



Souran Q2686 Design Guide

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Acknowledgments

Please note that references in this document to Sierra-Wireless, Wavecom, OpenAT and Q2686 are either registered names of those corporations or names which are subject to copyright. Symstream acknowledges this and has used these names in this document for the sole purpose of illustrating to Symstream's customers how they can utilise products from these corporations with Symstream's technology solution. Customers should seek advice from these corporations should they wish to utilise these names publicly.

Document Information

References

| Reference Number | Details |
|-------------------------|--|
| [1] | Wavecom Q2686 Wireless CPU, Product Technical Specification, Reference WM_PRJ_Q2686_PTS_001, Revision 008, October 25 2008 |
| [2] | Symstream BOSS Operators User Guide & Reference Manual |
| [3] | Symstream Souran Platform AT Commands Reference Manual & User Guide |
| [4] | |
| [5] | |

Version History

| Version | Release Date | Author(s) | Areas affected |
|----------------|---------------------|------------------|---|
| 0.1 | 20 August 2009 | HvH | Initial release for review |
| 0.2 | 25 August 2009 | HvH | Updates for review comments plus changes to section 2 diagrams. |
| 1.0 | 26 August 2009 | HvH | Software load procedure |
| 1.1 | 6 October 2009 | HvH | Addition of System Application section plus review comments |

Review History

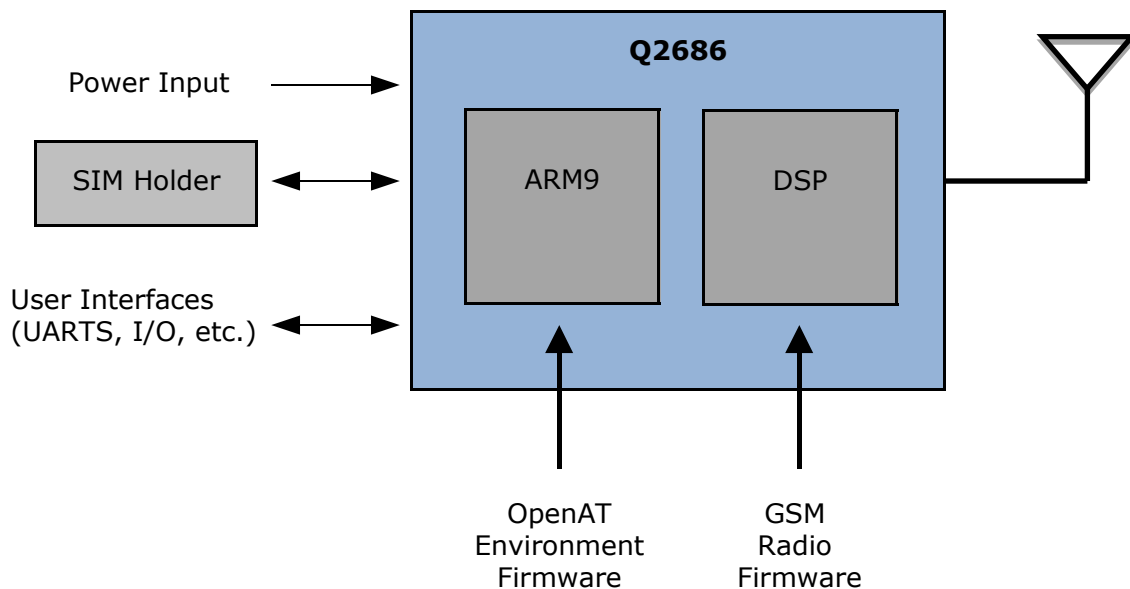
| Version | Review Date | Reviewer(s) | Review Comments Summary |
|----------------|--------------------|--------------------|--|
| 0.1 | 24 August 2009 | SK, RL, SB | Corrections to USB connector detail required, updates to software load procedure |
| 0.2 | 26 August 2009 | AG | Changes to software load procedure for XP laptops |
| 1.0 | 2-6 October 2009 | SZ,RA | Minor comments for new System Application section |
| | | | |

1 Introduction

1.1 Overview

The document has been prepared to assist customers to engineer a Wavecom (subsidiary of Sierra-Wireless) Q2686 GSM radio module into their application and utilize Symstream's software application supporting the Souran management platform and its data over voice communications. Customers are encouraged to follow these guidelines to ensure that solution incorporates the necessary minimum features for deployment which are supported by Symstream's application software.

