SR 8/32 Multiplexer

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1.   DESCRIPTION

The DCB SR series statistical multiplexers are used in pairs to allow up to 32 asynchronous RS-232 devices to communicate through a single composite (network) data link. The network may be synchronous or asynchronous, using leased lines, dial-up modems, ISDN, radio links, or digital data service. Asynchronous terminal devices may be terminals, printers, plotters, computer ports, etc.

Each data port is configured individually for speeds up to 38,400 bps.

Network speeds may be as high as 115.2 Kbps asynchonous or 128 Kbps synchronous.

The SR multiplexers also control the data flow to and from each RS-232 device. These individually configured flow control parameters may either be software controlled (Xon/Xoff) or hardware controlled through the RS-232-D interface.
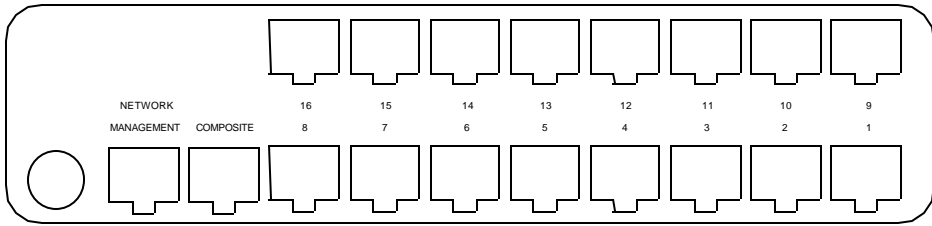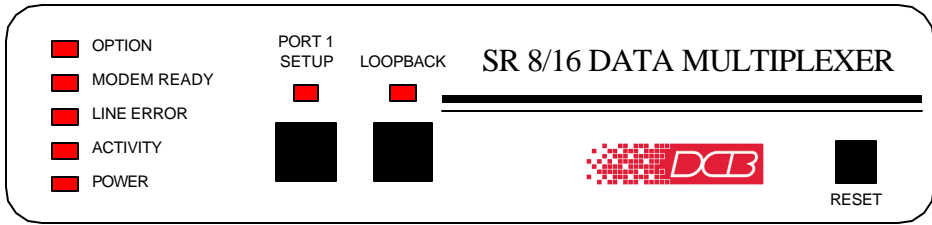
The multiplexer is configured using a network management port or port one of either unit by using an asynchronous terminal or PC with terminal emulation software. Multiplexer configurations are kept in non-volatile memory.

Some features of the SR include:
- Automatic full time or on-demand dial-up operation.
- Test message generation to any local or remote port.
- "Copy" commands to allow host site trainer to assist remote trainee.
- Monitor functions allow network management port user to monitor transmit or receive of any data port.
- Capture command to allow network management port user to control a remote data port.
- Many test features allow diagnostics of the system and communications link.
- Error correction on all network data.
- Field upgradable from 8 to 32 ports.
- Power supplies available for 12 VDC, 24 VDC, 48 VDC, 120 VAC, and 240 VAC.

Options:
- Internal 56K Dial-Up Modem.
- Internal V.33 (14,400 bps) Leased Line Modem.
- Internal 56 or 64Kbps DSU/CSU.
- Rack mount options available.

OPTION

MODEM READY

LINE ERROR

ACTIVITY

POWER

PORT 1
SETUP

LOOPBACK

SR 8/16 DATA MULTIPLEXER

DCB

RESET

NETWORK

MANAGEMENT   COMPOSITE

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

SR Multiplexer, 16 Channel Unit

2.   SPECIFICATIONS

2.1   Product

2.1.1   Data Ports

Port Speeds
Asynchronous only
300, 600, 1200, 2400, 4800, 9600, 19,200 or 38,400 bps

Port Rate Selection
Selected per port through network management port control
with an asynchronous terminal.

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

Interface
CCITT V.24, RS-232D, implemented in RJ-45, 8 position
connectors. (RS-561 standard physical pin-out used on RJ-45
connectors)

Port Flow Control
Input (SR control of data input to each port)
Software: Xon/Xoff
Hardware: Clear to Send
Output (Attached device control of output from each SR port)
Software: Xon/Xoff
Hardware: Busy High or Busy Low

Port Flow Control Selection
Selected per port through the network management port with
an asynchronous terminal.

