

SPL Point-to-Point

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1. DESCRIPTION

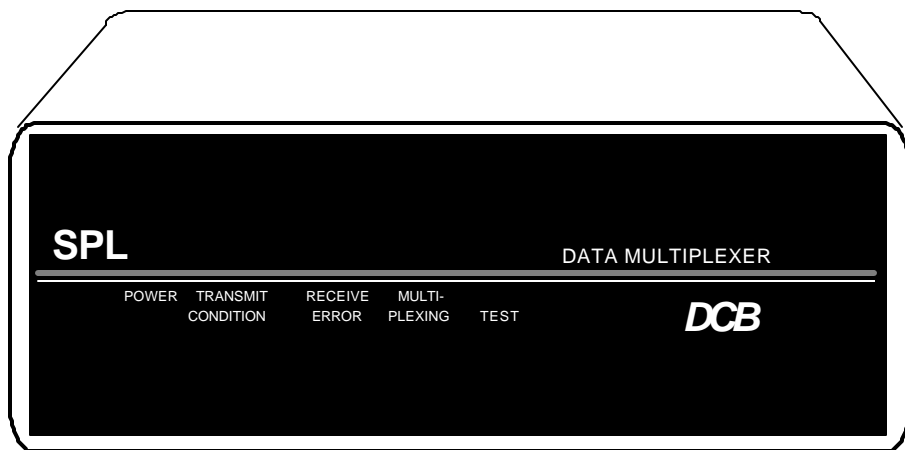
SPL statistical multiplexers are available in 2 to 14 port versions. They are used in pairs to allow asynchronous terminal devices to communicate over a single composite (network) link. The link must be full duplex, either synchronous or asynchronous. Dial-up, leased analog or digital data services may be used.

Any asynchronous device may be connected through the multiplexer data ports. Each port is configured individually for speed and flow control. Ports speeds up to 38.4 Kbps are supported with either software (xon/xoff) or hardware (CTS/Busy) flow control.

Data port configuration may be set using DIP switches located behind the front panel or through the Network Management port using an asynchronous terminal. The composite link configuration is set by switches only.

Features of the SPL multiplexer include:

- Automatic full time or on-demand dial-up operation.
- Test message generation to any local or remote port.
- On-line manual for switch settings.
- Diagnostic capabilities through the Network Management port.



SPL Multiplexer

2. SPECIFICATIONS

2.1 Data Ports

Port Speed

Asynchronous only

300, 1200, 1800, 2400, 4800, 9600, 19,200 or 38,400 bps

Data Format

10 bits/character, 1 start, 1 stop, 8 data (including parity)

Interface

RS-232D, implemented in DB-25 female connectors

2.2 Network Port

Speed

Synchronous to 64Kbps

Asynchronous at 1200, 1800, 2400, 4800, 9600, 19,200 or 38,400 bps

Interface

RS-232D, implemented in DB-25 male connector

2.3 Environmental

Operation: 0 to 65° C, 10 to 85% relative humidity

Storage: -40 to 85° C, 10 to 85% relative humidity

2.4 Physical / Electrical

10¼" W x 9¾" D x 2½" H - 2 thru 6 port units

10¼" W x 9¾" D x 4¼" H - 8 thru 14 port units

120 VAC external power supply

30 watts, .25 amps

2.5 Network Management Port

Speed: 9600 bps

Parity: Space (none)

2.5.1 Network Management Port Commands

- Help Network
- Help Port
- Show Network Configuration
- Show Port Configuration
- Change Port Configuration
- Change multiplexer parameters
- Configure Dialup
- Configure Modem
- Show / Change ID
- Activity Counts
- Zero Activity Counters
- Flow Control
- Test Tools
 - Capture Port
 - Copy Command
 - Show RS232
 - Network Loop
 - Test Message
 - Remote Test Loop
 - Monitor Port TX
 - Monitor Port RX
 - NMP Parity
 - Port Reset
 - Reset Multiplexer
- Type (of unit)
- Repeat Last Command
- Disconnect NMP

3. INSTALLATION

3.1 Unpacking

The following is included with each SPL multiplexer

- Multiplexer and external power supply
- Cable for connecting a modem or DSU/CSU
- Manual
- Information regarding warranty, maintenance contracts and repair

3.2 Location

Place the multiplexer in a clear area where you can reach the front panel for setup and the rear panel to connect the cables. The multiplexer has an external power supply that requires a properly grounded 120 VAC outlet. The total power cord length is about 12 feet.

3.3 Setup

The Network port must be configured properly for the type of link used. In addition, each data port must have the proper speed, parity and flow control settings. This is done with switches. See Section 4 for the location and proper setting of switches.

3.4 Connections

The SPL is connected to the modem or DSU/CSU using the cable supplied. Connect the Network port of the multiplexer to the RS-232 interface port on the modem or DSU/CSU. For information regarding data port connections to DTE devices, see Section 6.

3.5 Dial-up Operation

To configure the SPL multiplexers to use external DCB D-56K modems perform the following:

1. Connect the modem to the multiplexer using the cable supplied.
2. Attach a terminal or PC to Port 1 of the multiplexer and set the terminal to match the port 1 DIP switch settings.
3. Remove the faceplate from the multiplexer and set the 6-position DIP switches to UDDUUD.
4. Move the small 3-position toggle switch on the bottom circuit board to the LEFT position (Port 1 Setup) See paragraph 4.1.3 and Figure 2, p. 13 of the manual.
5. Press the <Enter> key on the terminal. When you see "AT YOUR COMMAND >>", follow the instructions below. User responses are shown in **BOLD**.