The Q2686 comes with a host of interface options, however, only a minimal set of these are required for compatibility with Symstream's software application and functions which are important to achieve successful deployment. The latter is based on Symstream's field deployment experience to date.



As with any embedded modem solution, customers utilizing this solution are encouraged to procure a Q26 development kit from Wavecom. The development board supplied with the kit can be used with a terminal to gain a better understanding of the operation of Symstream's software application and assist in resolving any implementation issues.

1.2 Scope

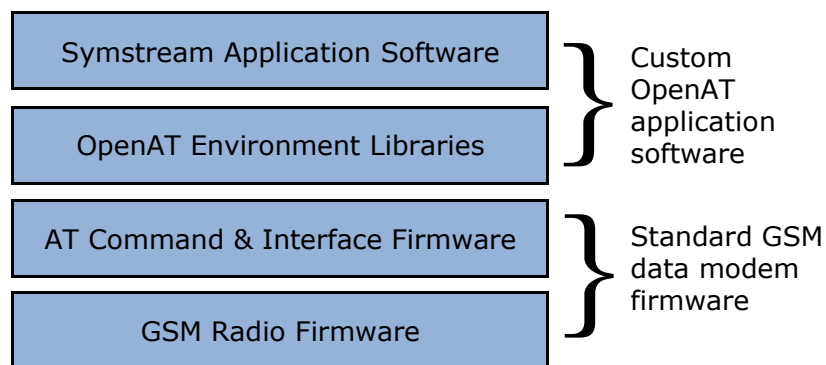
These guidelines only describe specific requirements for compatibility with Symstream's software application and functions which Symstream believes are important to achieve successful deployment, based on field experience to date. The reader should refer to other documents and recommendations provided by Wavecom to ensure successful integration of the Q2686 into their design and compliance requirements. In particular, Wavecom product technical specification for the Q2686 [Ref. 1] should be referenced.

2 Q2686 Modem Solution

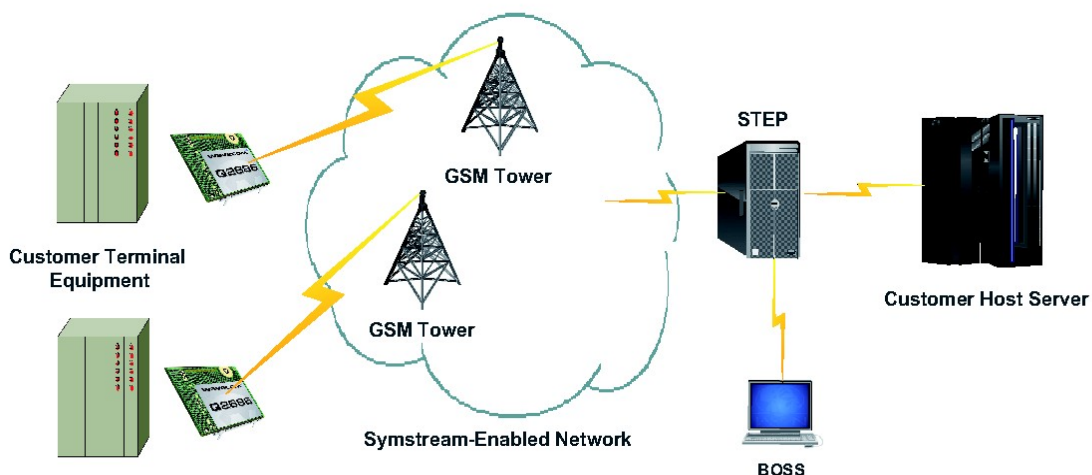
The Q2686 incorporates 2 processors:

- A DSP which handles the GSM radio software and signal processing functions
- An ARM9 processor which supports various control and data interface functions and which supports an OpenAT environment suitable for use by custom software applications

As supplied, the Q2686 supports OpenAT and standard GSM data modem functionality including GPRS and CSD as well as access to the voice channel. The standard Q2686 firmware can be updated for later releases when required. Custom OpenAT software applications are loaded separately into the GSM radio module to run on the ARM9 processor. These software applications have access to all the standard Q2686 functions via defined API's.



Symstream's application includes support for data over voice channel transmission and the Souran management platform. Souran permits operators to remotely manage their own wireless communications infrastructure including Symstream enabled wireless remote modem devices and the data paths they use. Access to the remote management capability is via the Business and Operation Support System (BOSS) graphical user interface (GUI) which runs on the Symstream Transaction Event Processor (STEP). The STEP serves as a gateway for communications between a customer's host server and large numbers of remotely located Symstream enabled modems.

