

DL Series DSU/CSU

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1. DESCRIPTION

The DL DSU/CSU is designed for synchronous or asynchronous operation over 4-wire point-to-point or multi-point leased digital lines. The DL can also be used as a line driver over customer-owned wire for links up to 5 miles. The DL can be set up via the LCD front panel or through the network management port. For the typical point-to-point synchronous application, DL DSU/CSU can be attached to the phone line and terminal, plugged in and be in operation in minutes.

The DL DSU/CSU operates at line rates of 9600, 19200 or 56000 bps. It will also support synchronous or asynchronous terminal rates of 4800, 9600, 19200 or 38400 bps.

The DL series DSU/CSU is available in stand-alone configurations or can be installed in the DCB MR modem rack, which holds up to eight units.

Special features of the DL series DSU/CSU include the following:

- Set up and control through the front panel or through the network management port
- Eprom cartridge for easy firmware upgrades
- Sync or async operation
- Telephone company digital line use or local line driver

2. SPECIFICATIONS

2.1 Physical/Electrical

10 ¼" W x 9 ¾" D x 2 ½" H
120 VAC, .25 A
4 pounds
External power supply
Battery backed up RAM for saving parameters

2.2 Environmental

Operation: 0 to 65° C, 10 to 85% relative humidity
Storage: -40 to 85° C, 10 to 85% relative humidity

2.3 Data Signalling Rates and Modulation

Digital line rates of 9,600; 19,200 or 56,000 bps
Bi-polar non-return-to-zero modulation
135 ohm ± 10% transmit impedance
Transmit level @ 135 ohm load, 56 kbps, 1.4v peak
135 ohm ± 10% receive impedance
Receive level sensitivity, -40 dB
Automatic equalization

2.4 Transmission Line

4 wire leased line, telephone company digital line (DDS)
4 wire in-house 2 twisted pair for line driver

2.5 Operating Mode

Full duplex
Constant or switched carrier
Point-to-point or multi-point

2.6 DTE Timing

Synchronous mode: line rate or 4,800; 9,600; 19,200; 38,400 bps

Asynchronous mode: 4,800; 9,600; 19,200; 38,400 bps

2.7 Loopbacks

Local Digital

Local Analog

2.8 Connectors

Telephone line connector: 8 wire, RJ-48S

Digital connector: DB-25 female, RS-232D / V.24

2.9 Network Management Port Commands

Show Configuration

Configure Modem

Modem Type

Set ID

Test Line

Testing Tools

 Analog Loopback

 Digital Loopback

 Unit Test (Self Test)

 End Tests

 Show RS-232

Reset to Defaults

Reset Modem

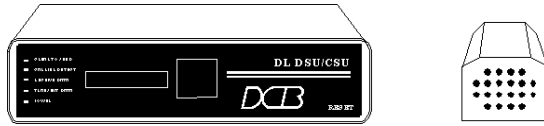
NM Parity

Disconnect NM Port

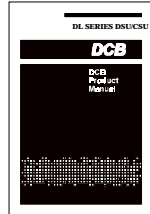
3. INSTALLATION

3.1 Unpacking

The following is included with all DL DSU/CSU's:



- DL DSU/CSU and external power supply



- manual
- information regarding warranty, maintenance contract and repair

3.2 Location

Place the DSU/CSU in an uncluttered area where you can reach the front panel for set up and the rear panel to connect the cables. The DL DSU/CSU has an external power supply that is plugged into a 120 VAC outlet. The total power cord length is about 12 feet.

3.3 Setup

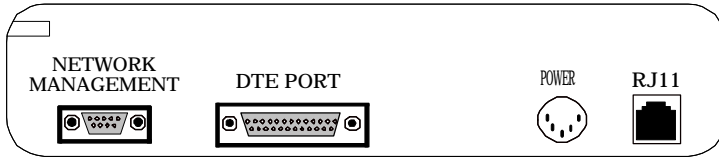
The DL DSU/CSU will typically work in point-to-point applications right out of the box. The default configuration covers 90% of typical applications. The defaults are as follows:

STANDARD CLOCK 56
SYNC
Terminal Rate MAXIMUM (Line Rate)
RTS forced ON
Tx data NOT clamped by RTS

For multi-point applications, set the remote DLs for RTS Control FROM INTERFACE.

If your application requires a change, new settings can be made via the front panel or the network management port. Front panel operation is covered in Section 4. The network management port is covered in Section 5. DSU/CSU configuration options are listed in paragraph 5.4.3.