Buffering
32K dynamically allocated

2.1.2   Composite Port

Full Duplex

Speed
Synchronous up to 128 Kbps
Asynchronous from 300 to 115,200 bps

Interface
RS-232D, implemented in RJ-45, 8 position connector

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2.1.3   Network Management Port Commands

       Show Network Status
       Show Port Configuration
       Change Port Configuration
       Change Mux Parameters
       Configure Modem
       Configure Network
       Show / Change ID
       Activity Counters
       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 Mux
       Type
       Repeat Last Command
       Disconnect NMP

2.2   Environmental

       Operation: -40 to 70° C, 10 to 85% relative humidity
       Storage: -40 to 85° C, 10 to 85% relative humidity

2.3   Physical / Electrical

       10¼" W x 9¾" D x 2½" H – 8 and 16 channel units
       10¼" W x 9¾" D x 4¼" H – 24 and 32 channel units
       120 VAC external power supply
       30 watts, .25 amps
       Optional 12 VDC, 24VDC, 48VDC, or 240VAC power supply
           available

2.4   Other Specifications

    Operating Modes
        Multiplexing
        Network Loopback
        Port Loopbacks

    Front Panel Indicators
        Power
        Activity
        Line Error
        Modem Ready
        Option
        Port 1 Setup
        Loopback

    Front Panel Switches
        Loopback
        Port 1 Setup
        Reset

2.5   Internal Modem or DSU/CSU Specifications

    Optional internal 14,400 bps modem
        V.33 14,400 bps
        12,000, 9600 and 7200 bps fallback rates
        4 wire leased line

    Optional internal DSU/CSU
        Compatible with Common Carrier digital signalling
        56 or 64 Kbps configurable from Network Management Port
        4 wire digital line
        Can be used as high speed 4 wire line driver in 56K mode

    Optional internal 56K (V.90) dial-up modem
        Standard AT command set
        Configurable from Network Management Port

3.   INSTALLATION

3.1   Unpacking

Remove the SR multiplexer from the shipping container and examine it carefully for external damage. If shipping damage is apparent, notify the shipper immediately.

The following accessories are included with all SR multiplexers:
- external power supply
- manual
- warranty, maintenance contract and repair information
- Modem to Composite cable (black) for connecting the SR to an external modem or DSU/CSU
- Network Management Port cable (green) for connecting the SR network management port to an asynchronous terminal or PC for configuration
- If your unit has an optional internal modem or DSU/CSU, a cable is also included for connection to the phone line.

3.2   Setup

The composite port must be configured properly for the type of link used (Sync or Async). In addition, each data port must have the proper speed, parity and flow control settings. This is done using the network management port CN and CP commands (see Section 5).

3.3   Using Leased Line Modems

In this section, a reference to modem includes modems, digital radios or DSU/CSUs for leased line installations.

Connect the modems to the phone line and power ON the modems. Confirm the presence of carrier at each modem. If carrier is not detected at both ends, recheck the option settings. If carrier is still not present, check the cable from the telephone line to the modem. If everything is correct and still no carrier call the manufacturer of the modem or contact the telephone company for assistance.

Connect the SR composite port to the modem. A two foot RJ45 to DB-25 male cable connects the composite port of the SR (the RJ45 connector second from the left when viewed from the rear) to the data port of the modem (usually a DB-25 female connector). See Section 6 for cabling information.

Connect the multiplexers to power.

Power, Activity and Modem Ready indicators on the front panel of the SR must be ON indicating the on-line condition. (See Section 4).

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3.4   Using Dial-Up Modems

        To configure your SR Multiplexers to work with DCB dial-up modems
        first connect the modems to the multiplexers using the Modem to
        Composite cable supplied (not required for internal modems). Next
        attach a terminal or PC to the SR Network Management Port using the
        green cable and the appropriate adapter (supplied). Set the terminal for
        9600 8,N,1 and no flow control. When you see "AT YOUR COMMAND
        >>", follow the instructions below. User responses are shown in **BOLD**.