HOST MULTIPLEXER (ANSWER)

AT YOUR COMMAND >> **CD<Enter>**

CONFIGURE DIALUP

ONE-TOUCH DIALING: OFF
DISCONNECT TIMEOUT: DISABLED

One-Touch Dialing? [ATD / DTR Dial / OFF] >> **OFF<Enter>**
Disconnect timeout? [1 to 99 min; 0=Disable] >> **0<Enter>**

ONE-TOUCH DIALING: OFF
DISCONNECT TIMEOUT: DISABLED

Configure Modem Now? [Y/N] >> **Y<Enter>**
*** CONFIGURE MODEM - Type ESC ESC to stop

at<Enter>

OK

at&f &q6 s0=1 &w<Enter>

OK

Type **<Esc><Esc>** to return to AT YOUR COMMAND.

*** END CONFIGURE MODEM

AT YOUR COMMAND >>

Return the 3-position toggle switch to the center position (Normal).
Repeat steps 1 thru 5 and follow instructions on the next page for the
REMOTE multiplexer.

REMOTE MULTIPLEXER (ORIGINATE)

AT YOUR COMMAND >> **CD<Enter>**

CONFIGURE DIALUP

ONE-TOUCH DIALING: OFF
DISCONNECT TIMEOUT: DISABLED

One-Touch Dialing? [ATD / DTR Dial / OFF] >> **AT<Enter>**
ATD command? [ATDS0 / Custom] >> **C<Enter>**
Enter ATD command [20 char max] >> **ATDnnn-nnnn<Enter>**

Note: Replace nnn-nnnn with the phone number of the HOST Multiplexer.

To configure a full time link with automatic redial perform the following:

Disconnect timeout? [1 to 99 min; 0=Auto-Redial] >> **0<Enter>**
Auto-redial timeout? [15 to 900 sec] >> **15<Enter>**

To configure an on-demand link, perform the following:

Disconnect timeout? [1 to 99 min; 0=Auto-Redial] >> **nn<Enter>**
Send mux call progress messages? [Y/N] >> **Y<Enter>**

ONE-TOUCH DIALING: ATD Dialing - [ATDnnn-nnnn]
DISCONNECT TIMEOUT: Auto-Redial Enabled
AUTO-REDIAL TIMEOUT: 15 sec.

Configure Modem Now? [Y/N] >> **Y<Enter>**
*** CONFIGURE MODEM - Type ESC ESC to stop
at<Enter>
OK
at&f &q6 &w<Enter>
OK

Type **<Esc><Esc>** to return to AT YOUR COMMAND.
*** END CONFIGURE MODEM

AT YOUR COMMAND >>

Return the 3-position toggle switch to the center position (Normal).

3.6 On-Demand One Touch Dialing

To establish an on-demand connection to the host press any key on any terminal connected to the remote multiplexer. When you see “SPL: Connected...” you should be able to log in from all remote terminals. The multiplexer will terminate the connection if there is no activity to or from any port for the period of time set as the Disconnect Timeout. To reestablish the connection, press any key on any terminal.

3.7 Installation Summary

1. Set the network switches for the type of link.
2. Configure the ports for correct speed, parity and flow control.
3. Connect the multiplexer Network port to the modem or DSU/CSU using the cable supplied.
4. Connect the modem or DSU/CSU to the phone line.
5. Connect the data ports to the asynchronous devices using cables shown in Section 6.

4 CONTROLS AND INDICATORS

4.1 Switches

The front panel of the SPL is held in place with magnets. It can be easily removed by pulling on the small handles provided. Behind this panel are one or more circuit boards. Each circuit board has several banks of switches called DIP switches.

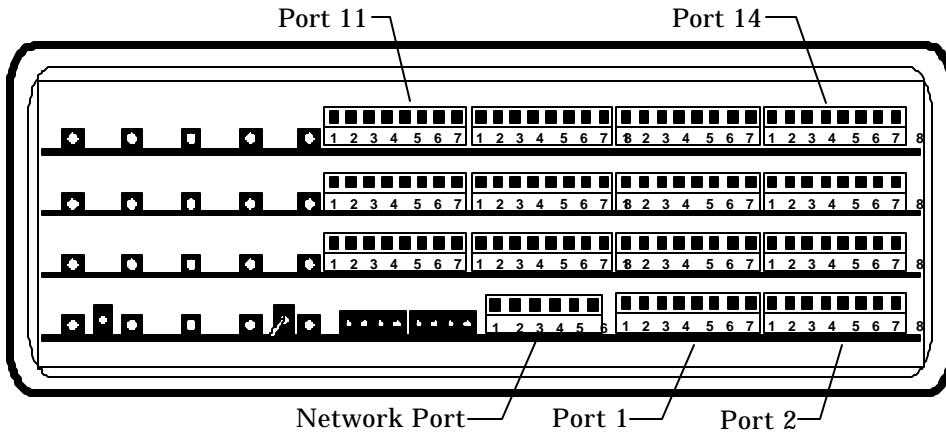


Figure 1
Configuration Switches

Figure 1 illustrates the Network and Data port configuration switches. The Network switch contains 6 sections numbered 1 thru 6. The Data port switches have 8 sections each.

4.1.1 Network

The network switches must be set according to the type of link used. Options include synchronous or asynchronous, leased line or dial-up, and error correction enabled or disabled. The multiplexers are set at the factory for synchronous leased line with error correction enabled.

