

# **DATA CONNECT ENTERPRISE**

---

## **User's Manual**

For

**DSP19.2 & DSP9612**

Fast Poll Modem

Copyright © 2008 Data Connect Enterprise.  
All Rights Reserved.

**Web site: [www.data-connect.com](http://www.data-connect.com)**

The products and programs described in this User's Manual are licensed products of Data connect Enterprise. This User's Manual contains proprietary information protected by copyright, and this User's Guide and all accompanying hardware and documentation are copyrighted.

Data Connect Enterprise. does not warrant that the product will work in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability, or fitness for a particular purpose.

Information in this User's Guide is subject to change without notice and does not represent a commitment on the part of Data Connect Enterprise. Data Connect Enterprise. assumes no responsibility for any inaccuracies that may be contained in this User's Manual.

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or information storage and retrieval systems, for any purpose other than the purchaser's personal use, without the express written permission of Data Connect Enterprise

# Contents

<b>Chapter 1 Introduction .....</b>	<b>6</b>
Features .....	7
Applications .....	8
<b>Chapter 2 Installation .....</b>	<b>9</b>
Unpacking Your Hardware .....	9
Additional Items You Need to Complete Your Installation.....	9
Hardware Overview .....	10
Front View .....	10
Back View.....	10
Rack-Mount View .....	11
Installation Summary.....	11
Configuring the Modem .....	12
Setting the DIP Switches.....	14
S1-1, S1-2, S1-3 – Modem Data Rate.....	15
S1-4 – Async Character (Fast-Poll Mode Only) .....	15
S1-5 – Auto RTS .....	15
S1-6 – Transmit Carrier Control .....	15
S1-7 – 2 or 4-Wire Operation .....	16
S1-8 – Transmitter Impedance .....	16
S1-9 – Remote Loopback Enable.....	16
S1-10 – Reserved (Test Only).....	17
S2-1 through S2-3 – Transmit Level.....	17
S2-4 – Receiver Dynamic Range .....	17
S2-5 and S2-6 – Cable Equalizer (Fast-Poll Mode Only) .....	18
S2-7 – Anti-streaming.....	18
S2-10 – RTS-CTS Delay (Bell 202 Mode Only) .....	18
Configuring the Jumper Blocks .....	19
For Stand-alone Units.....	19
For Rack-Mount Plug-in Modules .....	19
Connecting to a Transmission Line .....	19
Connecting to a Voltage Source.....	21
Connecting to an RS-232 Device .....	22
Connecting to an RS-485 Device .....	22
LEDs.....	23
Loopback Control Switch.....	23

<b>Appendix A Troubleshooting</b> .....	<b>25</b>
Problem Solving .....	25
<b>Appendix B Specifications</b> .....	<b>26</b>
General Specifications .....	26
Mechanical Specifications .....	27
Interface Connector Pin Assignments .....	27
RS-232 (DTE) Interface.....	28
RS-485 (DTE) Interface.....	28
Environmental Specifications .....	28
<b>Appendix C Limited Product Warranty</b> .....	<b>29</b>
<b>Appendix D RMA Procedure</b> .....	<b>30</b>

## Figures

Figure 1-1. Point-to-Point Network Using the DSP19.2FP Modem.....	8
Figure 1-2. Multipoint Polling Network Using the DSP19.2FP Modem .....	8
Figure 2-1. Front View of the DSP19.2 Modem .....	10
Figure 2-2. Back View of DSP19.2 Modem.....	10
Figure 2-3. Rack-Mount Module for the DSP19.2-RM Modem Board.....	11
Figure 2-4. DSP19.2 Fast-Poll Stand-alone Modem Board .....	13
Figure 2-5. DSP19.2 Fast-Poll Rack-mount Modem Board .....	13
Figure 2-6. DSP19.2 Modem Transmission Line Interface .....	20
Figure 2-7. Pin Locations on the Modem's RJ-11C Jack .....	22
Figure 2-8. Loopback Diagnostic Modes.....	24
Figure 2-9. Back-to-Back Connection to a Second Modem .....	27

## Tables

Table 2-1. Modem Switch Settings .....	14
Table 2-2. Modem Operating Speed.....	15
Table 2-3. Transmit Levels.....	17
Table 2-4. Transmission Line Connector Pin Assignments .....	20
Table 2-5. RJ-11C Modular Jack Pin Assignments.....	22
Table 2-6. Modem LEDs .....	23
Table A-1 Problem Solving .....	25
Table B-1. Leased Line Terminal Block Pin Assignments .....	27
Table B-2. RS-232 (DTE) Interface.....	28
Table B-2. RS-485 (DTE) Interface.....	28

# Chapter 1

## Introduction

Thank you for purchasing DCE's DSP19.2 fast poll modem, the finest industrial-grade fast-poll modem available.

