
`OK`
	`=?` is used to query acceptable range of the `<mode>` parameter.

Set Port Configuration ($QCDMI)

Syntax

`$QCDMI=<value>`

Description

Sets the port configuration of the module. It can be used to set the Diagnostic and Data port configuration.

Valid Values

0	Both Diagnostic and Data port use USB.
1	Data port uses USB. Diagnostic port is not set.
2	Data port uses RS-232. Diagnostic port uses USB.

Power-On/Reset Default Value(s)

None

Missing Parameter Default Value(s)

N/A.

Configuration and USB drivers used.

		Data Port
DATA + DMI Option	USB (USB Driver)	USB (USB Driver)
DATA Only Option	None	USB (Host USB Driver)
DMI Only Option	USB (Host USB Driver)	RS-232 (Data Port)

Note If an AT command is used to set the preference, the UT must be rebooted for the changes to be effective.

Results Returned

	Condition
OK	If a valid value is used and the configuration is set successfully.
ERROR	If an invalid value is used or if there is an error in setting the configuration.

Set Auxiliary Port Functionality ($QCCTL)

Syntax

$QCCTL=<value>

Description

This command sets the auxiliary port functionality. It can be used to set the port as a control port or an NMEA port.

Valid Values

0	None.
1	Control port.
2	NMEA port.

Power-On/Reset Default Value(s)

None

Missing Parameter Default Value(s)

N/A

Note If the AT command is used to set the preference, the UT must be rebooted for the changes to take effect.

Results Returned

	Condition
OK	If a valid value is used and the configuration is set successfully.
ERROR	If an invalid value is used or if there is an error setting the configuration.

Route HFK Audio ($QCHFK)

Syntax

```
$QCHFK=<value>
```

Description

Instructs the HFK to route audio to either HFK (microphone and loud speaker) or to a handset connected in a house kit configuration.

Valid Values

```
0          Route the audio to HFK.
1          Route the audio to house kit.
```

Power-On/Reset Default Value(s)

None

Missing Parameter Default Value(s)

N/A.

Results Returned

Result Code	Condition
OK	If a valid value is used and the audio routing is set successfully.
ERROR	If an invalid value is used or if there is an error in the audio routing.

Display Current Memory Usage ($QCMEM)

Syntax

```
$QCMEM=<cr>
```

Description

This command displays the current memory usage in the UT. It displays the percentage free in the IMSG, LOG and SYS memory pools.

Valid Values

IMSG	Percentage free in the current IMSG memory pool.
LOG	Percentage free in the current LOG memory pool.
SYS	Percentage free in the current SYS memory pool.

Power-On/Reset Default Value(s)

None

Missing Parameter Default Value(s)

N/A

Results Returned

Result Code	Condition
OK	If the command is processed successfully.
ERROR	If there is an error in processing the command.

Protocol Stack Modification Commands

Caution We strongly recommend that you do not use these commands if you do not have a thorough understanding of what they do and of how TCP networking works.

TCP is used to ensure end-to-end integrity of data on the over-the-air link in an asynchronous data call. These commands allow modification of the TCP stacks between the module and the Gateway IWF.

Caution Improperly setting these commands can cause severe performance degradation.

TCP Stack Changes ($QCTCP)

Syntax

```
$QCTCP[=<tcpmod>|[=<tcpmod>[,<lowertxmss>[,
<uppertxmss>[,<rxmss>[,<minrto>[,<maxrto>[,<minato>[
,<maxato>[,<maxtcpbackoff>]]]]]]]]]|?|=?]
```

Description

Allows you to modify the behavior of the TCP stack by accessing to several variables that control it. This includes the ability to change the maximum segment size for both transmit and receive, as well as the ability to change the values controlling the retransmit timer, and the acknowledgment timer.

Note

As shown in the syntax above, any of the parameters can be optionally specified. Any unspecified value is left unchanged. Optional parameters must be separated by commas. The commas act as place holders (in the command parser) for the missing optional parameters.

`<tcpmod>`	Defines whether or not to use the default TCP values, or to use the values passed in.
`<lowertxmss>`	Sets the lower bound for outgoing TCP packet sizes.
`<uppertxmss>`	Sets the upper bound for outgoing TCP packet sizes. The variable can be overwritten during TCP negotiation if the other end of the connection sets a TCP MSS lower than this value.
`<rxmss>`	Sets the size for the incoming TCP MSS.
`<minrto>`	Sets the minimum value for the range used to calculate the retransmit timeout.
`<maxrto>`	Sets the maximum value for the range used to calculate the retransmit timeout.
`<minato>`	Set the minimum value for the range used to calculate the acknowledgment timeout.
`<maxato>`	Sets the maximum values for the range used to calculate the acknowledgment timeout.

<tcpmaxbackoff>	Sets the number of TCP backoffs allowed before tearing down the connection. A value of zero will keep the phone from tearing down the call based on the number of TCP backoffs.

If <tcpmod> is equal to one, the values in the rest of the variables are put into effect. If <tcpmod> is set to zero, the rest of the values entered into the AT command are ignored, and the default values are restored to the internal variables.

Valid Value(s)

<tcpmod>

0	Use the default values for the TCP stack.
1	Use the values passed in for the TCP stack.

<lowertxmss>

0-1500	Lower bound for the transmit MSS

<uppertxmss>

0-1500	Upper bound for the transmit MSS

<rxmss>

0-1500	Receive MSS requested

<minrto>

0-120000	Minimum Retransmit Timeout (in ms)

<maxrto>

0-120000	Maximum Retransmit Timeout (in ms)

<minato>

0-1000	Minimum Acknowledgment Timeout (in ms)

<maxato>

0-6000	Maximum Acknowledgment Timeout (in ms)

<maxtcpbackoff>

0	TCP backoffs will never release call.
1-100	Number of TCP backoffs before terminating call.

Missing Parameter Default Value(s)

See "Description" above for values assumed when optional parameters are missing.

Power-On/Reset Default Value(s)

<tcpmod> = 0

<lowertxmss> = 536

<uppertxmss> = 536

<rxmss> = 536

<minrto> = 500

<maxrto> = 6000

<minato> = 100

<maxato> = 6000

<tcpmaxbackoff> = 0

Results Returned

Result Code	Condition
OK	The values entered into the command were correct.
ERROR	Incorrect syntax, value out of range, or incorrect number of parameters
$QCTCP: <tcpmod>, <lowertxmss>, <uppertxmss>, <rxmss>,<minrto>, <maxrto>,<minato>, <maxato>, <tcpmaxbackoff>	? is used to query current setting.
$QCTCP: (0-1), (0-1500), (0,1500), (0-1500),(0-54464), (0-54464),(0-1000), (0-6000),(0-100)	=? is used to query acceptable range if the <value> parameter

Use Van Jacobsen Header Compression ($QCVJ)

Syntax

$QCVJ[=<usevj>|?|=?]