4.1.1.1 Synchronous or Asynchronous

Switch position 1 selects synchronous or asynchronous clocking for the network. If your modem or DSU/CSU supports synchronous operation, this is highly recommended. Synchronous clocking will smooth the data flow to the users.

Put switch 1 UP for asynchronous or DOWN for synchronous.

4.1.1.2 Line Type

Section 2 of the network switch selects leased line or dial-up. Put this switch UP for leased line or DOWN for dial-up.

4.1.1.3 Error Correction

Position 3 enables or disables error correction. Although many dial-up modems provide error correction, it is generally better to disable error correction in the modem and enable it in the multiplexer. The multiplexer error correction algorithms are optimized for multi channel operation.

Put switch 3 UP to disable error correction or DOWN to enable it.

4.1.1.4 Asynchronous Speed

Positions 4, 5 and 6 of the network switch are used to set the asynchronous speed of the network port. If the port is set for synchronous operation, these switches are ignored.

Network Switch Position			Speed
4	5	6	
Up	Up	Down	38400 BPS
Up	Up	Up	19200 BPS
Down	Down	Down	9600 BPS
Down	Down	Up	4800 BPS
Down	Up	Down	2400 BPS
Down	Up	Up	1800 BPS
Up	Down	Down	1200 BPS

4.1.2 Data Port Configuration

Data ports are configured using the 8-position DIP switches. See Figure 1. Position 1 is not used. Position 2 sets port loopback for troubleshooting. Positions 3 thru 5 set flow control and parity. Positions 6 thru 8 set speed.

4.1.2.1 Port Loopback

Individual ports may be put in loopback using position 2 of the port configuration switch. When UP, loopback is enabled. Port loopbacks are used during troubleshooting and will be discussed in more detail in Section 7. Normally this switch should be left down.

4.1.2.2 Parity Considerations

SPL multiplexers transfer all data bits whether it is 7 data bits plus parity or 8 data bits and no parity. The multiplexer does not verify parity for each character. Consequently, the parity setting of the devices at each end of an SPL link must be correct. Because of this ability to transfer 8 data bits transparently, the SPL can transfer graphic characters or binary files, and support "PC terminals".

Parity is an issue only if you are using software (Xon/Xoff) flow control. In this case, both the multiplexer and the attached device must know which character to interpret as flow control, including the parity bit.

When setting software flow control at a remote site, set the parity of the multiplexer port to match the attached device. If the device is set for 8 data bits and no parity, set the multiplexer port for Xon/Xoff Space.

Since host computers can process data faster than humans can type, computer ports will never issue flow control to stop incoming data. If an Xon or Xoff character is sent from a computer port it is for a status or initialization function, not for flow control. Because of this, the multiplexer must pass the Xon or Xoff character to the remote end without taking any action. To accomplish this, the multiplexer has an Xon/Xoff Transparent setting. When using software flow control, set the host side multiplexer for Xon/Xoff Transparent.

When the host multiplexer port is set for Xon/Xoff Transparent, parity for the Xon and Xoff characters issued to the host computer port is determined by the setting of the corresponding port on the remote multiplexer. If the corresponding remote multiplexer port is set for even, odd, mark or space parity, that parity will be used at the host. If the corresponding remote port is set for Xon/Xoff Transparent or any of the CTS/Busy options, Space parity will be used at the host.

4.1.2.3 Parity and Flow Control

Flow control and parity must be set for each port using positions 3, 4 and 5 of the port DIP switch. This setting must match the configuration of the attached DTE device. The factory default is Xon/Xoff Even.

Port Switch Position			Option
3	4	5	
Down	Down	Down	Xon/Xoff Even Parity
Down	Down	Up	Xon/Xoff Odd Parity
Down	Up	Down	Xon/Xoff Mark Parity
Down	Up	Up	Xon/Xoff Space Parity
Up	Down	Down	Xon/Xoff Transparent
Up	Down	Up	CTS / No Busy
Up	Up	Down	CTS / Busy Low
Up	Up	Up	CTS / Busy High

4.1.2.4 Port Speed

Port speed is set using positions 6, 7 and 8 of the port DIP switch. The port speed must match the speed of the attached DTE device. The factory default is 9600.

Port Switch Position			Speed
6	7	8	
Up	Up	Down	38400 BPS
Up	Up	Up	19200 BPS
Down	Down	Down	9600 BPS
Down	Down	Up	4800 BPS
Down	Up	Down	2400 BPS
Down	Up	Up	1800 BPS
Up	Down	Down	1200 BPS
Up	Down	Up	300 BPS

4.1.3 Port 1 Setup

Port 1 setup is enabled by a three position toggle switch located on the bottom circuit board between the Multiplexing and Test indicators (Figure 2). Normally this switch is left in the center position. When this switch is pushed to the left, port 1 setup is enabled. This allows a terminal connected to port 1 of the multiplexer to perform the functions of the Network Management port. See Section 5 for information about Network Management port functions.

4.1.4 Network Loopback

The same toggle switch that controls port 1 setup also controls network loopback. When pushed to the right, this switch enables a bi-directional network loopback.

4.1.5 Reset

The reset switch is a small pushbutton switch located on the bottom circuit board between the Power and Transmit Condition indicators (Figure 2). Pressing this switch will reset the multiplexer. If this fails to clear a problem, disconnect power from the unit for five seconds and then reconnect.