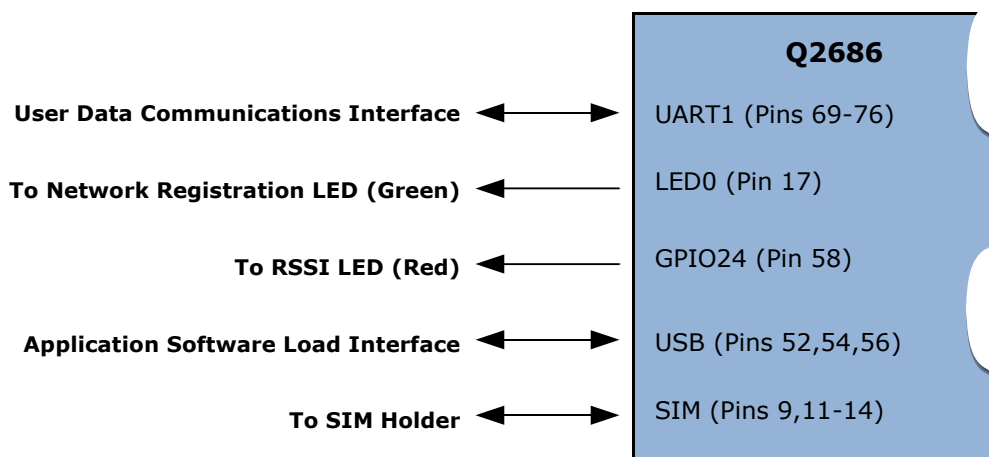


Souran provides:

- 2 levels of operator login
- Configuration, control, monitoring and diagnostics associated with the remote modem devices
- Support for fleets (grouping) of remote modems devices and hence customer terminal equipment
- Encryption for all customer data paths
- Capability to add specific customer applications when necessary to optimize communications infrastructure utilisation

3 Hardware Features

The specific minimum features Symstream considers important and which are supported by its standard software application include:



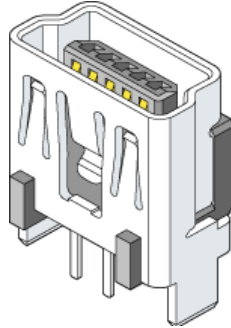
1. UART1 - Main Serial Link. This interface is supported by Symstream’s software application for its AT commands and full duplex data transfer. It is recommended that all 8 V.24 protocol compliant signals are connected to the customer’s CPU interface to allow for current signaling functions and possible future capabilities which may be introduced to improve efficiency of communications. Please refer to section 3.6 in Ref. 1 for hardware design details.
2. LED0 Signal. This signal provides indication of the GSM network registration status for the modem. A green LED is recommended and should be connected to this output to assist in field deployment. Please refer to section 3.20 in Ref. 1 for hardware design and functional details.
3. GPIO24 Signal. This output is used by Symstream’s software application to provide a Received Signal Strength Indication (RSSI). A red LED is recommended and should be connected to this output to assist with antenna setup during field deployment. Please refer to section 3.9 in Ref. 1 for hardware design details.

When connected, the function provided by this LED is as follows:

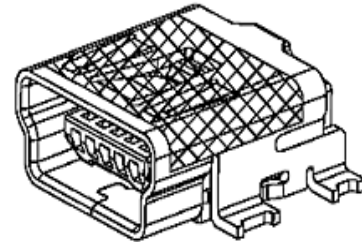
| LED Signal | Functional Indication |
|--|---------------------------------------|
| Off | None (No RSSI reading available yet) |
| On continuously | Good GSM signal (RSSI >= 12) |
| Quick flash (on 200ms, off 600ms) | Weak GSM signal (7 <= RSSI < 12) |
| Very quick flash (on 100ms, off 200ms) | Very weak or no GSM signal (RSSI < 7) |

4. USB 2.0 Interface. This interface will be used to locally update Symstream’s software application when required after the GSM radio module has been installed in the customer’s equipment. A Mini-B USB connector similar to one of the Molex connectors shown below is recommended so that off the shelf USB cables can be used to connect to a PC for local download of Symstream software application updates when required. Please refer to section 3.22 in Ref. 1 for

hardware design details. Loading of software into the Q2686 is described in the following section.