Description

Allows Van Jacobsen header compression to be turned on or off for the next negotiated connection.

Valid Value(s)

<usevj>

0	Turn Van Jacobsen header compression off.
1	Use Van Jacobsen header compression.

Missing Parameter Default Value(s)

1	Use Van Jacobsen header compression.

Power-On/Reset Default Value(s)

<usevj> = 1

Results Returned

Result Code	Condition
OK	The requested operation was successful.
ERROR	If an illegal value is detected
$QCVJ: <usevj>	? Is used to query current <usevj> value.
$QCVJ: (0-1)	=? is used to query acceptable range of parameters.

7 TROUBLESHOOTING

If you are having a problem with a GSP-1720 Satellite Data/Voice Module, try the troubleshooting tips in Table 7-1.

Table 7-1. Troubleshooting Module Problems

Problem	Possible Solutions
`AT$QCSTATUS` command returns `RSSI: 0` *-or-* DTE application determines, after a service alert, that there is no Globalstar signal.	▪ The antenna is not properly connected, or is not outside with a clear view of the sky. ▪ Antenna cables may be crossed (that is, the module Rx cable may be connected to the antenna Tx Transmit connector, and vice versa). Make sure module Tx is connected to the antenna Tx connector and the module Rx is connected to the antenna Rx connector.
`AT$QCSTATUS` command returns `Registration: No`	▪ The module may not be service-programmed correctly. See *Service-Programming Modules* on page 3-1 and consult your SP to make sure you have the correct service programming values.
Upon attempting a connection, the `SELF TEST RESULT` is not received within a few seconds.	▪ HyperTerminal is connected to the wrong COM port. ▪ The module is not plugged in to a power source.

Table 7-1. Troubleshooting Module Problems (continued)

Problem	Possible Solutions
The module does not seem to be getting power, even though it is plugged in.	n Both the AC power connector on the diagnostic cable and the DC power connector on the interface cable are plugged in. Only one can be used at a time. n Ensure the PWR LED is on.
AT commands that you type in HyperTerminal do not appear on the screen.	n Command echoing has been turned off. Type `ATE1` or `ATZ` to turn echoing back on.
AT commands are not recognized on the Data port.	n Check to see if the Control port is active. AT commands will not work on the Data port when the Control port is active.
HyperTerminal or Dial-Up Networking cannot talk to the module.	n Make sure the baud rate in HyperTerminal or Dial-Up Networking matches that for the module port. The Control port is 9600 only; the Data port default is 19200 but can be set to selected rates from 300 to 38400.

Note Service is subject to Network availability. Contact your service provider for assistance.

8 INTEGRATING GSP-1720 MODULES INTO PRODUCTS

Integrators can buy GSP-1720 Satellite Data/Voice Modules direct from Globalstar and its Service Providers.

As an integrator, you build custom module and antenna cables as appropriate to your specific products. You may also purchase antenna cables from Globalstar. You must also mount the module boards in protective enclosures, which field technicians can then install on-site, connected to antennas.

This chapter is intended for:

- Integrators who incorporate GSP-1720 hardware into products (for example, oil pipeline monitors)
- Field technicians who install those products on site

It is assumed that integrators and field technicians can work directly from the technical specifications. This chapter contains the following information:

- Integrating modules into products
  - Hardware description of the module, including mechanical descriptions; specifications; Data and Control port signaling and pinouts; DC power; and grounding information
  - Guidelines for mounting modules in enclosures
- Mounting antennas on-site
  - Antenna cable specifications and lengths
  - Positioning antennas for Globalstar service, and mounting and sealing antennas
- Environmental specifications for the GSP-1720.

Caution For your safety and to avoid potential damage to the equipment, observe the *Cautions and Warnings* on page xxiv.

Caution When integrating the GSP-1720 and its antennas into products, be sure to abide by all RF restrictions as described in Appendix A.

Integrating Modules into Products

This section describes the GSP-1720 Satellite Data/Voice Module hardware, including mechanical descriptions of the module, its Data and Control port signals and pinouts, DC power, and grounding.

Using this information for your specific products, you can create custom cables, which connect a module (the DCE) to:

- A terminal or processor (the DTE) running custom application software for your product — using the Data port only, or both Data and Control ports
- An appropriate DC power source
- Antenna — for information about installing antennas and calculating cable lengths, see *Mounting Antennas at the Field Site* on page 8-17.

Note The Diagnostic port uses a standard USB cable.

Module Mechanical Description

The GSP-1720 is a single circuit card assembly (CCA) that is open and unprotected. As a result, the GSP-1720 must be shielded from direct impacts, precipitation, and particulates.

I/O is obtained through four connectors:

- Power, Data, and Control functions are accessed via a 22-pin connector (labeled J4 on the board).
- Globalstar RF transmit signals are routed to an SMA-style coaxial connector (labeled J2 on the board).

- Globalstar RF receive signals are routed to an SMA-style coaxial connector (labeled J1 on the board).
- The Diagnostic port uses a standard USB cable (labeled J3 on the board).

Module Board Layout

This section includes the following technical drawings depicting the module:

- GSP-1720 Module Board Layout (Top View), Figure 8-1
- GSP-1720 Module Board Layout (Side and Bottom View), Figure 8-2

Note

In Figure 8-1 and Figure 8-2, dimensions are shown as: millimeters [inches]. Millimeters are the controlling dimensions on these drawings. Inch dimensions are for reference only.

Figure 8-1. GSP-1720 Module Board Layout (Top View)