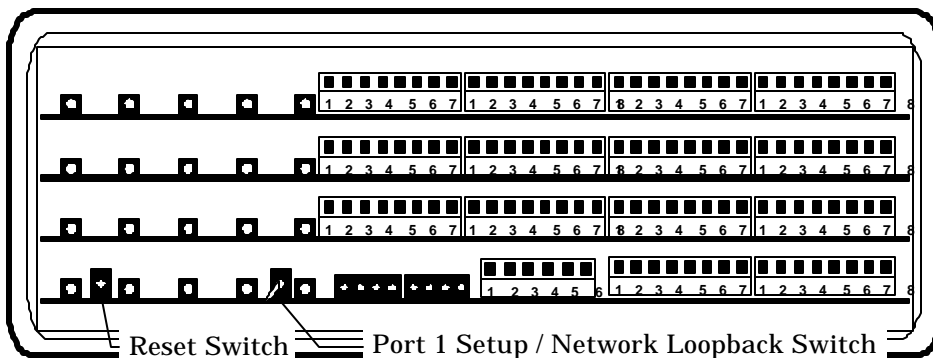


Figure 2
Special Switches

4.2 Indicators

There are five indicators visible on the front panel. These indicators provide information about the multiplexer's operation. You should become familiar with which lights are on during normal operation. If this pattern changes, there may be a problem.

The indicators and their function are:

POWER

ON when power is applied to the unit.

TRANSMIT CONDITION

ON when the network link is active (DCD and DSR are high).

OFF means the network is down.

FLASHING means ten blocks of data are outstanding without a response from the remote multiplexer.

RECEIVE ERROR

ON when a data block is received in error. The multiplexer has requested retransmission of the bad block. The light will go off when the data is correctly received. If receive errors are common, there is a problem with the modems or the telephone line.

MULTIPLEXING

ON when the link is up and the multiplexers are on line. Flickering indicates data traffic on the link.

OFF means that data blocks are not being acknowledged.

FLASHING together with the TEST indicator means the multiplexer is in off-line mode.

TEST

ON when the network loopback switch is enabled.

4.2.1 Mini LEDs

Besides these five main indicators there are eight smaller indicators located behind the front panel directly to the left of the network switch.

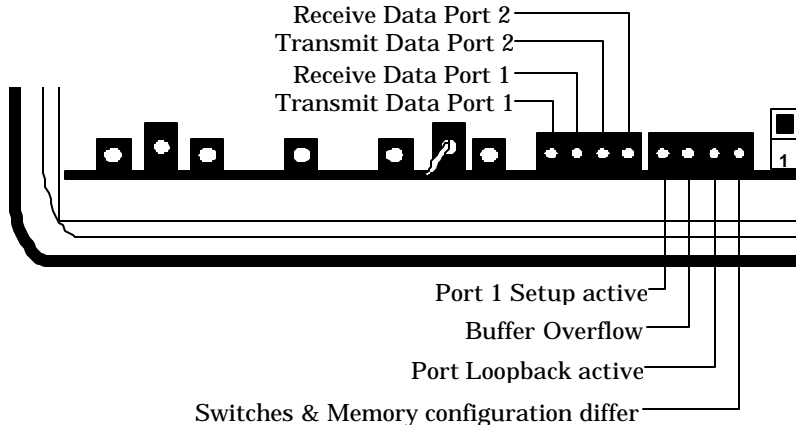


Figure 3
Mini LEDs

4.3 Modes of Operation

There are three operational modes in the SPL multiplexer. These are determined by switch settings and/or the state of network control leads.

ON-LINE

This is the normal mode of operation where all ports are active. When in on-line mode, the Power, Transmit Condition and Multiplexing indicators are on.

OFF-LINE

This mode exists when either DCD or DSR is low from the modem. When in off-line mode, the Multiplexing and Test indicators flash together.

LOOPBACK

Network loopback is activated by a switch located on the bottom circuit board. See paragraph 4.1.4 and Figure 2. When in network loopback, the Test indicator is on solid.

5. NETWORK MANAGEMENT PORT

5.1 Introduction

The Network Management port (NMP) provides access to vital statistics and troubleshooting tools. By connecting a terminal or modem to the NMP a vast array of information is at your finger tips.

5.2 Connections and Setup

Connection to the NMP is made either through a port on the rear of the multiplexer or by using Port 1 Setup.

5.2.1 Port 1 Setup

The easiest way to access the NMP functions is by using a terminal connected to port 1 of the multiplexer. A switch located behind the front panel performs this function. See paragraph 4.1.3 for information. Once the switch is set, no further setup is required. This option cannot be used if a printer is connected to port 1.

5.2.2 Dedicated Terminal

The NMP functions are also available through a port on the rear of the unit labeled Exec Port. To connect a dedicated terminal to this port, use the cable described in paragraph 6.3.3. Set the terminal for 9600 bps, 8 data bits, no parity and one stop bit.

5.2.3 Dedicated Modem

For remote access to NMP functions, a dial-up modem may be connected to the Exec Port. You must fix the DTE interface speed of the modem at 9600 bps, 8 data bits, no parity and one stop bit. Refer to your modem manual for appropriate setup procedures. Use the appropriate cable from paragraph 6.3.3 for connection.

5.3 Using the Network Management port

To activate the NMP, press the ENTER key. When you see **AT YOUR COMMAND >>**, the NMP is active and ready for your commands. Type H <Enter> to display the command set.