3.4.1   Host Multiplexer (ANSWER)

```
AT YOUR COMMAND >> CN<Enter>

CONFIGURE NETWORK
-------------------------------
 SYNC MODEM
 LEASED LINE
 ERROR CORRECTION ON

SYNC or ASYNC modem? [S/A] >> A<Enter>
ASYNC rate? [9600 / 19200 / 38400 / 57600 / 115200] >> 57<Enter>
Leased or Dialup Line? [L/D] >> D<Enter>
Enable Error Correction? [Y/N] >> Y<Enter>
One-Touch Dialing? [ATD / DTR Dial / OFF] >> OFF<Enter>
Disconnect timeout? [1 to 99 min; 0=Disable] >> 0<Enter>

 ASYNC MODEM: 57600
 DIALUP LINE
 ERROR CORRECTION ON
 ONE-TOUCH DIALING: OFF
 DISCONNECT TIMEOUT: DISABLED

NOTE: Use CM to configure network modem.

AT YOUR COMMAND >> CM<Enter>

*** CONFIGURE NETWORK 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 >>
```

3.4.2   Remote Multiplexer (ORIGINATE)

```
AT YOUR COMMAND >> CN<Enter>

CONFIGURE NETWORK
-------------------------------
 SYNC MODEM
 LEASED LINE
 ERROR CORRECTION ON

SYNC or ASYNC modem? [S/A] >> A<Enter>
ASYNC rate? [9600 / 19200 / 38400 / 57600 / 115200] >> 57<Enter>
Leased or Dialup Line? [L/D] >> D<Enter>
Enable Error Correction? [Y/N] >> Y<Enter>
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 SR call progress messages? [Y/N] >> Y<Enter>

 ASYNC MODEM: 57600
 DIALUP LINE
 ERROR CORRECTION ON
 ONE-TOUCH DIALING: ATD Dialing – [ATDnnn-nnnn]
 DISCONNECT TIMEOUT: Auto-Redial Enabled
 AUTO-REDIAL TIMEOUT: 15 sec.

NOTE: Use CM to configure network modem.

AT YOUR COMMAND >> CM<Enter>

*** CONFIGURE NETWORK 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 >>
```
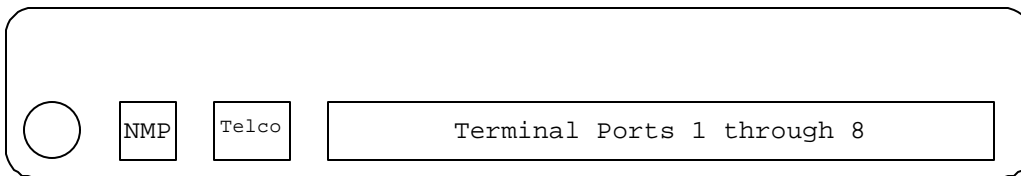
9

3.4.3   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 "SR: 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.

3.5   Optional Internal V.33 Modem

The internal V.33 (14,400 bps) modem is pre-configured to work in most applications. Simply insert the appropriate phone line cable into the RJ-45 "Telco" jack on the rear of the multiplexer and plug the other end into the phone company termination jack.

```
 _____
|                                                        \
|                                                         |
|   ___    _____    _____    _____   |
|  /   \  | NMP |  | Telco |  |  Terminal Ports 1 through 8  |
|  \___/  |_____|  |_____|  |_____|  |
|_____/
```

SR 8 Multiplexer With Internal Modem
Rear View

The alternate configurations are accessed through the network management port of the multiplexer. If you wish to change the configuration, use the "Configure Modem" (CM) command from the network management port. See Section 5.

To check the current configuration use the "Show Network" (SN) command.

3.6   Optional Internal DSU/CSU

The SR composite connector is disabled. The DSU/CSU composite cable comes out of the upper left hand corner of the back panel of the multiplexer and is terminated with an RJ-48S connector.

The cable has transmit on positions 1 and 2 and receive on positions 7 and 8. See Section 6 for correct position orientation. This should plug directly into the phone company provided jack.

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The DSU/CSU should operate with no special configuration required. The DSU follows the phone company line speed of 56 or 64Kbps when set to standard clock. The default setting is 56K.

The DSU/CSU will operate as a line driver over customer provided in-house cable. To run as a line driver, use to CM command to set one unit to "Line Driver 56", the other to "Std Clk 56".

The alternate configurations are accessed through the network management port of the multiplexer. If you wish to change the configuration, use the "Configure Modem" (CM) command from the network management port. See Section 5.

To check the current configuration use the "Show Network" (SN) command.

3.7   Cabling

Cabling between the multiplexer and the computer ports or terminal devices is a common source of installation problems. The SR must have data from attached terminal devices or computer ports, as an input on Position 6 of the RJ45 connector. Data from the SR to any attached equipment will be transmitted on position 5 of the RJ45 connector. See paragraph 6.1 for position location on the RJ45 connector.

See Section 6 to determine the correct cables for your computer and terminal devices.