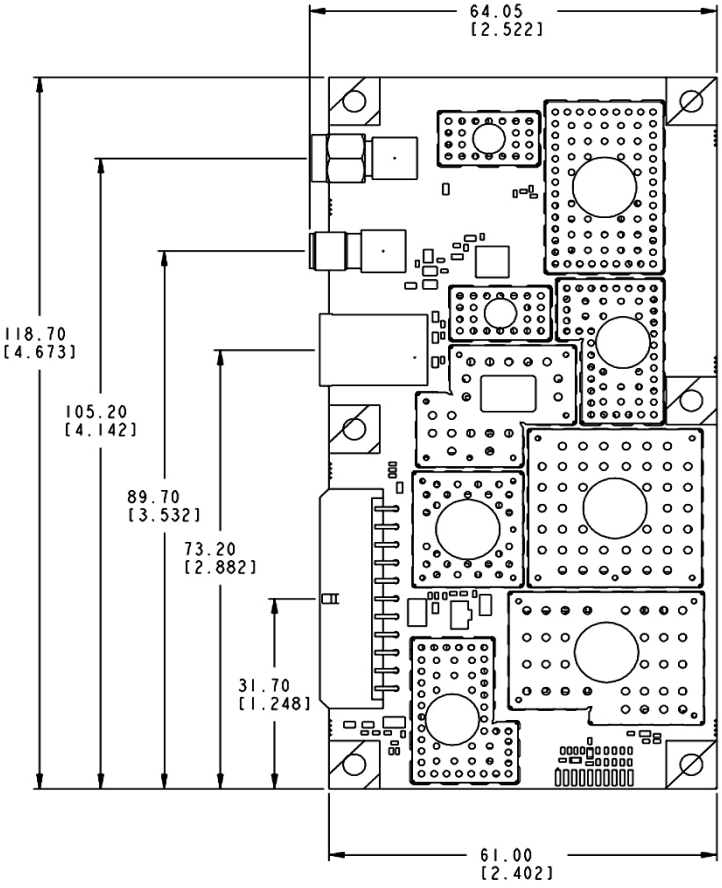
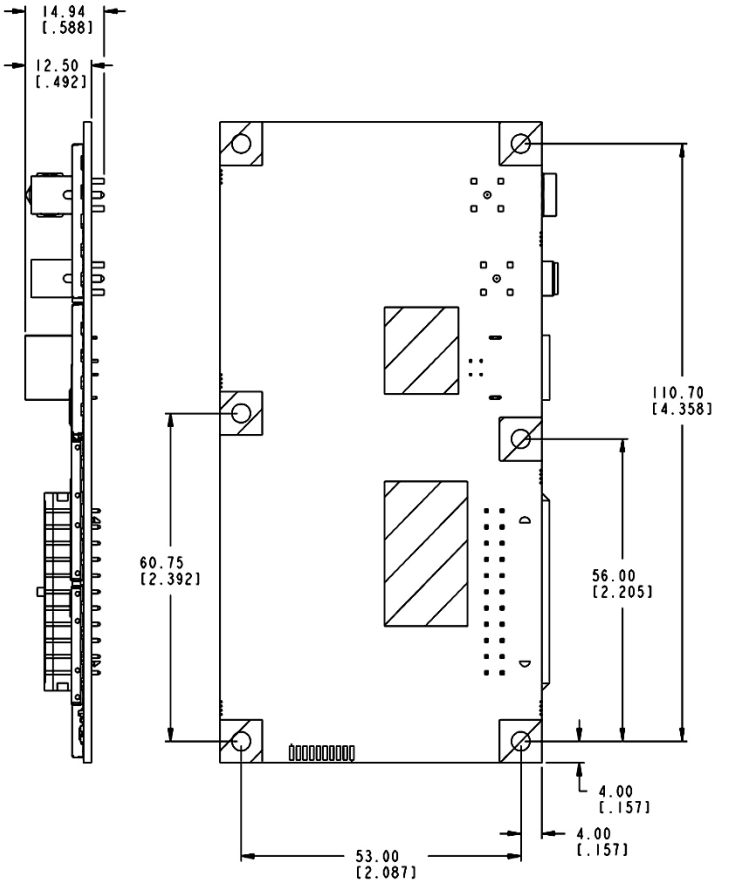


Figure 8-2. GSP-1720 Module Board Layout (Side/ Bottom Views)



Module Dimensions and Weight

Module dimensions are 119 x 65x 14 millimeters (4.69 x 2.56 x 0.55 inches).

Module weight is less than 60 grams (2.15 ounces).

Module Antenna Connectors

The GSP-1720 has two (2) sma screw-on connectors for the antenna leads, connecting the antenna to the module:

- Transmit (Tx) is lead is Female and is labeled **J2**.
- Receive (Rx) lead is Male and is labeled **J1**.

Caution The SMA connectors are secured only by a solder joint and are not designed to withstand excessive force. When cables are connected to these connectors, care must be taken to ensure adequate strain relief is provided.

Data and Control Ports

The Data and Control ports are combined into a single 22-pin Molex serial connector, which provides the primary user interface:

- The connector contains two (2) 9-pin serial ports, DC power leads, and a reset lead.
- Line speed for the Data port is variable between 300 bps and 38400 bps. (This is different from the over-the-air effective throughput, which is 9600 bps.)
- Line speed for the Control port is fixed at 9600 bps.
- Signaling uses 8 bits, no parity and 1 stop bit (8,N,1).
- All ports are ESD and short-circuit protected.

Note The Data port can be set to either USB or serial. Refer to Chapter 5 for setting port configurations.

Note The module signal naming convention assumes that the module is the DCE and that the user application is the DTE.

Note Pin 13 in the 22-pin Molex connector is used for power on/off. Pull the pin low to power on the module. By floating or pulling the pin high (4.7 V), the module will power down.

Control Port Signals

The Control port (CP) is an RS-232-level asynchronous interface operating at 9600 bps using Transmit Data (TxD),

Receive Data (RxD), Data Terminal Ready (DTR), Data Set Ready (DSR), and Signal Common (GND).

RxD and TxD perform data transfer and handshaking, while DTR is used to turn on the module and to let it know that there is an application waiting to talk to it.

The Control port specifically allows dedicated usage of the Data Port by the application. It allows all AT commands, module alerting, and SMS messages to be sent simultaneously via a separate "control" port to/from the module. In case of a reboot (due to fatal errors or any other reason), the DSR line will be set inactive so that the user application can detect a reset condition and take the necessary action.

Data Port Signals

The Data port (DP) is a hardware-flow controlled, RS-232 level, asynchronous serial interface:

- The Data port uses the following RS-232 leads for operations: Transmit Data (TxD), Receive Data (RxD), Clear To Send (CTS), Data Terminal Ready (DTR), Data Set Ready (DSR), Ready to Send (RTS), Data Carrier Detect (DCD), Ring Indicator (RI), and Signal Common (GND).
- The format for data on the Data port is 8 bits, no parity and 1 stop bit.
- The baud rate is user-configurable to selected rates from 300 bps to 38400 bps. The baud rate is adjustable in software.
- In case of a reboot (due to fatal errors or any other reason), the DCD and DSR lines will be set inactive so that the user application can detect a reset condition and take the necessary action.
- Functionally, the Data port integrates AT commands and alert messages as well as application data traffic.

22-Pin Data and Control Port Pinouts

Table 8-1 provides detailed information about the Interface connector pinouts. The connector is a Molex part (Part Number 43045).