5.4 Commands

5.4.1 Help (H or ?)

<u>COMMAND</u>	<u>LOCAL</u>	<u>REMOTE</u>	<u>PARAGRAPH</u>
Help: Network	HN		5.4.2
Ports	HP		5.4.3
Show: Network	SN		5.4.4
Config	SC	RSC	5.4.5
Change: Port Config	CP	RCP	5.4.6
MUX Param	CO	RCO	5.4.7
Config Dialup	CD		5.4.8
Config Modem	CM		5.4.9
Set ID	ID	RID	5.4.10
Activity Counts/Zero	AC/Z	RAC	5.4.11
Flow Control	FC		5.4.12
Test Tools	TT		5.4.16
Type	TY	RTY	5.4.13
Repeat Last Command	*		5.4.14
Disconnect NMP	BYE		5.4.15

5.4.2 Help Network

The Help Network (HN) command displays the switch settings for the 6-position network switch.

5.4.3 Help Ports

The Help Ports (HP) command displays switch settings for the 8-position port configuration switches.

5.4.4 Show Network

The Show Network (SN) command shows the status of the local network port. Included are the current switch selected parameters and the multiplexer's mode of operation.

5.4.5 Show (Port) Configuration

The Show Config (SC) command shows the current port configuration settings for either the local or the remote (RSC) ports. Port numbers may be included with this command to limit the display range. If no port numbers are included, settings for all ports are shown. Use this command to verify proper port configuration.

NOTE

Several commands allow port numbers or port number ranges to be included on the command line. When port numbers are included, the syntax is as follows:

(Command)1	Port 1
(Command)1,2,6	Ports 1, 2 & 6
(Command)1 2 6	Ports 1, 2 & 6
(Command)2-6	Ports 2 thru 6
(Command)1,5-8	Ports 1 and 5 thru 8

5.4.6 Change Port Configuration

The Change Port Config (CP / RCP) command sets the data port loopback, flow control and rate configuration for each data port. Follow the prompts and examples on the screen to select the port(s) and parameter(s) you wish to change. One or more ports may be set with a single command by selecting a range of port numbers. The factory default setting is Xon/Xoff Even, 9600 bps.

5.4.7 Change Multiplexer Parameters

The CO / RCO command allows configuration of global data port parameters. These include RTS Data Gate and Data Carrier Detect. For most systems, these settings will never have to be changed.

The RTS Data Gate is used to insure that no data is transmitted from a data port unless RTS is high from the attached device. This will sometimes stop "streaming" ports.

The state of Data Carrier Detect is critical to proper operation of some host computers. Many computers depend on DCD to issue login prompts. If your host does not issue logins properly, you may need to change this setting.

5.4.8 Configure Dialup

This command (CD) is used to configure the multiplexer for dial-up operation. To configure the multiplexer to work with DCB dial-up modems, see section 3.5. Other modem brands may be similar.

5.4.9 Configure Modem

The Configure Modem command (CM) establishes a direct connection between the network management port and the composite port. This allows the operator to give commands directly to an attached dial-up modem.

Type two consecutive ESC characters to return to the AT YOUR COMMAND >> prompt.

5.4.10 Set ID

The Set ID (ID / RID) command allows you to set or change either the local or remote multiplexer identifier. IDs can be a maximum of 15 characters in length. Pressing <Enter> with no entry will leave the ID unchanged.

5.4.11 Activity Counts / Zero

The Activity Counts (AC / RAC) command shows transmit and receive data statistics for all ports. The data are presented in terms of blocks of information sent and received by the network and each data port. Error counts are also shown. A range of ports may be included with this command to reduce the number of ports shown.

The Z command is used to zero the counters so that current activity can be monitored.

5.4.12 Flow Control

The Flow Control (FC) command displays the current port flow control status for both local and remote ports. A port range may be included with this command.

5.4.13 Type

The Type (TY) command displays information about the local multiplexer including firmware version, number of ports and multiplexer ID. The Remote Type (RTY) command is used to display similar information about the remote multiplexer.

5.4.14 Repeat Last Command

To repeat the last command, simply press the * key. This is handy for repeating screens of constantly changing data.

5.4.15 Disconnect NMP

The BYE command toggles the CTS output from the Network Management port. This is used to disconnect equipment such as dial-up modems or the DCB Access Switch.

5.4.16 Test Tools

The Test Tools (TT) menu summarizes the test and troubleshooting commands. These commands are listed separately to reduce the clutter in the main help list, but are always available from the command prompt.

<u>COMMAND</u>	<u>LOCAL</u>	<u>REMOTE</u>	<u>PARAGRAPH</u>
Capture Port	CA#	RCA#	5.4.17
Copy Command	CC#	RCC#	5.4.18
Show RS232	SR	RSR	5.4.19
Network Loop/Quit	NL/QNL		5.4.20
Test Message	TM#	RTM#	5.4.21
Remote Test Loop		RTL#	5.4.22
Monitor Port TX	MT#		5.4.23
Monitor Port RX	MR#		5.4.23
NMP Parity	P		5.4.24
Port Reset	PR		5.4.25
Reset MUX	RESET	RRESET	5.4.26

5.4.17 Capture Port

The Capture Port command (CA#) permits the network management port to capture any of the local ports. While this command is active, the normal data path is interrupted and a two-way communication link is established between the network management port and the captured port. A port number must be included on the command line.

The Remote Capture port command (RCA#) connects the network management port to a remote multiplexer port. During this time, normal data communications are suspended and the NMP terminal can talk directly to captured port.

The Capture commands are active until two consecutive ESC characters are issued.