3.8   Parity Considerations

SR multiplexers transfer all character bits whether it is 7 data bits plus parity or 8 data bits. The SR does not verify parity for each character transferred. Consequently, the parity setting of the devices at either end of an SR channel must match. Because of this ability to transfer 8 bits transparently, the SR can transfer graphic characters, binary files and support "PC terminals."

Why XON/XOFF parity settings?

Parity only becomes an issue if you are using XON/XOFF flow control. The SR must know what to send for the parity bit of the XON and XOFF characters. The attached devices will not recognize the flow control characters if the parity is not correct. Also, the SR must know which character to interpret as an XON or XOFF when received from the attached device.

Remote site XON/XOFF parity settings.

When setting XON/XOFF flow control at a remote site, set the parity of the SR port to match the attached device. If the device is set for EVEN parity, set the SR port for XE (XON/XOFF Even). If the attached device is set for ODD parity, set the SR port for XO (XON/XOFF Odd). If you are using 8 data bits and no parity, set the SR port for XS (XON/XOFF Space). For the XON/ XOFF characters, the SPACE parity setting is the same as 8 data bits no parity.

Host site XON/XOFF parity settings.

Since the host computer can process data faster than we can type, it will never issue flow control to stop the inflow of data. If an XON or XOFF character is issued by the CPU, it is for a status or initialization function and not flow control. Because of this activity, the host SR must pass the XON/XOFF character to the remote end and not act upon it. To accomplish this task, the SR has an XON/XOFF Transparent setting. When set for Transparent, the SR will pass the XON/XOFF characters to the other end without taking flow control action. When using XON/XOFF flow control, set the host computer side SR ports to XT (XON/XOFF Transparent).

Host site parity determination.

When the host site SR port is set for XT (XON/XOFF Transparent), parity is not specified for the XON or XOFF characters to be issued. The SR will determine the parity for the XON/XOFF characters as follows:

1. If the flow control setting is for XT (XON/XOFF Transparent), the SR will interrogate the other SR multiplexer for the parity setting of the corresponding port.

2. If the corresponding port is set for XE(Even), XO(Odd), XM(Mark) or XS(Space) flow control, the SR will use the matching parity.

3. If the corresponding port is set for XT(Transparent) or any of the CTS flow control options, the SR will default to Space parity (same as 8 data bits-no parity).

3.9   Flow Control and Rate Tips

Individual port options are set through the network management port or through port 1 setup. (See Section 5).

Flow control options are the most critical and the most common source of installation problems. If the flow control is improperly implemented data loss may occur.

If you are using software flow control (Xon/Xoff) double check the parity settings. Make sure that the Parity is set the same at the CPU, remote SR and attached devices. If your system uses 8 bits, no parity (8,N,1), set the host multiplexer ports for Xon/Xoff Transparent (XT) and set the remote ports for Xon/Xoff Space (XS).

If half of your characters are good and half are bad, there is a parity setting mismatch between the CPU and terminal device.

When using hardware flow control, double check the cabling (see Section 6). For input flow control (data flow into the SR) Clear To Send, position 7 of the RJ45 connector, is used. For output flow control (data output from the SR to a terminal or printer) Busy high or low, position 3 is used.

Using the network management port, issue the "AC" command (Activity) to see information about port errors and retransmissions. Port errors indicate either speed, parity or both are incorrectly set. The "SC" command (Show Configuration) can be used to confirm each port is set correctly.

3.10   Resetting Factory Defaults

The factory default settings for the SR multiplexer ports are as follows:

Data Ports:
    Loop   OFF
    Flow Control   XS (XON/XOFF Space)
    Rate   9600

Composite Port:
    Modem type   SYNC
    Line type   Leased Line
    Error Correction   ON

Optional DSU/CSU:
    Standard clock, 56Kbps

To reset the unit to factory defaults use the !R command from the network management port or perform the following steps using the front panel switches:

1. Depress and hold the PORT 1 SETUP switch. Press and release the RESET switch.

2. Be sure to continue to hold the Port 1 Setup switch until its LED has gone OFF and returned ON.

3. Release and depress the Port 1 Setup switch again to return management control to the network management port.

4. All port settings should be at the factory defaults. Use the SC (Show Configuration) command to check the port settings.