Table 8-1. Interface Connector Pinouts

	Signal Name	Termination	Pin
1	Audio Out		n/a
2	Audio In		n/a
3	Audio GND		n/a
4	Data Port TX	P2-Data port	3
5	Data Port RX	P2-Data port	2
6	Data Port DTR	P2-Data port	4
7	Data Port RTS	P2-Data port	7
8	Data Port CTS	P2-Data port	8
9	Data Port DCD	P2-Data port	1
10	Data Port RI	P2-Data port	9
11	Data Port DSR	P2-Data port	6
12	GND	P2-Data port	5
13	VEXT_ON_N		n/a
14	GND		n/a
15	DC In		n/a
16	Control Port TX	P3-Control Port	3
17	Control Port DTR	P3-Control Port	4
18	Control Port RX	P3-Control Port	2
19	GND		
20	GND	P3-Control Port	5
21	Control Port DSR	P3-Control Port	6
22	VDD_ODU		n/a

Note Pin 22 should be left floating or set to ground unless a Richardson active TX ODU is being used.

Diagnostic Port

The Diagnostic port can be connected to a standard USB cable. By connecting a USB cable to the Diagnostic port, you can:

- Service-program a module or upgrade its software, using the Globalstar User Terminal Program Support Tool (UTPST).

Note

For more information about the UTPST, see *UTPST Overview* on page 3-2.

Caution

The USB connector is secured only by a solder joint and is not designed to withstand excessive force. When a cable is connected to this connector, care must be taken to ensure adequate strain relief is provided.

DC Power

The GSP-1720 requires input DC power ranging from 4.7 V to 5.1 V, with 1 Amp (maximum) (pin 15). The module DC input power must be clean (maximum of 50 mV peak-peak ripple and noise) and must be within the absolute maximum voltage range of 4.7 V to 5.1 V under all conditions. For typical DC power consumption limits, see *Power Consumption* on page 8-10.

The approximate minimum input impedance of the module is given by $R = V^2/P_{max}$ where V is the operating voltage of the module and P_{max} is the maximum power consumed by the module. For example, the minimum input impedance of the module at 5 V would be approximately 5*5/5.0 = 5.0 Ohms. Any DC power supply capable of supplying the peak demand of 5 W at 5 V would have this output impedance. Additional design margin of at least 20% is recommended beyond this minimum value.

Care should be taken that if additional EMI filtering is added (see *EMI Filtering* on page 8-10), the impedance as seen by the module's input power supply does not exceed this value.

Warning **Do not unplug the power cables while the module is powered up. This can cause ESD damage to the module and also presents a danger of electrical shock.**

Caution You must ensure that the output impedance of the power supply sourcing DC power to the module is always less than that of the input impedance of the module. Otherwise, a potential exists for oscillations on the DC power line and the GSP-1720 will not operate as designed.

Surge Protection

As an integrator, you are responsible for ensuring that the input voltage specification will never be exceeded.

Minimal transient protection is provided on the GSP-1720 board but this is intended only for low energy/duration events (total transient power less than 1 kW). It is not intended to protect the module in case of a sustained over-voltage/lightning condition.

The use of a fuse is strongly recommended in the power supply connecting to the GSP-1720. The input surge current requirements of the GSP-1720 are such that a fuse with a minimum melting I^2t rating of 0.02 A^2 seconds will be sufficient.

EMI Filtering

Adequate conducted EMI filtering has already been provided in the GSP-1720 to pass FCC and ETSI limits. Additional filtering should not be necessary to meet these requirements.

Caution Should additional filtering be necessary, you must take precautions to ensure that the above criteria are not violated. Please contact Globalstar for further details in such a case.

Power Consumption

Power consumption depends on a variety of factors such as transmit power, input voltage, and data rate. Table 8-2 summarizes the power consumption of the GSP-1720 at an

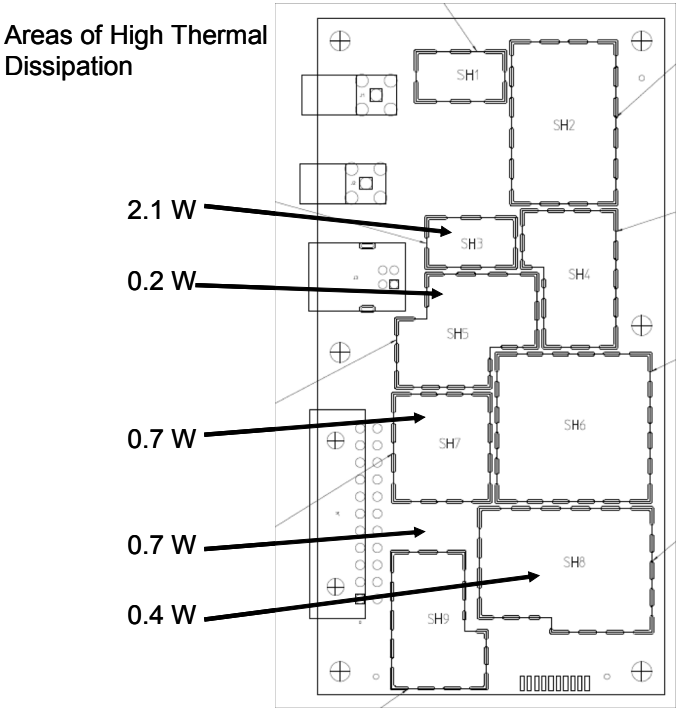
input voltage of 4.7 V to 5.1 V DC. All power estimates include the DC power consumption of the antenna's receive section.

Table 8-2. Module DC Power Consumption Estimates at 5.0 V DC Input

Mode	Minimum	Typical	Maximum
Shutdown	0 mW	3.5 mW	5 mW
Standby	0.5 W	0.5 W	1.1 W
Transmit	2.2 W	3.65 W	5 W

The power modes in Table 8-2 are as follows:

- **Shutdown** — The module is not operational in this state when VEXT_ON_N is high.



- **Standby** — The receiver section in the module is active during this time and the module is ready to transmit/receive data.
- **Transmit** — The module's transmitter is active in this state and may be in the process of transmitting/receiving data.

Power-On

Power-on is controlled by the presence of DC In and POWER_ENABLED_N being low.

Power-Off

Power-off is also controlled by the removal of DC In or raising POWER_ENABLED_N.

Hard Power Reset

Provisions equivalent to power cycling (see Pin 13 in Table 8-1) are included to "hard reset" a GSP-1720 under user control. This pin is pulled high for a minimum of five seconds to reset the module. The line is normally left grounded.

The grounding for the 22-pin Molex connector is common with the four corner mounting hole ground pads. This ground is the same as the signal and power ground. Integrators need to be aware of this fact to avoid ground loops in the final installation.

The GSP-1720 has been certified in accordance with the technical and regulatory requirements of the FCC and the European Union. The module was tested in a configuration that did not include, or require, an enclosure or specially shielded cable configuration in order to demonstrate compliance with the requirements.

Your application may need different grounding configurations. To do accomplish this, a chassis ground connection to the module may be established using conductive support posts/ screws between the module mounting holes, where the solder mask is exposed on both

sides of the board, and the integrator-provided chassis (metallic enclosure or base).