5.4.18 Copy Command

The Copy Command (CC#) is used for training. This command is used when the instructor is at the host site and the trainee is at the remote. The command is followed by the port number to which the trainee's terminal is attached.

After the command is entered, all data from the local port will be displayed on both terminals. Keyboard inputs from either terminal will be sent to the host port.

The Remote Copy Command (RCC#) performs the same function when the instructor is located at the remote site. This command is used only at the remote site.

The Copy commands are active until two consecutive ESC characters are issued by the instructor.

5.4.19 Show RS-232

The Show RS-232 (SR) command shows the current state of RS-232 control signals on the local ports. A range of port numbers may be included to limit the display.

The Remote Show RS-232 (RSR) command shows the status of RS-232 control signals at the remote ports. As with the SR command, a range of port numbers may be included on the command line.

5.4.20 Network Loopback

The Network Loopback (NL) command enables a bi-directional network loopback. Use the QNL command to disable the loopback.

5.4.21 Test Message

The Test Message (TM#) command sends a Quick Brown Fox... message to a local port. The QBF message continues until any key is pressed on the network management port terminal. A local port number must be included on the command line.

The Remote Test Message (RTM#) command sends a QBF test message to a remote port. The message continues until any key is pressed on the network management port terminal. The number of the remote port must be included on the command line.

5.4.22 Remote Test Loop

The Remote Test Loop (RTL#) command is used to test a data path from end to end. This command enables port loopback in the remote multiplexer, then sends a test message to that port. If everything is working correctly, the test message is displayed on the network management port terminal. A remote port number must be included on the command line.

5.4.23 Monitor Port TX or RX

The Monitor Port TX (MT#) command monitors data transmitted from the selected port to the corresponding port of the remote multiplexer. The Monitor Port RX (MR#) command monitors data received by the selected port from the corresponding port of the remote multiplexer. A local port number must be included on the command line.

When port monitor is active, two ESC characters are needed to end the test.

5.4.24 NMP Parity

The NMP Parity command (P) sets the parity for the network management port. The factory default is SPACE.

5.4.25 Port Reset

The Port Reset (PR) command is used to reset flow control to hung ports. A range of local port numbers or ALL may be included with this command. Flow control leads at both the local and remote ports are reset.

5.4.26 Reset Mux

The Reset Mux (RESET) command performs a local multiplexer reset. To reset the remote multiplexer use RRESET.

6. INTERFACE SIGNALS and CABLING

6.1 Connector Location and Pin Reference

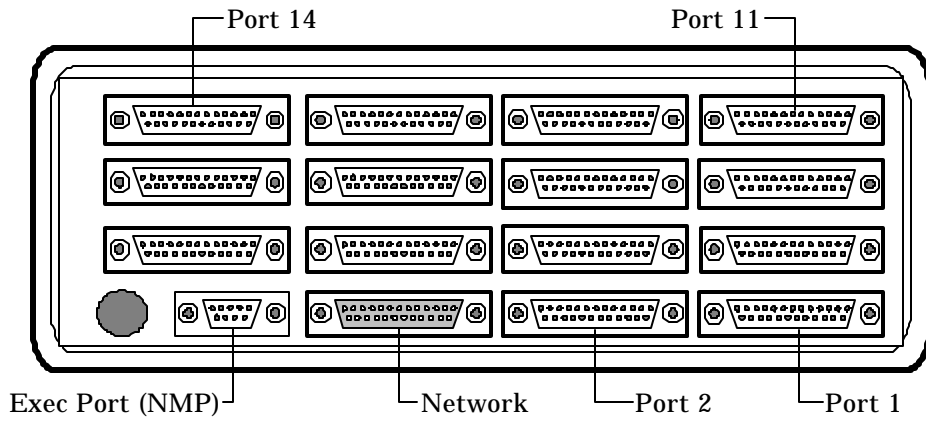


Figure 4
Connector Location - Rear View

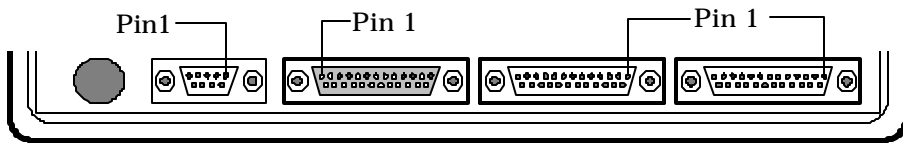


Figure 5
Connector Pin Reference

6.2 Port Interface

6.2.1 Network Port (DB-25P)

<u>Pin</u>	<u>Signal</u>	<u>In/Out</u>
1	Frame Ground	---
2	Transmit Data	OUT
3	Receive Data	IN
4	Request to Send	OUT
5	Clear to Send	IN
6	Data Set Ready	IN
7	Signal Ground	---
8	Data Carrier Detect	IN
15	Transmit Clock	IN
17	Receive Clock	IN
20	Data Terminal Ready	OUT

6.2.2 Data Ports (DB-25S)

<u>Pin</u>	<u>Signal</u>	<u>In/Out</u>
1	Frame Ground	---
2	Transmit Data	IN
3	Receive Data	OUT
4	Request to Send	IN
5	Clear to Send	OUT
6	Data Set Ready	OUT
7	Signal Ground	---
8	Data Carrier Detect	OUT
11	Busy	IN
20	Data Terminal Ready	IN