The DCE modem is a 19200/9600/2400/1200 bps modem designed for 4-wire, full-duplex or 2-wire, half-duplex operation over a voice-band leased line or private line. The modem is designed utilizing the latest digital-signal processing (DSP) technology to achieve high performance. The modem employs efficient modulation and encoding scheme to achieve fast modem training time. The modem is also backward compatible with Bell 202 and ITU-T V.23 modems.

The DSP19.2 is the most technologically advanced modem on the market. Boasting a fast DSP processor and automatic adaptive equalizer, the DSP19.2 modem is ideally suited for multi-point communication systems that require fast response time, short training time, and low throughput delay.

This User's Guide describes the DSP19.2 (AC-powered) and DSP19.2-LV (DC-powered) stand-alone modems, as well as the rack-mount DSP19.2-RM plug-in module for the Motorola/UDS RM16M. This manual is designed to get your modem "up and running" as quickly as possible. It contains all the information you need to configure and install your modem. It also contains troubleshooting information in the unlikely event you encounter a problem with your modem.

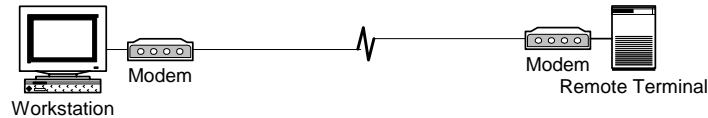
## Features

The DSP19.2 modem is specifically designed for harsh environments typically associated in utility substations and industrial facilities. Though functionally similar to commercial modems, the DSP19.2 provides the following unique features that make it well suited for utility and industrial applications.

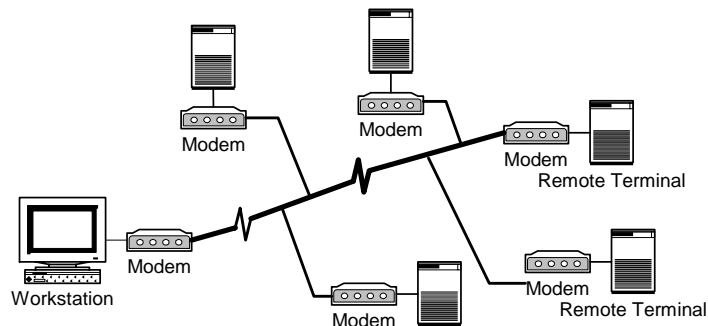
- Packaged in a rugged, compact enclosure for industrial applications.
- Leased-line interface protected with heavy-duty surge protection devices.
- Built-in hardware watchdog timer for software lock-up prevention without requiring human intervention, making it ideal for unmanned locations.
- Works within an extended temperature range of -40°C to +85°C.
- Designed with coupling transformers for high-voltage isolation and common mode noise rejection in industrial and commercial environments.
- Operate over voice-band conditioned or unconditioned leased-line and pilot wires.
- Accepts power from a wide range of AC and DC power supplies:
  - DSP19.2: 90 to 265 VAC or 100 to 400 VDC
  - DSP19.2-LV: 10 to 60 VDC
  - DSP19.2-RM: Plug-in module for the Motorola/UDS RM16M modem nest
- Standard industrial connectors for data, analog, and power interfaces allow reliable interconnection to other industrial equipment.
- Asynchronous data rates (selectable) of 19200, 9600, 2400, and 0-1800 bps.
- Easily accessible DIP switches for user configuration and option selection.
- DB9-F connector for RS-232/V.24 interface, and RJ-11 for RS-485.
- Local analog, local digital, and remote digital loopback diagnostics.

## Applications

The DSP19.2 modem is designed for point-to-point and multipoint data communications. Figure 1-1 shows a typical point-to-point configuration using the DSP19.2 modem and Figure 1-2 shows a typical multipoint configuration using the DSP19.2 modem.