Molex - 5000751517
USB On-The-Go (OTG) Mini-B
Receptacle, Vertical, Through Hole
Solder Tails and Shell Tabs, Lead-
free



Molex - 0675031020
USB On-The-Go (OTG) Mini-B
Receptacle, Surface Mount, Right
Angle, Solder Tabs with Back Cover
and PCB Locator Plastic Pegs, Lead
Free

5. SIM Interface. A SIM holder with a SIM presence switch should be used. Symstream's software application invokes a factory default setting of its configuration parameters when the GSM radio module is powered up without the SIM present. Please refer to section 3.8 of Ref. 1 for hardware design details.
6. Optional Reset Signal (\sim RESET). The use of this signal is optional and can be used to force a reset of the GSM radio module and the Symstream software application, if required. If this signal is connected, care should be taken to only apply this reset when absolutely required as it will cause a delay till the GSM radio module is ready again for normal operation. Please refer to section 3.16 in Ref. 1 for hardware design details.

4 Loading Software

The following describes how to load Symstream's software application into the Q2686. This may be performed whilst a Q2686 is installed on a Wavecom development board or installed inside customer equipment providing there is access to the USB port.

If a previous installation of Symstream's software application already exists on the Q2686, it is also possible to perform an over-the-air (OTA) update of the software using the BOSS facilities. However, for this to work, the modem must be registered and activated by the BOSS. In some circumstances there may also be an incompatibility or limitation in network performance at some locations preventing efficient OTA updates and hence this local update procedure should be used.

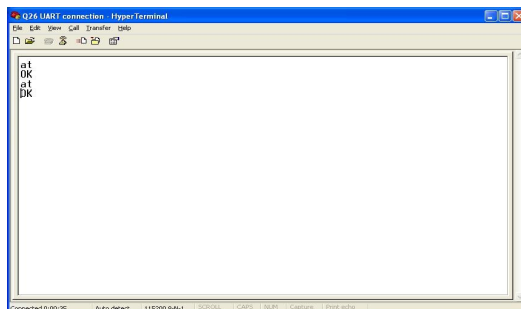
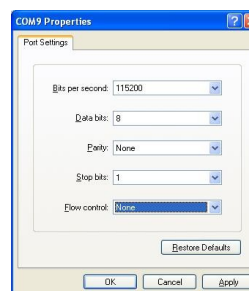
Loading of Symstream's application software into the Q2686 utilizes the 1k-XModem protocol which is invoked via the HyperTerminal program on a Windows computer. All software downloads are performed in 8-bit data mode and any baud rate may be used.

4.1 Upgrade Requirements

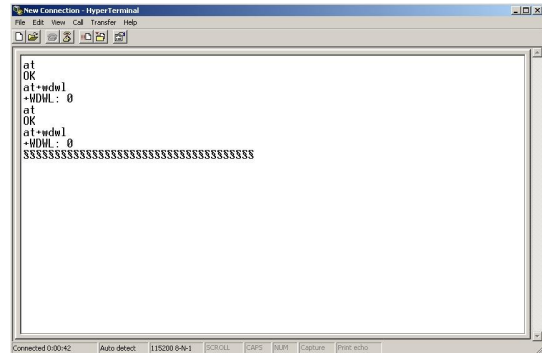
1. The Q2686 modem installed on a development board or in customer equipment which can be powered on. It is assumed that the USB connector is accessible.
2. PC or laptop computer with a USB port and Wavecom's Windows XP and Vista USB driver installed for the Q2686. This driver can be obtained from Wavecom's website under the "Download" tab for the Q2686 product.
3. USB cable to suit computer and equipment connectors.
4. Symstream application software install file which has a .DWL extension.

4.2 Loading the Software Application

1. Power on the Q2686 modem.
2. Connect the PC to the Q2686 modem USB port. The USB serial port should be recognised by the laptop. This will usually be a COMxx port on Windows. The device manager can also be used to determine the identity of the port.
3. Open the HyperTerminal program, select the COM port corresponding to the USB port then configure 115200 baud, 8 bit, no parity, 1 stop bit data settings with no flow control for this port.
4. Type AT<Enter> one or more times to confirm that there is an active AT command prompt.