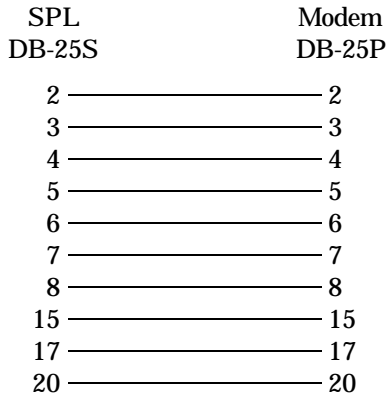
6.2.3 Network Management Port (DE-9S)

<u>Pin</u>	<u>Signal</u>	<u>In/Out</u>
1	Frame Ground	---
2	Transmit Data	IN
3	Receive Data	OUT
4	Request to Send	IN
5	Clear to Send	OUT
6	Data Set Ready	OUT
7	Signal Ground	---
8	Data Carrier Detect	OUT

6.3 Cables

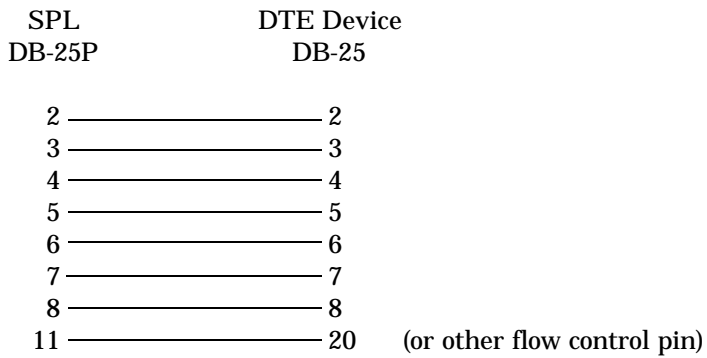
6.3.1 Network Port to Modem

A 25 conductor cable is supplied with the SPL multiplexer for this purpose. If a longer cable is needed, a minimum of 10 conductors are required.



6.3.2 Data Ports

To a TERMINAL, PRINTER or other DTE Device



6.3.2 Data Ports, continued

To a PC using terminal emulation

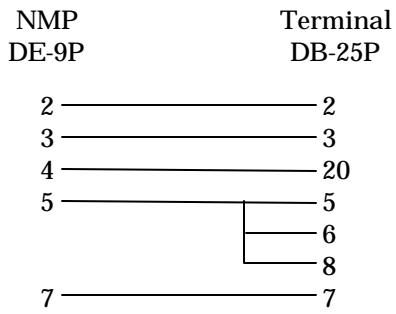
SPL DB-25P	Computer	
	DB-25S	DE-9S
2	2	or 3
3	3	or 2
4	20	or 4
5	5	or 8
6	6	or 6
7	7	or 5
8	8	or 1
11	4	or 7

To a MODEM or other DCE Device

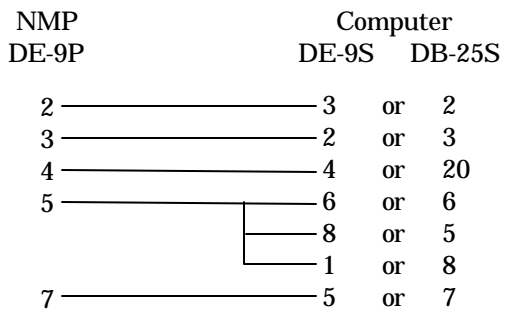
SPL DB-25P	Modem DB-25	
2	3	
3	2	
4	8	
5	4	(flow control)
7	7	
8	20	
11	5	(flow control)

6.3.3 Network Management Port

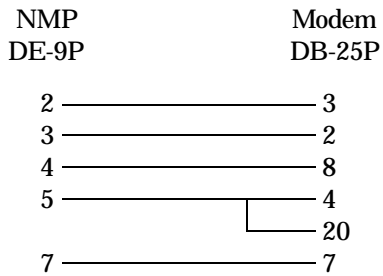
To a TERMINAL



To a PC using terminal emulation

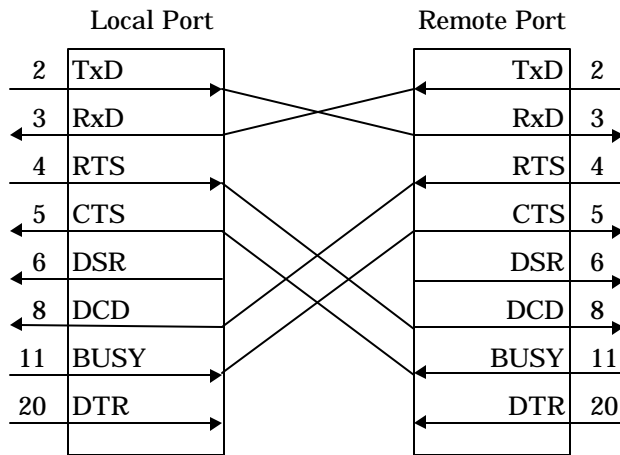


To a dial-up MODEM for remote access



6.4 Signal Paths through SPL Multiplexers

The following diagram shows the signal flow between data ports in a pair of SPL multiplexers.



Transmit Data to Receive Data is the normal required path for data flow.

RTS to DCD is a hardware handshake path used to wake up the remote device. Many host computers require DCD to issue a login prompt.

Busy to CTS is the hardware flow control path. For CTS/Busy flow control, the hardware flow control pin of the attached device must be wired to Busy on the multiplexer.

The DSR output of the multiplexer port is always asserted (high).