4.   FRONT PANEL CONTROLS AND INDICATORS
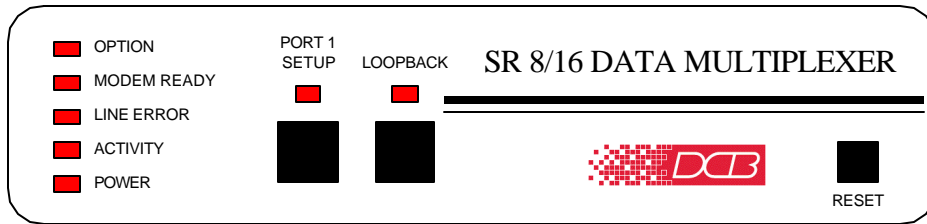
4.1   Switches

Port 1 Setup – Maps the network management port commands to the terminal attached to data port 1. When Port 1 Setup is active, the indicator is on.

Loopback – Initiates a bi-directional composite port loopback. The loopback is active when the indicator is on.

Reset – Performs a hardware reset of the multiplexer.

4.2   Indicators

POWER – is ON when the SR is connected to power.

ACTIVITY – three states:

> ON – multiplexing mode with no data activity.

> FLICKERING – multiplexing mode with data activity (the ACTIVITY indicator flickers off for every 16 blocks of data).

> FLASHING SLOWLY – Data Carrier Detect has been lost for over 45 seconds indicating a major composite link problem.

LINE ERROR – flashes when an error is detected in received data.

MODEM READY – four states:

ON – Data Carrier Detect and Clear to Send are present from the composite link device indicating an active composite link.

FAST FLASHING – composite link is active but there are 10 blocks of data outstanding without a response from the remote multiplexer.

SLOW FLASHING – composite link modem is retraining and flashing Data Carrier Detect or Clear to Send upon each retrain indicating a problem with the composite link.

OFF – Data Carrier Detect or Clear to Send is not present from the composite modem or DSU/CSU indicating a problem with the composite link.

OPTION – indicates the composite port is configured ASYNC

PORT 1 SETUP – is ON when the network management port functions have been mapped to data port 1 by depressing the front panel switch. To return these functions to the network management port, depress the front panel switch again.

LOOPBACK – is ON when the bidirectional composite loopback has been activated by depressing the front panel switch. To return to normal operation, depress the front panel switch again.

The following table shows the relationship between composite DCD and CTS and the front panel MODEM READY and ACTIVITY indicators.

DCD	CTS	MODEM READY	ACTIVITY
HI	HI	ON	ON
LO	LO	OFF	Flash
LO	HI	OFF	Flash
HI	LO	OFF	ON

5.   NETWORK MANAGEMENT PORT

5.1   Introduction

The Network Management port (NMP) is used to configure the SR multiplexer for proper operation. This connection must be used to configure the SR composite and data ports. The NMP can also be used to configure remote SR ports after a link is established between the host and remote sites.

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 on the front panel performs this function. See paragraph 4.1 for information. This option cannot be used if a printer is connected to port 1.

5.2.2   Dedicated Terminal or PC

The NMP functions are also available through a port on the rear of the unit labeled Network Management Port. To connect a dedicated terminal to this port, use the green cable provided and the appropriate adapter for either a terminal or PC. Set the terminal device for 9600 bps, 8 data bits, no parity, one stop bit and no flow control.

5.2.3   Dedicated Modem

For remote access to NMP functions, a dial-up modem may be connected to the Network Management 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.

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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>

        Show: Network   SN   5.4.2
                Config   SC   RSC   5.4.3
        Change: Port Config   CP   RCP   5.4.4
                  MUX Param   CO   RCO   5.4.5
        Config Modem   CM   5.4.6
        Config Network   CN   5.4.7
        Set ID   ID   RID   5.4.8
        Activity Counters/Zero AC/Z   RAC   5.4.9
        Flow Control   FC   5.4.10
        Test Tools   TT   5.4.14
        Type   TY   RTY   5.4.11
        Repeat Last Command   *   5.4.12
        Disconnect NMP   BYE   5.4.13

        This Help screen shows the choice of commands available. The
        commands allow you to display the selected options (Show network and
        configuration), configure the SR (Configure ports and Set ID), and
        perform many different diagnostic functions such as send a test
        message, monitor data, perform loopbacks, show flow control state,
        show activity and other useful tests.

5.4.2   Show Network (Configuration)

        The Show Network (SN) command displays the current network
        (composite port) configuration and multiplexer mode of operation.

        Configuration parameters include SYNC or ASYNC, LEASED LINE or
        DIAL-UP, ERROR CORRECTION ON or OFF and one touch dialing
        information if enabled.

        Operating modes are OFF LINE, ON-LINE MUXING, and LOOPBACK
        MUXING.

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5.4.3   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

5.4.4   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 Space, 9600 bps.