Caution

The RF connector ground is the same as the signal and power ground. As an integrator, you should understand this when designing an integrated product for use in environments where surge protection may be required. You should also be aware of this fact to avoid ground loops in the final installation.

Voice Call Specifications

The SDVM audio system is designed to function in a near field application such as a headset or a handset. Audio levels at the 22-pin connector.

Table 8-3. Audio OUT

Output impedance	10 ohms, intended to drive a 16 ohms load
Freq response	300 Hz-3300 Hz
Output power	8 mW into 16 ohm full scale out with VDD 2.5 V-2.7 V
Power Supply rejection ratio	45 dB

Table 8-4. Audio IN

Input Impedance	35 Kohms
Freq response	300 Hz-3300 Hz
Max Input Voltage	64.5 Vrms

Table 8-5. 3.626 V ADC Reference Voltage

Gain	Vin (SE)	Digital Output (dBFS)
-2	2.5	-5.2
6	1.8	0
8	1.4	0
16	0.6	0

Module Mounting Guidelines

Globalstar offers the GSP-1720 without a mechanical enclosure, anticipating that integrators will incorporate and package the module into an enclosure or cabinet appropriate to the end-user's application. The enclosure must shield the GSP-1720 from direct impacts, precipitation, vibration, acoustic noise, and particulates.

The GSP-1720 has six mounting holes sized for M3 screws. All six mounting locations of the module must be fastened to a rigid structure to meet the vibration and shock requirements specified in *Integrating Modules into Products* on page 8-2.

For hole size and locations, connector locations, and overall envelope dimensions, see Figure 8-1 on page 8-4 and Figure 8-2 on page 8-5.

Caution

When you mount the GSP-1720 into an enclosure or onto a surface, you must exercise care during the process. Adhere to the following recommendations:

- Observe handling precautions necessary to avoid damage by ESD.
- Fasten the module to a planar surface of sufficient flatness and rigidity to prevent flexing of the module.
- Use shock mounts when the environment includes vibration in excess of that shown in Figure 8-5 on page 8-22.

- Use acoustic dampening material when the environment includes acoustic noise in excess of 110 dB OSPL (Overall Sound Pressure Level).
- Do not use fasteners that will damage the grounding areas around the through holes.
- Do not fasten the module using tools with speed and/or torque that will cause damage to the printed circuit board.
- Do not fasten the module with enough clamping force to damage the printed circuit board.
- Exercise caution and do not damage components on the module during handling.

QUALCOMM Mark on Integrator Enclosures

Each GSP-1720 based product and its packaging shall bear the "CDMA by QUALCOMM" mark and such other mark(s) of QUALCOMM, or those which QUALCOMM has the right to use and permit the use of, as QUALCOMM may designate from time to time upon notice to the buyer. The product markings shall appear in a size and location reasonably agreed to by both parties.

Figure 8-3 shows the QUALCOMM marking suitable for integrator enclosures.

Figure 8-3. QUALCOMM Mark for Integrator Enclosures

CDMA BY
QUALCOMM

Integrated Product Regulatory Labeling

The GSP-1720 as delivered by Globalstar is approved and labeled in accordance with the requirements for the FCC, the European Union, and Industry Canada (see Appendix A, *RF Certifications/Restrictions*).

If the regulatory labeling is not visible when the module is integrated into the final product, then the labels must be applied to the product enclosure clearly showing the FCC and Industry Canada numbers with the same style and font size as the label on the circuit board. Globalstar authorizes the duplication and use of these regulatory approvals on the integrated product provided that the module has not been modified or altered to the extent that the electromagnetic performance has been degraded (see *Module Mounting Guidelines* on page 8-14 and Appendix A, *RF Certifications/Restrictions*).

The integrator is responsible for obtaining all required regulatory approvals and certifications for the Integrated Product and for ensuring that the Integrated Product complies with all requirements for its target market and is labeled accordingly.

The label must be located on the product in an area that can be easily viewed and the type size must be large enough to be legible without the aid of magnification. The integrator labeling may be worded as follows:

> "This Product Contains a Globalstar Radio Transceiver FCC ID: J9CGSSDVM; CE0168"

Passive Antenna Cable Specifications

The passive antenna requires two (2) cables, one for transmit and one for receive:

- The required connectors are male SMA to male SMA (module Tx) and female SMA to male SMA (module Rx).
- Transmit cable maximum 1.0 dB insertion loss @ 1618 MHz is required for the cable.
- Receive cable maximum 3.0 dB insertion loss @ 2492 MHz is required for the cable.

Globalstar provides cables for integrator applications. Table 8-6 lists other potential suppliers of RF and microwave connectors and cable assemblies.

Table 8-6. Suggested RF Cable and Connector Suppliers

Volex Inc.:
Address: Volex Inc. 1 Batterymarch Park, Quincy, MA 02169 USA Web: http://www.volex.com/
Times Microwave Systems:
Address: Times Microwave Systems 358 Hall Avenue P.O. Box 5039 Wallingford, CT 06492-5039 Web: http://www.timesmicrowave.com

Calculating Passive Antenna Cable Length

The maximum loss for a passive antenna cable of any length is 1.0 dB at 1.6 GHz for module transmit and 3 dB at 2.5 GHz for module receive.

You must take these losses into account when calculating passive antenna cable lengths for a GSP-1720 installation.

Mounting Antennas at the Field Site

When mounting an antenna on-site, you must position it properly to obtain Globalstar satellite signals. You can mount the antenna on a flat surface or on a pole. In either case, you should seal the antenna connectors against dirt and moisture.

Caution

The antenna must be installed in a configuration that ensures a minimum line-of-sight separation distance of 25 centimeters (10 inches) is maintained at all times between the antenna and any personnel.

Finding a Good Antenna Location

When installed in the field, the antenna of a GSP-1720 product must have a direct line of sight to the Globalstar satellites. Keep in mind that Globalstar satellites follow different paths across the sky, and you cannot predict where they will be.

Position the antenna outdoors where it has a clear view of the sky, unimpeded by tall obstacles such as buildings and trees.

Signal fading associated with trees, buildings, and other obstacles that prevent a clear line-of-sight to the satellite can cause degraded operation in a mobile environment.

Note

Globalstar frequencies are attenuated by wet snow. When mounting the antenna in a snowy location, you must make provisions to prevent snow buildup on the antenna. Wet ice/snow must be restricted to a maximum thickness of 20 centimeters (8 inches) by suitably mounting the antenna.

Securing Antenna Cables

When connecting the antenna cables, the recommended torque for the SMA connectors is 0.79 to 1.13 N·m (7 to 10 in·lb).

Environmental Specifications

This section describes environmental specifications for both the GSP-1720 Satellite Data/Voice Module.

The environmental requirements specified herein are under development and are subject to change without notice.