5. Start the XModem server on the Q26 by typing AT+WDWL<Enter>. The response should be +WDWL: 0. Several Xmodem unique characters should also be output on the terminal screen indicating waiting for start of transmission. If these characters do not appear the connection may need to be re-established by:



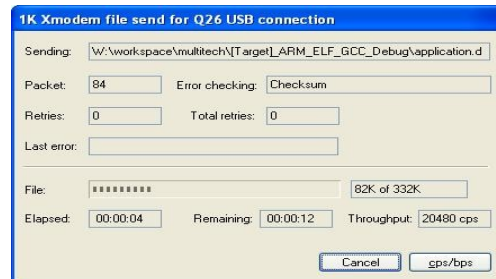
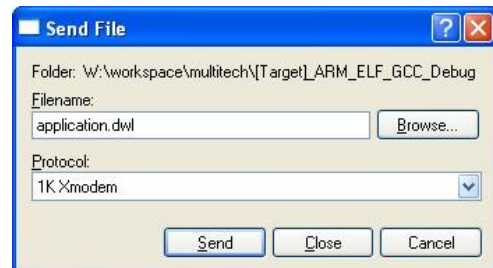
XP users -

- disconnecting using the icon at the top of the screen
- typing <Enter>

Vista users-

- disconnecting using the icon at the top of the screen
- disconnecting and re-connecting the USB cable
- checking the COM port and associated settings
- typing AT<Enter> to confirm the AT prompt
- typing AT+WDWL<Enter> again

6. In HyperTerminal, select "Transfer" and then "Send File". In the dialogue box opened, select the Symstream software application file provided and select the protocol as "1k-XModem" and "Send" the file. A progress dialogue box appears whilst the transfer is in progress. After the transfer has completed, the dialogue box disappears and several Xmodem unique characters will again be output on the terminal screen.



7. To terminate the download mode reset the modem by typing the command AT +CFUN=1<Enter>. After the modem reboots, you may not be able to get an AT prompt when typing AT<Enter> or the terminal program may indicate that the serial port cannot be opened. If this happens the connection should be re-established by:

XP users -

- disconnecting using the icon at the top of the screen
- typing AT<Enter> again

Vista users-

- disconnecting using the icon at the top of the screen
- disconnecting and re-connecting the USB cable
- checking the COM port and associated settings
- typing AT<Enter> again

8. If the Symstream's software application was not loaded or running prior to loading the software it must be enabled by typing AT+WOPEN=1<Enter>. If Symstream's application was already installed and running, this command will have no effect.

5 Using the Software

The following describes key functional features to enable a customer to most easily use Symstream's software application running on a Q2686. Please refer to Ref. 3 for further detail about any of the AT commands described.

1. Configuration. Symstream's software application is intended to be used in a manner where configuration of remote modem devices is controlled centrally via the Souran management platform running on the STEP gateway. This means there is no need to locally configure a device as the configuration is downloaded from the STEP when invoked via the BOSS GUI. Please refer to Ref. 2 for further detail about use of the BOSS GUI.
2. Main serial link (UART1) settings. The default serial link settings configured by Souran will be:
 - Baud rate: 9600
 - Framing format: 8 data bits, no parity, one stop bit

It is recommended that all V.24 signal handshaking be used to ensure that no data is lost due to differences in serial interface and over the air line speeds. Other serial link settings can be configured by modification of the appropriate Universal application fleet configuration file. Please refer to Ref. 2 for further detail.

3. Invoking a data connection. The following sequence should be used:
 - Issue the "ATD1" command. Note there is no need for entry of a telephone number as this is pre-configured by Souran
 - Wait for "CONNECT 2400" response indicating that a call has been connected and entry into data mode. Data can now be sent and received.
 - The "Data Carrier Detect" V.24 signal will also be asserted whilst the call is connected
4. Disconnecting a data connection. The following sequence should be used:
 - Issue the "+++" sequence and avoid further data transmission
 - Wait for the "OK" response
 - Issue the "ATH" command to disconnect the call
 - The "Data Carrier Detect" V.24 signal will also be de-asserted once the call is disconnected
5. Answering an incoming call. The following sequence will occur as auto-answer will be configured by Souran:
 - The "RING" indication followed by a "CONNECT 2400" indication will be issued via the serial interface
 - The "Data Carrier Detect" (DCD) V.24 signal will also be asserted whilst the call is connected
6. Inactivity timeout. When no data is being transferred in either direction for longer than the configured inactivity timeout, the call and hence data connection will be automatically dropped by Souran. The default inactivity timeout is set to 10 seconds, however other periods can be set for the fleet via the BOSS GUI. Please refer to Ref. 2 for further detail.
7. Application disable. Symstream's software application can be disabled by entering the AT+WOPEN=0<CR> command. It can be re-enabled by entering the AT+WOPEN=1<CR> command.

6 System Application

The following describes the configuration and operation of Symstream's Souran management when using multiple terminals each with the Q2686 and Symstream's software application installed. Specific references are made to parameters which can be configured in the BOSS to setup this system. Please refer to Ref. 2 for specific information relating to the BOSS.