3.4 Telephone Line Connections

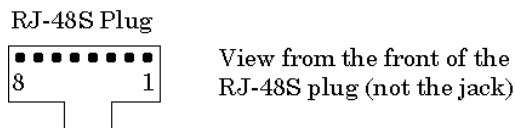


DL DSU/CSU REAR PANEL CONNECTORS

NOTE

The RJ-11 connector is not used when connecting the DL DSU/CSU.

The phone line cable supplied with the DL DSU/CSU has an RJ-48S plug at one end and exits the DL through a slot in the rear panel. Positions 1 and 2 on the connector are transmit, positions 7 and 8 are receive. The pairs are not polarity sensitive.



3.5 Installation Steps

1. Untie the RJ-48S phone cable that exits the rear of the DSU/CSU.
2. Plug the RJ-48S plug into the RJ-48S connector (demarc) supplied by the phone company.
3. Connect the DTE device cable. Refer to Section 6 for information about the RS-232 interface.
4. Connect the round (DIN) power supply connector to the DSU/CSU and plug the power supply into a convenient AC outlet.

4. FRONT PANEL CONTROLS AND INDICATORS

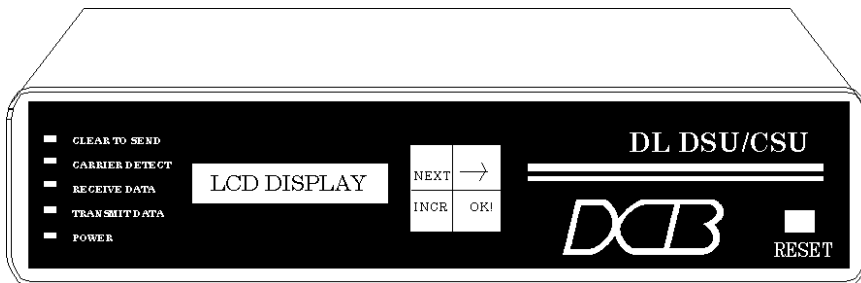
4.1 Keys

The **NEXT** key is used to cycle between the 3 top level displays, HOME, SET and TEST.

The **ARROW** key (→) switches between the top and bottom line of a display.

The **INCR** key is used to cycle through the various options available from the SET or TEST displays.

The **OK!** key is pressed to accept the selected value in the SET display or to enable/disable the selected test.



DL DSU/CSU FRONT PANEL LAYOUT

4.2 Display Tree

Use the **NEXT** key to go between these 3 displays.

<u>HOME</u>	<u>SET</u>	<u>TEST</u>
Type & Clock Setting	Rate (Line)	Test Line
Firmware Version	SYNC/ASYNC	Digital Loopback
	Terminal Rate	Local Analog Loopback
	RTS Control	Self Test
	TX Clamp	

4.3 Operation

To change a setting, first press the **NEXT** key until you see the SET display.

SET: <Parameter> <Value>

Example:

SET: Rate STD CLOCK 56

The parameter will be flashing. Press **INCR** to change the parameter.

To change a value, press the → key until the value flashes on the second line. To change the value, press the **INCR** key. This will increment the value. When you have the desired value, press **OK!** to write the change into memory.

If you are on the second line and want to go back up to the first line, press the → key again.

See Section 7 for information about using the TEST display selections to troubleshoot problems.

4.4 Indicators

CLEAR TO SEND

Normally ON, flashes on and off only when RTS Control is set to FROM INTERFACE and the attached device is toggling RTS.

CARRIER DETECT

Normally ON, off when no signal (carrier) is being received from the far end.

RECEIVE DATA

Flashes when data is being received.

TRANSMIT DATA

Flashes when data is being sent.

POWER

On when the DSU/CSU has power.

5. NETWORK MANAGEMENT PORT

5.1 Introduction

The Network Management Port (NMP) allows you to perform all the functions of the front panel from a remote location. In addition to the front panel functions, you can:

- Set an ID in the local DSU/CSU.
- See status of DTE port RS-232 signals.

5.2 Connections and Terminal Setup

The NMP is accessed through a DE-9S connector on the rear of the DSU/CSU. To connect to the NMP, use one of the cables shown in paragraph 6.3. Set your terminal for 300, 1200, 2400 or 9600 bps and 7 data bits, space parity and one stop bit. If your terminal does not support space parity, set it for 8 data bits and no parity or 7 data bits and even parity.

5.3 Using the Network Management Port

To activate the NMP, press the ENTER key. Several keypresses may be necessary depending on the speed of the terminal. When you see **AT YOUR COMMAND >>**, the NMP is active and ready for your commands. Type "H" to display a list of available commands.