5.4.5   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.

5.4.6   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.

Optional V.33 Internal Modem

With the optional V.33 internal modem the CM command is used to configure the following modem parameters:
- Line Rate, 14,400 to 4800 bps
- Transmit Level, 0 to -15 dBm
- Receive Threshold, -26 or -43 dBm
- Various loopbacks for troubleshooting

Optional 56/64Kbps DSU/CSU

With the optional built-in DSU/CSU the CM command is used to configure the clock source as either Standard Clock or Line Driver.

5.4.7   Configure Network

The Configure Network command (CN) allows configuration of the multiplexer composite port for asynchronous and/or dial-up operation. This command can also be used to disable error correction if required.

See paragraph 3.4 for step-by-step instructions for dial-up operation.

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

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5.4.8   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.

5.4.9   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.

5.4.10   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.

5.4.11   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.

5.4.12   Repeat Last Command

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

5.4.13   Disconnect NMP

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

5.4.14   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.

COMMAND	LOCAL	REMOTE	PARAGRAPH
Capture Port	CA#	RCA#	5.4.15
Copy Command	CC#	RCC#	5.4.16
Show RS232	SR	RSR	5.4.17
Network Loop/Quit	NL/QNL		5.4.18
Test Message	TM#	RTM#	5.4.19
Remote Test Loop		RTL#	5.4.20
Monitor Port Tx	MT#		5.4.21
Monitor Port Rx	MR#		5.4.21
NMP Parity	P		5.4.22
Port Reset	PR		5.4.23
Reset MUX	RESET	RRESET	5.4.24

5.4.15   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.

5.4.16   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.

5.4.17   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.

5.4.18   Network Loopback

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

5.4.19   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.

5.4.20 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.

5.4.21 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.

5.4.22 NMP Parity

The NMP Parity command (P) sets the parity for the network management port. The factory default is SPACE (8,N,1).

5.4.23 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.

5.4.24 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
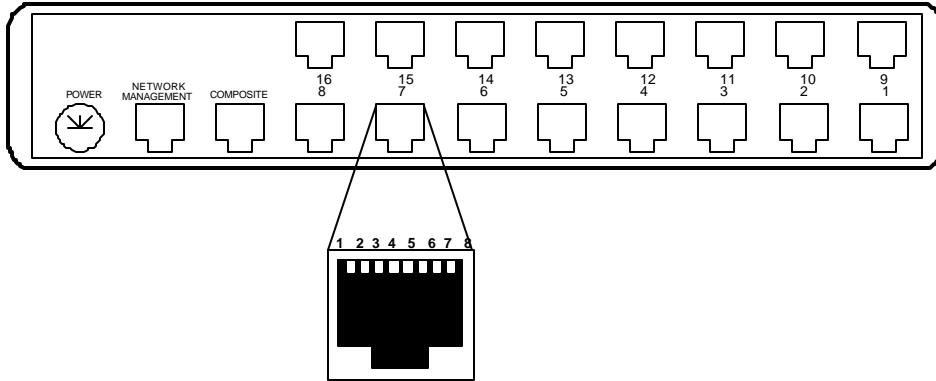
SR-16 Rear Panel and RJ-45 Jack

RJ-45 Plug Positions

6.2   Port Interface

6.2.1   Composite Port (RJ-45)

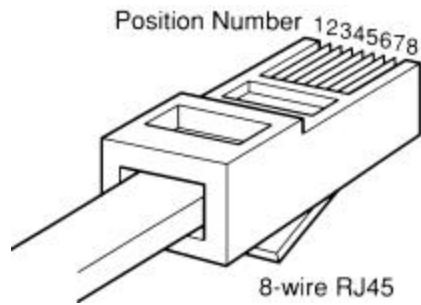| Pin	Signal	In/Out
1	Receive Clock	IN
2	Transmit Clock	IN
3	Data Carrier Detect	IN
4	Signal Ground	
5	Transmit Data	OUT
6	Receive Data	IN
7	Request to Send	OUT
8	Clear to Send	IN

6.2.2   Data Ports (RJ-45)

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

6.2.3   Network Management Port (RJ-45)

Pin	Signal	In/Out
1	Not Used	
2	Not Used	
3	Data Carrier Detect	IN
4	Signal Ground	
5	Transmit Data	OUT
6	Receive Data	IN
7	Request to Send	OUT
8	Clear to Send	IN