Note

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to

radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

GSP-1720 Module Environments

Environments affecting the GSP-1720 include temperature/humidity, thermal radiation, altitude, vibration, mechanical shock, and acoustic noise. This section also discusses connector durability, materials, and shipping.

Temperature/Humidity

Operational

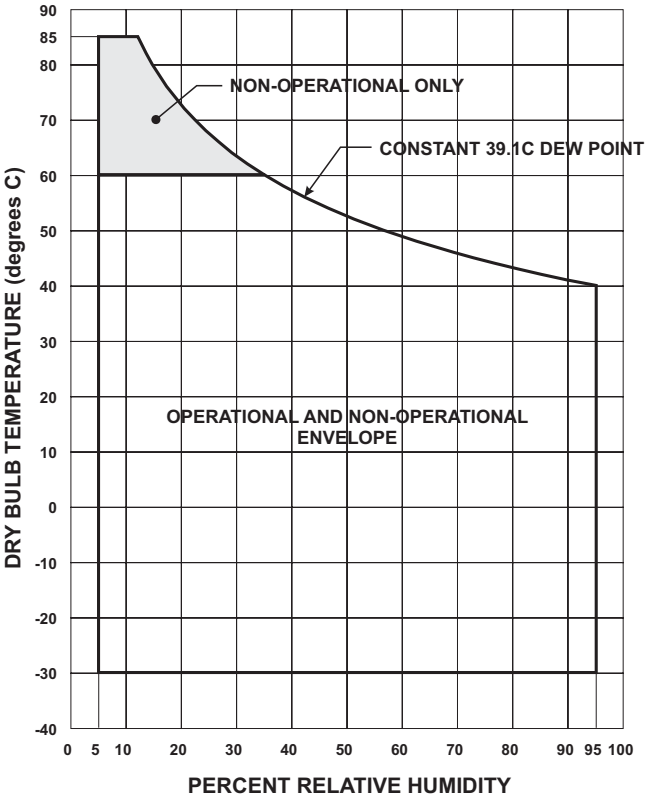
The GSP-1720 operates as specified during exposure to the operational temperature/humidity envelope shown in Figure 8-4.

Caution Condensation on the GSP-1720 is not permissible.

Non-Operational

The GSP-1720 operates as specified after exposure to the operational and non-operational temperature/humidity envelopes shown in Figure 8-4.

Figure 8-4. GSP-1720 Module Temperature/Humidity Envelope



Thermal Radiation

The temperature profile shown in Figure 8-4 includes temperature rise due to thermal radiation, solar radiation, and other heat loads. The GSP-1720 dissipates heat that is dependent on the mode and the transmit power. The dissipated heat is the difference between the DC input power and the RF transmitted power.

Altitude

Operational

The GSP-1720 operates at standard atmospheric pressure altitudes between 0 and 15,000 meters (50,000 feet).

Non-operational

The GSP-1720 operates as specified after storage at pressure altitudes ranging from 0 to 15,000 meters (50,000 feet).

Vibration

Operational–Random

The GSP-1720 operates as specified during exposure to the random vibration spectrum defined in Figure 8-5.

Non-Operational–Random

The GSP-1720 operates as specified after exposure to the random vibration spectrum defined in Figure 8-5.

Operational–Sinusoidal

The GSP-1720 operates as specified after exposure to the swept sinusoidal vibration environment defined in Table 8-7 when E-A-R damping feet (MF-100-UC04-H, black) are used as shock mounts.

Non-Operational–Sinusoidal

The GSP-1720 operates as specified after exposure to the swept sinusoidal vibration environment defined in Table 8-7.

Figure 8-5. GSP-1720 Module Random Vibration Spectra

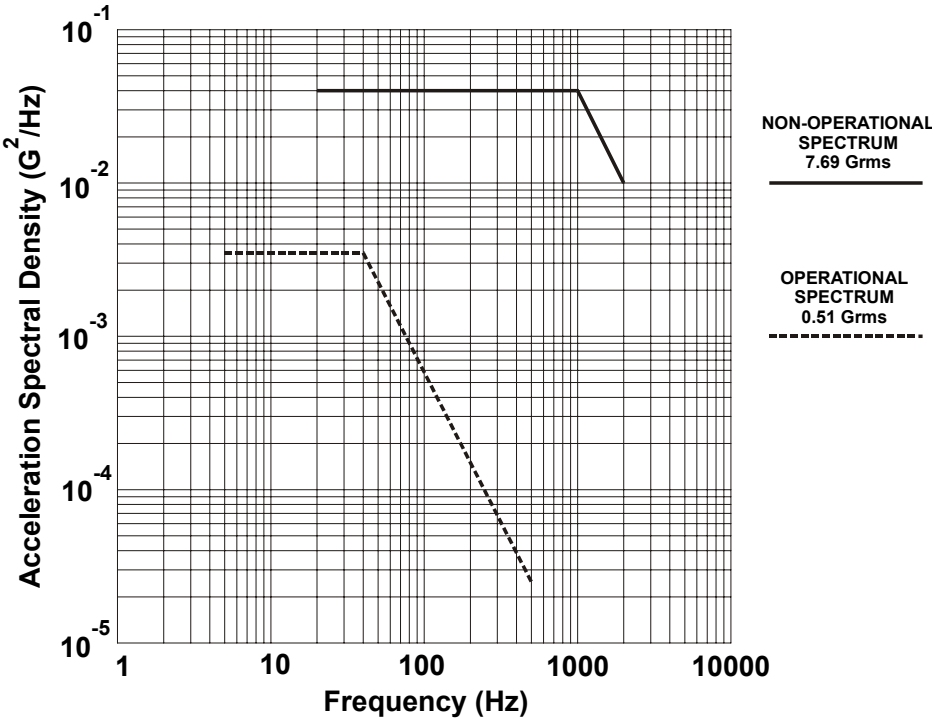


Table 8-7. Swept Sine Vibration Definition

	Acceleration (Gs)	Frequency Range (Hz)
Operational	0.28	2 to 6
	0.5	6 to 500*
Non-Operational	0.59	2 to 8
	2.04	8 to 200
	4.08	200 to 500

* E-A-R damping feet (MF-100-UC04-H, black) used as shock mounts

Mechanical Shock

Operational

The GSP-1720 operates as specified while being subjected to a half sine pulsed acceleration wave form of 11 milliseconds in duration, 2 Gs peak.

Non-Operational

The GSP-1720 operates as specified after being subjected to a half sine pulsed acceleration wave form of 6 milliseconds in duration, 30 Gs peak.

Acoustic Noise

The GSP-1720 is sensitive to very high ambient noise levels. Exceeding specified levels will cause degraded performance. Steps must be taken to ensure that the noise level at the module does not exceed 110 dB OSPL (Overall Sound Pressure Level).