5.4 Commands

5.4.1 Help

<u>Command</u>	<u>Keys</u>	<u>Paragraph</u>	<u>Front Panel Equivalent</u>
Show Config	SC	5.4.2	HOME/SET
Configure Modem	CM	5.4.3	SET
Modem Type	TY	5.4.4	HOME & → Key
Set ID	ID	5.4.5	None
Test Line	TL	5.4.6	TEST - Test Line
Testing Tools	TT	5.4.11	TEST
Reset to Default	RD	5.4.7	OK! + Reset Button
Reset Modem	RM	5.4.8	Reset Button
NM Parity	P	5.4.9	None
Disconnect NM Port	BYE	5.4.10	None

5.4.2 Show Config

The Show Config (SC) command displays the current DSU configuration. Included are DSU rate, terminal rate, SYNC/ASYNC, RTS control and TX (data) clamp.

5.4.3 Configure Modem

The Configure Modem (CM) command allows you to configure the DSU/CSU to fit your application. These options are also available from the front panel SET menu.

DSU Rate (line rate)

Standard Clock at 9.6, 19.2 or 56 Kbps for TELCO DDS service.

Line Driver at 9.6, 19.2 or 56 Kbps for in-house line driver applications. (one unit only)

SYNC/ASYNC

Configures the DTE (terminal) port to run sync or async. If set for async, the terminal rate must be set to a speed equal to or less than the DSU line rate.

Terminal Rate

MAXimum - sync only at the DSU line rate

4,800 - sync or async

9,600 - sync or async

19,200 - sync or async

38,400 - sync or async

RTS Control

Normal - FORCED ON for standard point-to-point applications.

From Interface - for remote units in multipoint applications.

TX Clamp

Normal - OFF

Clamp on RTS OFF - Clamps transmit data low if RTS goes off.

5.4.4 Modem Type

The Modem Type (TY) command displays information about the local DSU/CSU including firmware version and modem ID.

5.4.5 Set ID

The Set ID (ID) command allows you to assign an identifier to the local DSU/CSU.

5.4.6 Test Line

The Test Line (TL) command is used to verify the integrity of the phone line. When this command is activated, a message is sent to the remote DSU/CSU and the units exchange information. If the test passes, the phone line is probably okay. This command is also available from the front panel TEST menu.

5.4.7 Reset to Default

The Reset to Default (RD) command resets all DSU/CSU parameters to factory default (see paragraph 3.3). The modem ID will not be changed. This can also be done from the front panel by holding the OK! key down while pressing the Reset button.

5.4.8 Reset Modem

The Reset Modem (RM) command performs a hard reset of the DSU/CSU. This is equivalent to pressing the Reset button on the front panel. Modem configuration will not be lost.

5.4.9 NM Parity

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

5.4.10 Disconnect NM Port

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.

5.4.11 Testing Tools

<u>Command</u>	<u>Keys</u>	<u>Paragraph</u>	<u>Front Panel Equivalent</u>
Analog Loopback	AL	5.4.12	TEST - Loc Analog Loop
Digital Loopback	DL	5.4.13	TEST - Digital Loop
Unit Test	UT	5.4.14	TEST - Self Test
End Tests	END	5.4.15	OK! Key or Timeout
Show RS-232	SR	5.4.16	None

5.4.12 Analog Loopback

Analog Loopback (AL) loops the line back toward the local DTE. This loopback is not bi-directional.

5.4.13 Digital Loopback

Digital Loopback (DL) loops the DTE interface in both directions. Use this command to loop data back to the remote DSU/CSU.

5.4.14 Unit Test

Unit Test (UT) performs a self test of the DL. If this test passes, chances are the unit is good.

5.4.15 End Tests

The END command is used to disable loopback tests prior to the 15 minute timeout period.

5.4.16 Show RS-232

The Show RS-232 (SR) command displays the current status of RTS, CTS, DCD and DTR on the DTE port.

6. INTERFACE SIGNALS AND CABLING

6.1 DTE Port Interface (DB-25S)

RS-232D / V.24 Pin Assignments

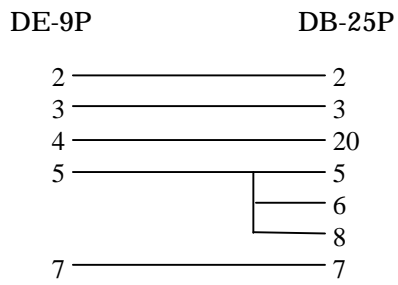
<u>Pin#</u>	<u>Signal Name</u>	<u>In/Out</u>
1	Frame Ground	---
2	Transmit Data	IN
3	Receive Data	OUT
4	Request to Send	IN
5	Clear to Send	OUT
6	Data Set Ready	OUT
7	Signal Ground	---
8	Data Carrier Detect	OUT
9	+12 volt test voltage	OUT
10	-12 volt test voltage	OUT
15	Transmit bit clock	OUT
17	Receive bit clock	OUT
18	Local Analog Loopback	IN
20	Data Terminal Ready	IN
21	Line Test	IN
24	External Transmit Clock	IN
25	Test	OUT