6.3   Cables

6.3.1   Composite Port to Modem

A two foot composite to modem cable is included with each SR
multiplexer. The configuration is as follows:

```
     SR                    Modem
     RJ-45                 DB-25P

     1 ─────────────────── 17
     2 ─────────────────── 15
     3 ─────────────────── 8
     4 ─────────────────── 7
     5 ─────────────────── 2
     6 ─────────────────── 3
     7 ──────────┐         4
                 └──────── 20
     8 ─────────────────── 5
```
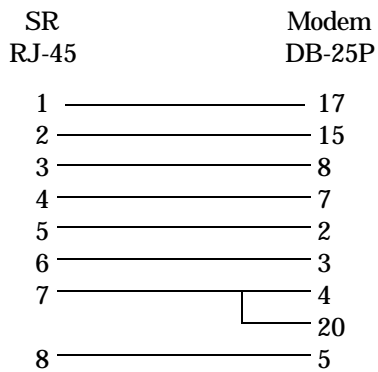
6.3.2   Data Ports to Host Computer

Configured as DTE

```
     SR                Computer
     RJ-45             DB-25

     1 ──────────────── 6
     2 ──────────────── 8
     3 ──────────────── 20   (or other flow control output pin)
     4 ──────────────── 7
     5 ──────────────── 3
     6 ──────────────── 2
     7 ──────────────── 5    (or other flow control input pin)
     8 ──────────────── 4    (or 20 if 4 is flow control)
```
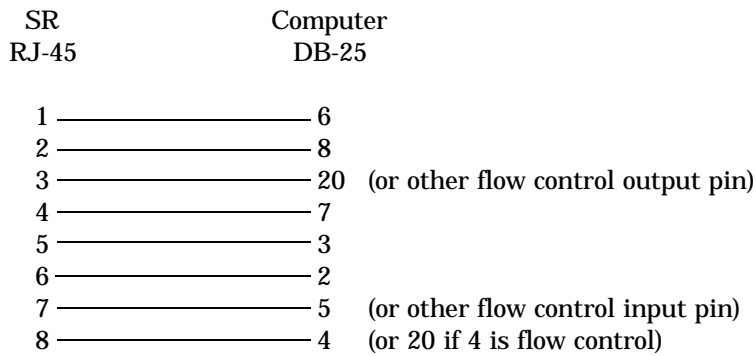
6.3.2   Data Ports to Host Computer, continued

Configured as DCE

```
    SR                    Computer
    RJ-45                 DB-25

     1
     2 ——————————— 20   (or 4 if 20 is flow control)
     3 ——————————— 5    (or other flow control output pin)
     4 ——————————— 7
     5 ——————————— 2
     6 ——————————— 3
     7 ——————————— 4    (or other flow control input pin)
     8 ——————————— 8
```

To a PC Com Port

```
    SR                       Computer
    RJ-45                 DB-25S    DE-9S

     1 ——————————— 6    or    6
     2 ——————————— 8    or    1
     3 ——————————— 4    or    7
     4 ——————————— 7    or    5
     5 ——————————— 3    or    2
     6 ——————————— 2    or    3
     7 ——————————— 5    or    8
     8 ——————————— 20   or    4
```