Data Terminal Ready (DTR) is an input to the SPL data ports which is passed through to the attached modem. In a dial-up environment it is necessary for DTR to be supplied either by the attached device or by the modem itself. There is a jumper that determines how DTR from the data ports will affect a dial-up modem. The jumper is located on the bottom circuit board behind the power indicator. From the factory, this jumper is set in the left position (it covers the center and left pin of a three pin header). In this configuration, DTR will always be high (+12v) to the attached modem. If the jumper is moved to the right position, DTR to the modem will be high only if at least one attached device asserts DTR.

The jumper also affects the RTS to DCD signal path. The following table shows the effect of local RTS and DTR on remote DCD.

Jumper Position	Local RTS Input	Local DTR Input	Remote DCD Output
Left (Default)	Not Connected or High	Not Connected or High	High
Right	Not Connected or High	Not Connected	Low
Right	Not Connected or High	High	High
Either	Low	Any	Low
Either	Any	Low	Low

7. TROUBLESHOOTING

7.1 General Approach

When troubleshooting problems, a rational plan can save you many hours of frustration. The following is a brief outline of standard troubleshooting procedures.

1. Gather the facts to determine the exact nature of the problem. If one port is not functional and all others are working, it is a completely different problem than if all ports are non-functional.
2. Determine what events immediately preceded the problem.
 - Was equipment moved or reconfigured?
 - Were any cables moved or replaced?
 - Were there any reported telephone problems?
 - Were there recent storms or electrical interruptions?
 - Is this a new circuit or was the equipment previously working?
3. Draw a picture of the system showing the equipment at both the host and remote ends and the phone line. Use this as a reference to note your observations.
4. Record the front panel indications before changing anything.
5. If you change anything, change only one thing at a time.
6. Use the built-in test functions, especially the loopback tests.

7.2 Troubleshooting Multiplexers

When troubleshooting a multiplexer link it is important to understand the overall function of the equipment. The multiplexers communicate over a telephone line using modems or DSU/CSUs. If a modem or the telephone line fails, the multiplexers will be unable to communicate and the link will be down. When this happens, none of the terminals at the remote site will work. In this case, troubleshoot the modems and telephone line. See paragraph 7.3.

If only some remote terminals are having problems then the multiplexers may be at fault. Paragraph 7.4 provides guidance for troubleshooting faulty terminals and printers. For further assistance contact DCB Customer Support at (217) 897-6600. Technicians are available between 8:00 am and 5:00 pm central time to assist you.

7.3 Troubleshooting Modems or DSU/CSUs

If none of the remote terminals work, the problem is probably with the modems, DSU/CSUs or the telephone line. Check to see if the modems have the Carrier Detect (CD, DCD) light on. If not, reset the modems. If this does not resolve the problem contact the telephone company and have the line checked.

If the phone company says the line is okay and Carrier Detect is still not on, the modem may be bad. Replace the modem that has DCD on (it provides carrier to the other modem) and try the circuit again. If DCD is off on both modems, contact DCB for assistance.

7.4 Troubleshooting Terminals and Printers

Terminal and printer problems typically fall into four categories:

1. The terminal or printer gets no data
2. The terminal or printer gets "garbage"
3. Blocks of data are lost
4. The terminal "hangs"

When a terminal or printer gets no data, check to see that the cables are wired correctly and that flow control is set properly. Then perform a series of loopback tests to isolate the problem. See paragraph 7.5.

If the terminal or printer gets "garbage" data, check the speeds of the host and remote multiplexers, the terminal and the computer ports to make sure they match.

Blocks of data are lost most often when data is sent to a printer, or a lot of data is being displayed on a terminal. Most of these problems are due to flow control not matching between the printer or terminal and the multiplexer.

If terminals and printers work for a while and then “hang”, check the flow control settings. When Xon/Xoff flow control is set to a different parity on the multiplexer than on the terminal or printer, the result is either a “hung” device that is flow controlled off but never back on, or the device is never flowed off causing buffer overflow and lost data.

7.5 Loopback Tests

It is best to begin loopback testing at the remote terminal and work toward the host. If all the loopbacks are successful, the data communications equipment and the terminal are working correctly.

Put the remote multiplexer port in loopback and have someone type alpha characters on the keyboard of the affected terminal. If the characters appear correctly on the screen, the port is working. Next loop the associated port of the host multiplexer. If characters again appear correctly, the communications link and the ports on both multiplexers are working properly. The problem then is with the host computer port or the cable between the host computer and the multiplexer.

Loopbacks can be turned on and off from the Network Management port of the multiplexer. See paragraph 5.4.6 for details. If a NMP terminal is not available, port loopback can be enabled using a DIP switch. Refer to Figure 1 and paragraph 4.1.2.1 for switch location and operation.

8. WARRANTY

All DCB products are warranted to be free of defects in materials and workmanship for one year. Data Comm for Business, Inc. will repair or replace any equipment proven to be defective within the warranty period. All warranty work is F.O.B. Dewey, IL. This warranty is exclusive of abuse, misuse, accidental damage, acts of God or consequential damages, etc. DCB liability shall not exceed the original purchase price.

All equipment returned for repair must be accompanied by a Returned Material Authorization (RMA) number. To receive an RMA number, call (217) 897-6600 between the hours of 8 AM and 5 PM central time. Equipment must be shipped prepaid to DCB and will be returned at DCB's expense.

Ship returned items to:

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2949 CR 1000E
Dewey, IL 61840

Data Comm for Business, Inc.
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Champaign, IL 61826-6329

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