22-Pin and USB Connector Durability

Applied Forces

The 22-pin data connector meets all performance requirements after application of a 25 newton force on the mating connector, applied in six directions—two opposite directions along each of three mutually perpendicular axes.

The USB connector meets all performance requirements after application of a 15 newton force on the mating connector, applied in six directions—two opposite directions along each of three mutually perpendicular axes.

Strain relieving of all cables is advised to minimize load placed upon connectors.

Mating cycles

The 22-pin data and USB connectors meet all performance requirements after a minimum of 3,000 connect/disconnect cycles.

RF Connector Durability

The GSP-1720 RF connectors meet all performance requirements after 500 connect/disconnect cycles at a maximum rate of 12 cycles per minute.

Materials

The GSP-1720 is manufactured of non-nutrient materials with respect to fungal growth.

Shipping

The GSP-1720 as packaged for shipment meets the pre-shipment test procedures specified in the National Safe Transit Association, Project 1A.

Since the GSP-1720 antenna communicates with Globalstar satellites, it must be positioned outdoors where it has a clear view of the sky.

As a result, environments affecting the antenna include temperature/humidity, thermal radiation, icing/freezing rain/snow, altitude, vibration, and mechanical shock. This section also discusses RF connector durability, materials, and shipping.

A RF CERTIFICATIONS/RESTRICTIONS

This appendix discusses certification compliance for the GSP-1720 Satellite Data/Voice Module as well as restrictions relating to RF, RF exposure, and electronic devices.

ALL GSP-1720 IMPLEMETATIONS MUST BE CERTIFIED BY GLOBALSTAR.

Certifications

The GSP-1720 Satellite Data/Voice Module, antenna, and cabling as specified by Globalstar shall be compliant with the following International standards when configured in accordance with the Globalstar recommendations. Any deviation from the guidelines or modifications to the product performed without the permission of Globalstar will invalidate all regulatory approvals.

Compliance to the technical requirements shall be demonstrated with the product installed in a non-metallic enclosure, which provides no additional shielding or RF protection. An integrator-supplied enclosure is required to protect the product from the effects of electrostatic discharge (ESD) and environmental conditions that result in the product operating within its specified range.

Compliance to the technical requirements shall be demonstrated with the product powered by a power supply that is compliant with the rules and regulations of the FCC and the European Community. The integrator is required to provide a power supply that ensures the product continues to meet the applicable regulatory requirements for the specific application.

Globalstar does not accept any responsibility for regulatory compliance of the integrator product. It is the responsibility of the integrator to ensure that all regulatory requirements (e.g., FAA, Hazardous Location) have been met for the specific application.

Federal Communications Commission (FCC)

The GSP-1720 configured with the Globalstar-specified antenna and RF cabling is compliant and approved in accordance with the FCC Code of Federal Rules (CFR) 47 parts:

- Part 1 Para 1.1310 Radio Frequency Radiation Exposure Limits
- Part 15 Radio Frequency Devices
- Part 25 Satellite Communications

European R&TTE Directive 1999/5/EC

The GSP-1720 configured with the Globalstar-specified antenna and RF cabling is compliant and approved in accordance with the essential requirements of the European Community, under European Directive 1999/5/EC On Radio Equipment & Telecommunications Terminal Equipment (R&TTE Directive).

The supporting technical standards used to demonstrate compliance are:

- EN 301 489 Electromagnetic Compatibility
- EN 301 441 (TBR 041) Essential Terminal Requirements

RF Restrictions

The GSP-1720 must be used with the Globalstar-approved antenna, and no modification to the RF transmit or receive path is permitted in the form of amplifiers.

Globalstar must be consulted before any changes can be made in the RF path, including cable length deviations from the Globalstar-provided or recommended cabling. Failure to do so may result in non-compliance with the Globalstar communications network and Government Radio Regulations.

Radio Astronomy Zones

Radio Astronomy exclusion zones may be blacked out of Globalstar service. The integrator should consult with the Globalstar Service Provider to ensure that service is available in the location(s) of the installed integrator product.

GPS Interference Elimination

The module antenna must be installed a minimum distance of 30 inches from a GPS antenna to ensure compatibility between the two satellite systems.

Radio Frequency Exposure Restrictions

The GSP-1720 incorporates a relatively low-power radio transmitter, receiver, and antenna. When it is ON it receives and sends radio frequency (RF) signals. In August 1996, the Federal Communications Commission (FCC) adopted RF exposure guidelines with safety levels for portable wireless phones and devices. Those guidelines are consistent with the safety standards previously set by both US and international standards bodies:

- ANSI/IEEE C95.1-1992 Standard [American National Standards Institute / Institute of Electrical and Electronic Engineers]
- NCRP Report 86 (1986) [National Council on Radiation Protection and Measurements]

- ICNIRP (1996) [International Commission on Non-Ionizing Radiation Protection]
- IRPA (1991) [International Radiation Protection Association]

The GSP-1720 is designed to comply with the established ANSI, FCC, and international safety standards for safe levels of human exposure to RF energy. Maintaining a minimum line-of-sight separation distance of 25 centimeters (10 inches) between the transmitting antenna and all personnel will ensure that the General Population/Uncontrolled Exposure maximum permissible exposure (MPE) limits are not exceeded.

This satisfies the MPE limits mandated by the FCC in 47 CFR Ch. 1 (10-1-99 Edition), Part 1, §1.1310 and defined in the ANSI/IEEE C95.1-1992 standard, and also satisfies the more-stringent European and international exposure limit recommendations of IRPA (1991) and ICNIRP (1996).

Caution The antenna must be installed in a configuration that ensures a minimum line-of-sight separation distance of 25 centimeters (10 inches) is maintained at all times between the ODU antenna and any personnel.

Electronic Device Restrictions

Most modern electronic equipment is shielded from RF signals. However, certain electronic equipment may not be shielded against the RF signals from wireless phones and modems.

Pacemakers

The Health Industry Manufacturers Association recommends that a minimum separation distance of 15.24 centimeters (6 inches) be maintained between a handheld wireless phone and a pacemaker to avoid potential interference with the pacemaker.

For a wireless modem, which has a higher power output than a wireless phone, the distance must be increased. For a GSP-1720, a minimum separation distance of 25 centimeters

(10 inches) should be maintained between the transmitting modem antenna and all pacemakers. These recommendations are consistent with the independent research by and recommendations of Wireless Technology Research, L.L.C.

Persons with pacemakers should follow these guidelines:

- Always keep the modem antenna more than 25 centimeters (10 inches) from your pacemaker when the modem is turned ON.
- If you have any reason to suspect that interference is taking place, turn your modem OFF immediately.

Hearing Aids

Some digital wireless phones and other wireless devices (including wireless modems) may interfere with some hearing aids. If interference occurs, you may want to consult your Service Provider.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from external RF energy. Your physician may be able to assist you in obtaining this information.