6.3.3   Network Management Port

To a TERMINAL

```
        NMP                     Terminal
        RJ-45                   DB-25P

          3 ──────────────────── 20
          4 ──────────────────── 7
          5 ──────────────────── 3
          6 ──────────────────── 2
          7 ───────────────┐     5
                           ├──── 6
                           └──── 8
          8 ──────────────────── 4
```
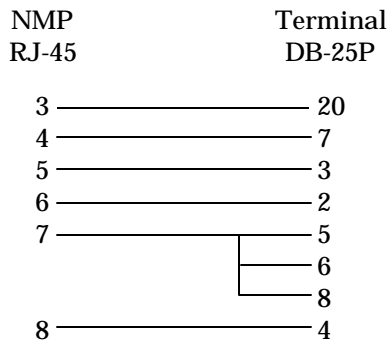
To a PC using terminal emulation

```
        NMP                           Computer
        RJ-45                       DE-9S     DB-25S

          3 ──────────────────── 4     or    20
          4 ──────────────────── 5     or    7
          5 ──────────────────── 2     or    3
          6 ──────────────────── 3     or    2
          7 ───────────────┐     8     or    5
                           ├──── 6     or    6
                           └──── 1     or    8
          8 ──────────────────── 7     or    4
```
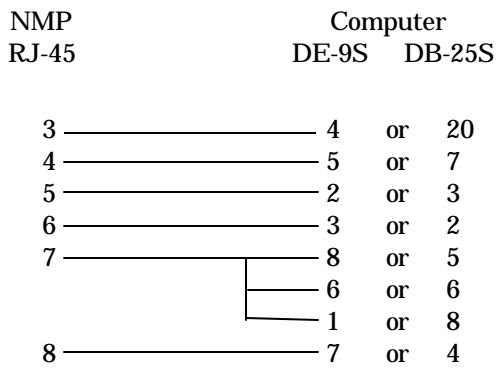
To a dial-up MODEM for remote access

```
        NMP                     Modem
        RJ-45                   DB-25P

          3 ──────────────────── 8
          4 ──────────────────── 7
          5 ──────────────────── 2
          6 ──────────────────── 3
          7 ───────────────┐     4
                           └──── 20
          8 ──────────────────── 5
```
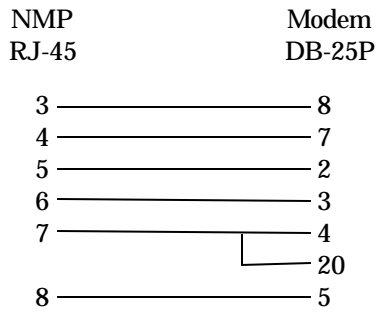
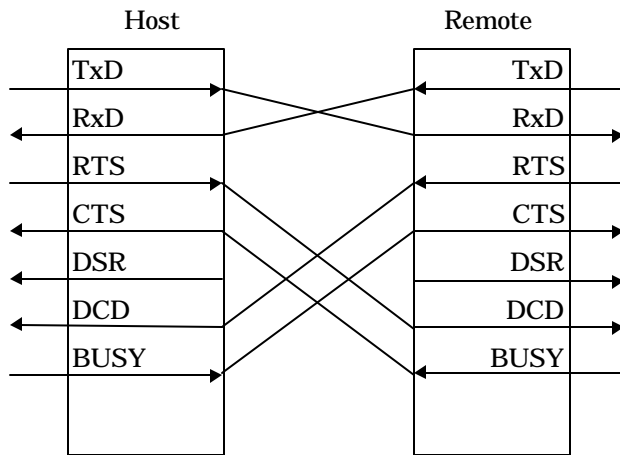## 6.4 Signal Paths through Multiplexers

The following diagram shows the signal flow between data ports of two SR 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).

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.

2.   Draw a picture of the system showing the equipment at both the host and remote ends and the phone lines or in-house wiring. Use this as a reference to note your observations, test steps and test results. A picture keeps you focused and often saves duplicate effort.

3.   Record the front panel indications before changing anything. This is an important part of fact gathering

4.   If you change anything, change only one thing at a time.

5.   Use the built-in test functions, especially the loopback tests and record your results.

7.2   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 correctly. The problem then is with the host computer port or the cable between the host computer and the multiplexer.

Port loopbacks can be turned on and off from the Network Management port of the multiplexer. If a NMP terminal is not available, port loopback can be enabled using the Port 1 Setup function of the remote multiplexer

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7.3   Installation Troubleshooting, Modems or DSUs

First, set up the Modems or DSUs without connecting the multiplexers. If DSUs are used they should be set to constant carrier, also called forced Request To Send, or constant RTS.

Carrier Detect should be ON at both locations.

7.4   Installation Troubleshooting, Multiplexers

Before trying terminals, make sure the multiplexers are able to "see" each other. Use the RTY command to verify a response from the remote multiplexer. If you get a correct response to RTY, the link is up and the multiplexers are communicating.

7.5   Installation Troubleshooting, Terminals

Terminal problems typically fall into four categories:

    1.   The terminal or printer gets no data
    2.   The terminal or printer gets "garbage" data
    3.   Blocks of data are lost
    4.   Terminals or printers seem to "hang".

When a terminal gets no data, check to see the cables are wired correctly and that flow control is set properly.

If the terminal 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 a device that is never flowed off causing buffer overflow and lost data.

7.6   Assistance

If you need assistance troubleshooting your system, contact DCB customer support at (217) 897-6600 between 8:00 am and 5:00 pm central time Monday through Friday.

8.   WARRANTY

DCB multiplexers are warranted to be free of defects in materials and workmanship for two years. Data Comm for Business 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:

Data Comm for Business
2949 CR 1000E
Dewey, IL 61840

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

Tel   (217) 897-6600
Fax   (217) 897-1331
Email   support@dcbnet.com