**Figure 1-1. Point-to-Point Network Using the DSP19.2 Modem**



**Figure 1-2. Multipoint Polling Network Using the DSP19.2 Modem**

There are a number of factors that can affect the modem's operation and performance. These include:

- Modem speed (i.e. bit error rate, transmission line distance)
- 2-wire or 4-wire configuration
- Transmission line characteristics, noise, and line impairments
- Network configuration (point-to-point or multipoint)



## Chapter 2 Installation

This chapter describes how to configure and install the modem to maximize the performance and to match with your Data Terminal Equipment (DTE) or Remote Terminal Unit (RTU).

### Unpacking Your Hardware

Your package should include:

- At least one of the following DSP19.2 modems:
  - Model DSP19.2 for 90 to 265 VAC
  - Model DSP19.2-LV for 10 to 60 VDC
  - Model DSP19.2-RM for RM16M plug-in module
- A switching power supply module for 90-265VAC input (model DSP19.2 only)
- A leased-line cable with optional earth ground conductor (for stand-alone units only)
- A DC power cable (model DSP19.2-LV modem only)
- This User's Manual or CD-ROM

If your package contents are damaged or missing, contact your place of purchase.

### Additional Items You Need to Complete Your Installation

To complete your installation and operate your modem, you need these additional items:

- Two- or four-wire transmission line or leased line
- A DB-9 data cable for your RS-232 interface Data Terminal Equipment (DTE) port, or a RJ-11C data cable for your RS-485 DTE.
- Power supply that provides either:
  - 90 to 265 Volts AC, 50 to 60 Hz, single phase or 100 to 400 VDC (if you have the model DSP19.2 modem), or
  - 10 to 60 Volts DC (if you have the model DSP19.2-LV modem)
  - For the DSP19.2-RM, consult the documentation for your Motorola/UDS RM16M

## Hardware Overview

### Front View

Figure 2-1 shows the front view of the DSP19.2 stand-alone modem. Starting from the left side, this view shows:

- A set of eight LEDs for modem interface status (see Table 2-6 on page 23)
- A loopback control push-button switch (see Loopback Control Switch on page 23)



Figure 2-1. Front View of the DSP19.2 Modem

### Back View

Figure 2-2 shows the back view of the DSP19.2 stand-alone modem. Starting from the left side, this view shows:

- A 4-wire/2-wire configuration block labeled **LEASED LINE**
- An RJ-11 modular jack labeled **RS-485** for connecting the modem to an RS-485 RTU
- A female, 9-pin RS-232 connector labeled **RS-232** for connecting the modem to a standard DTE (RTU)
- A power connector labeled **10-48V DC**



Figure 2-2. Back View of DSP19.2 Modem

## Rack-Mount View

Figure 2-3 shows the rack-mount plug-in module.

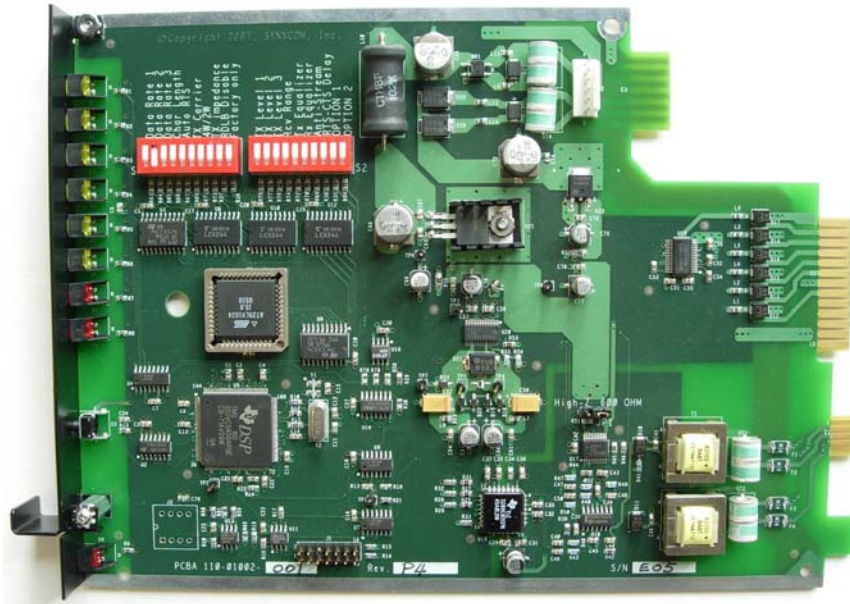


Figure 2-3. Rack-Mount Module for the DSP19.2-RM Modem Board

## Installation Summary

This section describes the steps for installing the modem.