For a system containing a large number of serial connected remote modems and terminals the simplest addressing scheme for TCP/IP traffic between the host and STEP gateway uses a common IP address and unique port number for each terminal. For this scheme the STEP acts as a terminal server and only payload data (minus TCP/IP overhead) is exchanged between the remote modem and terminal serial ports.

TCP/IP traffic routed to the host server from the STEP gateway will have the following parameters:

| TCP/IP Parameter | Server/Terminal Parameter | Configured in BOSS via |
|-------------------------|-------------------------------|---------------------------|
| Destination IP address | Host IP address | Fleet setup screen |
| Destination port number | Host listening port number | Fleet setup screen |
| Source IP address | Terminal IP address (common) | Fleet setup screen |
| Source port number | Terminal port number (unique) | Remote modem setup screen |

TCP/IP traffic routed from the host server to the STEP gateway for each terminal will have the following parameters:

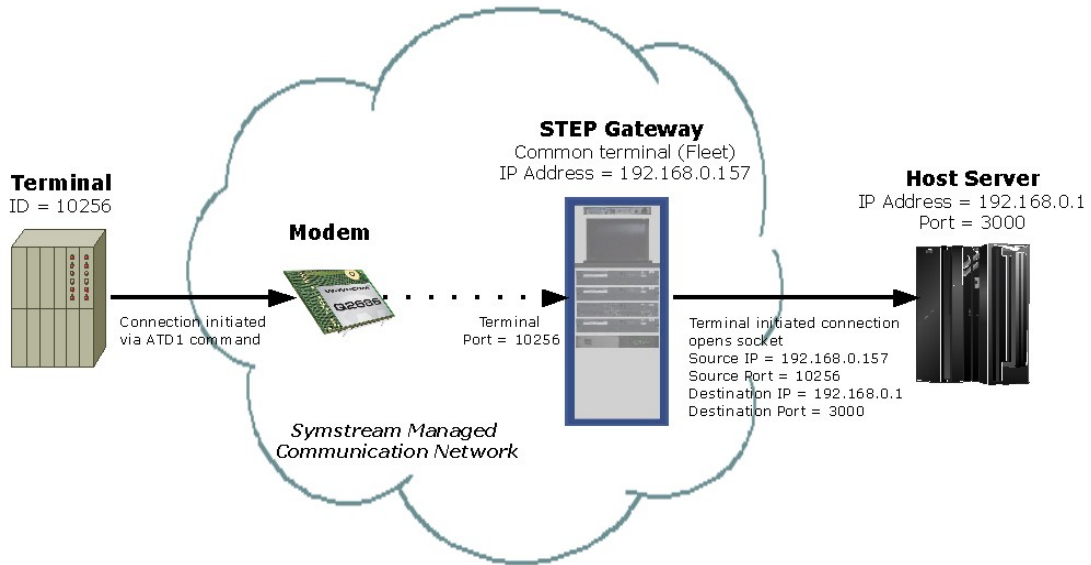
| TCP/IP Parameter | Server/Terminal Parameter | Configured in BOSS via |
|-------------------------|-------------------------------|---------------------------|
| Destination IP address | Terminal IP address (common) | Fleet setup screen |
| Destination port number | Terminal port number (unique) | Remote modem setup screen |
| Source IP address | Host IP address | Fleet setup screen |
| Source port number | Any host source port number | Fleet setup screen |

Connections between the terminal and host server can be initiated and dropped by either end as follows:

| Connection Action | Terminal/Host Action | Transparent Souran Action |
|-------------------------------|---|--|
| Terminal initiates connection | See step 3 in section 5 | Remote modem calls STEP STEP opens socket to Host |
| Terminal drops connection | See step 4 in section 5 | Remote modem hangs up STEP closes socket to Host |
| Host initiates connection | Host opens socket to STEP See step 5 in section 5 | STEP calls remote modem |
| Host drops connection | Host closes socket to STEP See step 4 in section 5 (DCD) | STEP hangs up call to remote modem |

After a connection has been established between the host and terminal payload data transfer can occur. For the host server to initiate a connection to a specific terminal it must know the specific port number corresponding to the terminal. This can be set explicitly on the host based on the setting in the BOSS. It can also be resolved implicitly by the host server when the terminal initiates the very first connection providing a unique terminal ID is included in the payload data structure.

The following diagram illustrates a typical routing example when the data connection is initiated from the terminal.



The following diagram illustrates a typical routing example when the data connection is initiated from the server.