6.2 Network Management Port Interface (DE-9S)

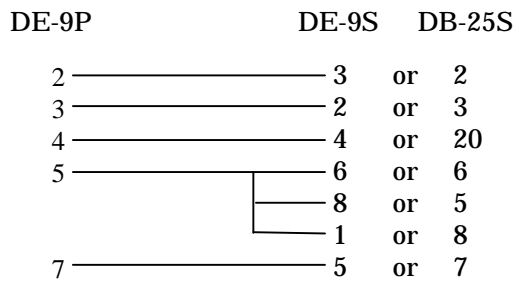
<u>Pin#</u>	<u>Signal Name</u>	<u>In/Out</u>	<u>Function</u>
1	Frame Ground	---	---
2	Transmit Data	IN	Data In
3	Receive Data	OUT	Data Out
4	Request to Send	IN	Wakeup
5	Clear to Send	OUT	Disconnect
6	Data Set Ready	OUT	+12v
7	Signal Ground	---	---
8	Data Carrier Detect	OUT	+12v

6.3 Network Management Port Cables

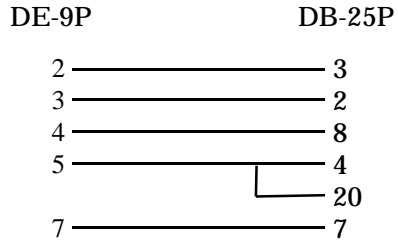
To a TERMINAL



To a PC Using Terminal Emulation



To a dial-up MODEM for remote access



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 host computer, the DSU/CSU, the phone line, the remote DSU/CSU and the terminal/controller/computer at the far end. Use this as reference to note your observations, test steps and test results. A picture keeps you focused and often saves duplicate test steps.
3. Record the front panel indicators 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 loopbacks, and record your results.

7.2 Using the Front Panel Tests

The first, and often the only test required to check the telephone lines and DSU/CSU is the **Test Line** test. This sends a command to the far end DSU and commands it into loopback. The local unit then sends a test pattern to the far end and compares the received pattern to the transmitted pattern. If the pattern matches, the test is considered successful and you have nearly 100% confidence that the phone line and the DSU/CSUs are working properly.

NOTE

Loopback tests will stay active for approximately 15 minutes unless disabled by the operator.

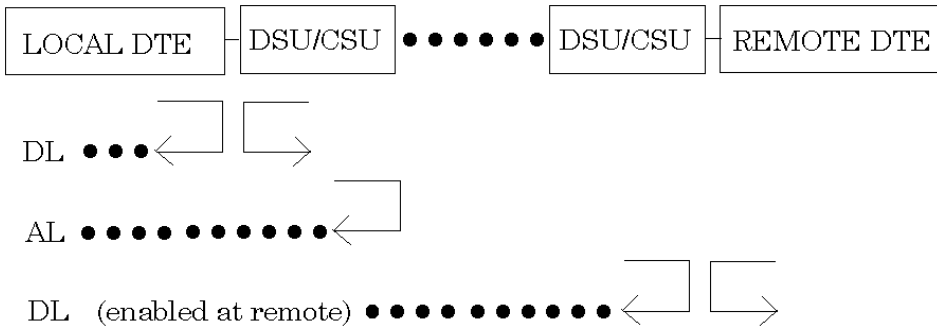
Digital Loopback (**Digital LB**) is a bi-directional local loopback.

Analog loopback (**Loc Analog**) is a local only loopback from the analog section of the DSU/CSU.

Use progressive loopbacks, starting at one end and working toward the other end of the link. As each loopback is enabled, press keys on the local DTE (terminal) and note if the characters are displayed on the screen. If your keypresses are displayed, the test passed. Use your diagram of the system to keep track of the loopbacks and the test results.

Perform loopback tests in the following order, working from the local end to the far end of the line:

- Digital Loopback
- Analog Loopback
- Remote Digital Loopback



WARRANTY

All DCB products are warranted to be free of defects in materials and or replace any equipment proven to be defective within the warranty period. All warranty work is F.O.B. Champaign, IL. This warranty consequential damages, etc. DCB liability shall not exceed the original purchase price.

by a Returned Material Authorization (RMA) number. To receive an RMA number, call (217) 352-3207 between the hours of 8 AM and will be returned at DCBs expense.

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