**NOTE:** It is important to follow the steps below to configure the modem's DIP switches to match your DTE/RTU interface requirement and the transmission line characteristics. If you are not certain about your system's parameters or the leased-line configuration, please contact your network administrator for assistance.

1. Configure the modem using the DIP switches and jumpers. See pages 14 and 19.
2. Connect to a transmission line. See page 19.
3. Connect to a voltage source. See page 21.
4. Connect a DTE device. See page 22.

## Configuring the Modem

You configure the modem using the two sets of DIP switches and two sets of configuration jumpers on the printed circuit board of the modem labeled **S1** and **S2**, **JP1** and **JP3**.

Configuration DIP switches **S1** and **S2** for the stand-alone and rack-mount modems are identical. Their descriptions in this user's manual apply to both modem versions.

Configuration jumper **JP1** for the rack-mount modem card is used to select receiver termination impedance.

It is important to follow the steps described below, in the order shown, to ensure that you configure your modem properly using the modem DIP switches:

1. Use DIP switch 1 (**S1**) to configure the modem for your host DTE interface and network topology. Using **S1**, you select the modem's operating speed to match you host computer or RTU devices, and other DTE specific operating parameters.
2. Use DIP switch 2 (**S2**) to select the modem's transmitter output level and receiver dynamic range specific leased line conditions. The **S2** settings apply for both high-speed fast-poll (QAM) and low-speed (FSK) modes.
3. After you change the DIP switch settings, recycle power to the modem to have the settings take effect.

**NOTE:** The DIP switch settings will not take effect until you recycle power to the modem.

To access the configuration DIP switches and jumpers on the stand-alone modem:

1. Ground yourself to discharge any ESD, which might cause damage to the sensitive devices on the modem board.
2. Use a small Philips screw driver to remove the rear panel and carefully slide the modem board out of the enclosure. The location of the DIP switches and jumpers for the stand-alone modem are shown in Figure 2-4. For DIP switches and jumpers on the rack-mount plug-in module, see Figure 2-5.
3. Carefully return the modem board into the enclosure. Then replace the rear panel after the configuration is completed.