Do not operate your GSP-1720 (that is, turn your module OFF) in health care facilities when any regulations posted in these areas instruct wireless phone users to do so. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

B WARRANTY

The warranty for the GSP-1720 Satellite Data/Voice Module will be as provided for in the Supply Agreement as verified by Globalstar Technical Support.

C PRODUCT SUPPORT

This appendix provides support information for the GSP-1720 Satellite Data/Voice Module hardware and software. It contains a description of the support available from Globalstar Technical Support, and how to contact the Technical Support and Order Fulfillment teams.

Globalstar Technical Support

The Globalstar Technical Support Center provides skilled Technical Support and Order Fulfillment staff to support customers with technical issues, purchase order requests, and Return Material Authorizations (RMA) for Globalstar-warranted equipment. The Globalstar Technical Support Website provides online information and forms for technical support and RMA requests. See “Contacting QUALCOMM Technical Support” on page C-3 for details.

Technical Support Information

Globalstar Technical Support is available ?????, to provide troubleshooting assistance for all Globalstar products. Technical Support creates a case to track each issue or request and works to provide a resolution. For more information on technical support, refer to “Contacting QUALCOMM Technical Support” on page C-3 for details.

Contact Technical Support for any Satellite Data/Voice Module related issue, including when you need to:

- Troubleshoot a problem.
- Inquire about a software or hardware upgrade.
- Report a documentation issue.
- Request a Return Material Authorization (RMA).
- Find out the status of a technical issue or of an RMA.
- Follow a procedure that requires Technical Support direction.

Prior to contacting Technical Support, please do the following:

- Repeat the steps or procedures to resolve the problem.
- Check the Website and documentation for solutions.
- Identify the software version and hardware version.
- Document steps or procedures taken.
- Prepare to describe the problem in detail.

Order Fulfillment Information

QUALCOMM Order Fulfillment is available between 8 a.m. and 5 p.m. Pacific Time, Monday through Friday, for Return Material Authorization (RMA) assistance on QUALCOMM equipment and to request a purchase order. For repairs, request an RMA from QUALCOMM. Submit RMA requests to Technical Support to create a case to track the request. Technical Support approves RMA requests, and Order Fulfillment validates the warranty and processes the RMA. For more information on the RMA process, refer to RMA information at http://gstechsupport.qualcomm.com.

Website Information

The QUALCOMM Technical Support Website is located at **http://www.satellitedatasolutions.com**.

Only registered customers may use this Website. For details on registering, go to the login page of the Website, click "Quick Connect," then fill in the information and select "Register" under Interest. Follow the instructions to become a registered user.

The Website provides several resources including the following:

- Product information for the Satellite Data/Voice Module
- Frequently asked questions
- Troubleshooting information

Contacting QUALCOMM Technical Support

QUALCOMM Technical Support is located in the United States and may be contacted via the Website, phone, or email. Skilled staff are available to assist with technical issues and Return Material Authorizations (RMA) processing for QUALCOMM equipment.

Technical support personnel are available 24 hours a day, every day. Order Fulfillment personnel are available between 8 a.m. and 5 p.m. Pacific Time, Monday through Friday, to process RMA and purchase order requests. A case number is assigned to track each technical issue or request.

Contact information

- Website

  The following Website address is available to registered users. Forms are available at:

  http://www.satellitedatasolutions.com (for submitting Technical Support issues)

  http://www.gstechsupport@qualcomm.com (for order fullfillment, RMA, or case submissions)

- Phone

  +1 858 651 4911

  then select the appropriate option.

- Email

  The following email addresses are available to registered customers.

  - **gstechsupport@qualcomm.com**

    Submit technical support issues and RMA requests to this email address. Be sure to provide your name, company, location, telephone number, description of the problem, part information, and details about the error messages and/or log information.

  - **status.techsupport@qualcomm.com**

    Obtain information on the status of an existing technical case by sending an email to this address. Be sure to include the case number in the subject line in the following format *Case Number:12345*.

  - **status.rma@qualcomm.com**

    Obtain information on the status of an existing RMA case request by sending an email to this address. Be sure to include the case number and the RMA number, if available, in the subject line in the following format *Case Number:12345 RMA Number:67890*.

  The following email address is available to all customers.

  - **qws.sales.team@qualcomm.com**

    Obtain answers for all product information questions by sending an email to this address.

D SPECIFICATION SUMMARY

This appendix summarizes the specifications for the GSP-1720 Satellite Data/Voice Module and its antenna.

For further discussion of hardware issues, see Chapter 8, *Integrating GSP-1720 Modules into Products*.

Table D-1. Specification Summary — GSP-1720 Module

Operating Frequencies	Transmit: Receive:	1610-1626.5 MHz 2483.5-2500 MHz		
Maximum Transmit Power	+31 dBm EIRP			
DC Input Voltage	+4.7 V to +5.1 V			
Power Consumption Estimates @ 5V Input	**State** Shutdown Standby Transmit	**Min** 0 mW 0.5 W 2.2 W	**Typical** 3.5 mW 0.5 W 3.65 W	**Max** 5 mW 1.1 W 5 W
Interfaces: User Port Module Antenna Connectors Antenna Connectors	 22-pin header with pin-outs for data, control, power, Analog Audio, remote on/off, and ODU antenna Bias-T TX SMA Female RX SMA Male TX SMA Female RX SMA Female			
Provisioning and Software Upgrade	USB			
Module Dimensions	119 x 65 x 14 mm (4.69 x 2.56 x 0.55 in)			
Module Weight	Less than 60 grams (2.1 ounces)			
Certification	FCC CE IC			

Table D-1. Specification Summary — GSP-1720 Module

Module Environmental Conditions	Operating: -30 °C to +60 °C Storage: -40 °C to +85 °C Relative Humidity: 5% to 95% (under 40 °C) The data module is sensitive to very high ambient noise levels. Steps must be taken to ensure that the noise level at the module does not exceed 110 dB OSPL (Overall Sound Pressure Level). Shock mounts must be used when the environment includes excessive vibration. The GSP-1720 will meet or exceed all operational vibration requirements defined in Table 8-7 when E-A-R damping feet (MF-100-UC04-H, black) are used as shock mounts.
Supporting Software Products	Globalstar User Terminal Program Support Tool (UTPST) (module provisioning tool) Globalstar User Terminal Diagnostic Monitor (UTDM) (module diagnostic tool)

E 22-PIN MOLEX CONNECTOR SPECIFICATION

The QUALCOMM Globalstar GSP-1720 Satellite Data/Voice Module uses a 22-pin Molex Micro Fit 3.0 Connector (part number 43045). Please see their Web page for specifications, drawings, and other details: http://www.molex.com.

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