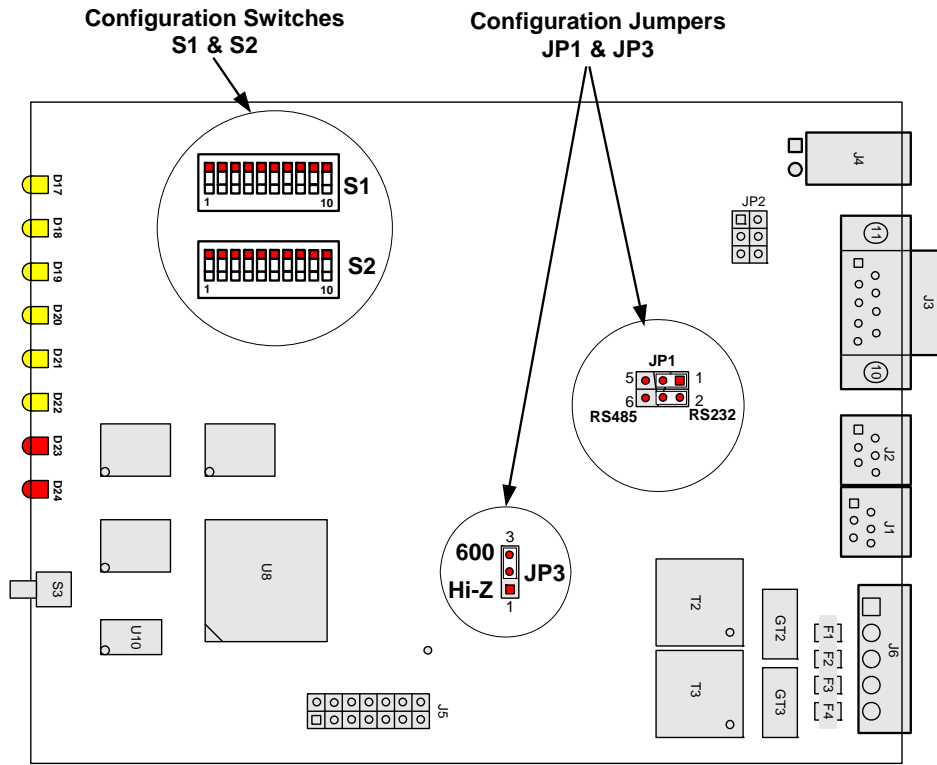


Figure 2-4. DSP19.2 Fast-Poll Stand-alone Modem Board

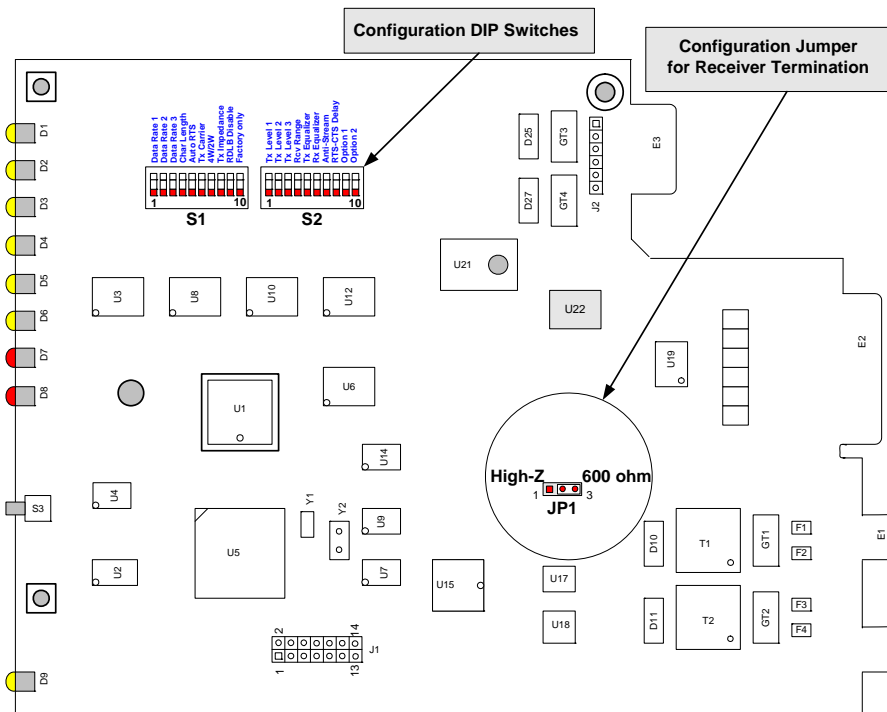


Figure 2-5. DSP19.2 Fast-Poll Rack-mount Modem Board

## Setting the DIP Switches

**S1** and **S2** are 10-position DIP switches used to configure all the options and features of the modem. Table 2-5 shows the setting of the switches.

**NOTE:** Switches **S1** and **S2** are toggle switches. To configure the switches, use a small sharp pin to firmly press down on one end to open or to close each switch. Never leave any switch in half open and half close. Press down on the side of the switch labeled **OPEN** is referring to as **OFF** condition. When the switch is **CLOSED**, it is in the **ON** state.

**Table 2-1. Modem Switch Settings**

DIP Switches	Switch Settings	
	ON	OFF (Default)
<b>DIP Switch S1</b>		
<b>S1-1 to S1-3:</b> Modem Data Rate	<b>19200:</b> SW1=OFF, SW2=OFF, SW3=OFF <b>9600:</b> SW1= <b>ON</b> , SW2=OFF, SW3=OFF <b>2400:</b> SW1=OFF, SW2= <b>ON</b> , SW3=OFF <b>Bell 202T:</b> SW1=OFF, SW2= OFF, SW3= <b>ON</b> <b>V.23:</b> SW1= <b>ON</b> , SW2= <b>ON</b> , SW3= <b>ON</b>	
<b>S1-4:</b> DTE Async Character	11 bit	10 bit
<b>S1-5:</b> Auto RTS	Enable	Disable
<b>S1-6:</b> Transmit Carrier Control	Constant On	Controlled by RTS
<b>S1-7:</b> 2- or 4-wire leased line	2-wire half duplex	4-wire full duplex
<b>S1-8:</b> Transmitter Impedance	Controlled by RTS	600 ohms
<b>S1-9:</b> Remote Digital Loopback	Enable	Disable
<b>S1-10:</b> Test Only (Reserved)	Test only	Normal
<b>DIP Switch S2</b>		
<b>S2-1 to S2-3:</b> Transmit Output Level	From -12 to +3 dBm (see Table 2-5)	
<b>S2-4:</b> Modem Receive Dynamic Range	-10 to -43dBm	+3 to -30dBm
<b>S2-5:</b> TX Cable Equalizer	Enabled	Disabled
<b>S2-6:</b> RX Cable Equalizer	Enabled	Disabled
<b>S2-7:</b> Anti-streaming	Active	Inactive
<b>S2-8:</b> RTS-CTS Delay (Bell 202T only)	33 msec	8 msec

**NOTE:** Switches S2-9 and S2-10 are for future options.

## S1-1, S1-2, S1-3 – Modem Data Rate

- S1-1, S1-2, S1-3: Select the modem speed per Table 2-2

**Table 2-2. Modem Operating Speed**

To Select...	Set Switch S1-1 to...	Set Switch S1-2 to...	Set Switch S1-3 to...
19,200 bps	OFF	OFF	OFF
9600 bps	ON	OFF	OFF
2400 bps	OFF	ON	OFF
Bell 202T	OFF	OFF	ON
V.23/1200	ON	ON	ON

For modem speeds of 2400 bps or higher, the modem uses QAM modulation automatically. When the modem is operating at 1200 bps either in Bell202T or ITU-V.23 mode, the modem uses FSK modulation.

## S1-4 – Async Character (Fast-Poll Mode Only)

- S1-4 ON = 11 bits
- S1-4 OFF = 10 bits (*default*)

Switch S1-4 selects whether the async character is 10 or 11 bits long. This switch setting is ignored when the modem uses FSK modulation.

## S1-5 – Auto RTS

- S1-5 ON = Enable Auto RTS
- S1-5 OFF = Disable Auto RTS (*default*)

For data terminals that do not provide hardware Request To Send (RTS), set switch S1-5 to ON to enable auto RTS mode. In this mode, TXD is detected at the modem and an internal RTS signal is turned ON. After training completes, the TXD is transmitted to the remote modem. The transmitter turns itself off if no TXD is detected after a pre-determined length of idle time.

## S1-6 – Transmit Carrier Control

- S1-6 ON = Constant carrier
- S1-6 OFF = Controlled by RTS (*default*)

Switch S1-6 selects either constant or switched carrier. Constant carrier allows DTEs, such as asynchronous terminals or RTUs, to operate with modems, without requiring an input

RTS signal. If you enable constant carrier (switch S1-6 = ON), the modem forces the transmit carrier active and the RTS-CTS delay is shortened to less than 0.5 ms.

You can use constant carrier in 4-wire point-to-point, or at the master unit of multi-point network applications to reduce modem training time.

In switched-carrier mode (switch S1-6 = OFF), the RTS-CTS delay is 23 ms for 2400 bps and above.

### **S1-7 – 2 or 4-Wire Operation**

- S1-7 ON = 2-Wire, Half-Duplex Mode
- S1-7 OFF = 4-Wire, Full-Duplex Mode (*default*)

Switch S1-7 configures the modem for either 4-wire full-duplex or 2-wire half-duplex operation.

### **S1-8 – Transmitter Impedance**

- S1-8 ON = Switched by RTS
- S1-8 OFF = 600  $\Omega$  (*default*)

Switch S1-8 is used for multi-point configuration networks. When multiple modems are connected on the same metallic circuit:

- The transmitter termination should be of high impedance if the modem is not transmitting in order not put a load on the line.
- The transmitter is only terminated with 600 ohms when RTS is asserted.

This configuration should be used for all slave modems to prevent the transmitting modem from being unnecessarily burdened. To select this configuration, set switch S1-8 ON for the slave modems.

If you use the modem with transmission lines that are transformer-coupled or with an impedance-isolated network (such as a transformer bridge), set switch S1-8 OFF for proper operation.

### **S1-9 – Remote Loopback Enable**

- S1-9 ON = Loopback enabled
- S1-9 OFF = Loopback disabled (*default*)

During instances of channel noise, the modem may mistake a received preamble as a request to go into remote digital loopback. Setting switch S1-9 to OFF prevents the modem



from participating in a remote digital loopback with another modem. Switch S1-9 does not prevent the modem from sending a remote digital loopback request to a remote modem.

### S1-10 – Reserved (Test Only)

- S1-10 = must be OFF

Switch S1-10 must be in the OFF position for normal operation. It is reserved for factory testing only.

### S2-1 through S2-3 – Transmit Level

Switches S2-1 through S2-3 adjust the modem's transmit level. Table 2-5 shows the transmit levels you can select using these switches.

**Table 2-3. Transmit Levels**

Transmit Level	S2-1 through S2-3 Switch Settings		
	S2-1	S2-2	S2-3
0 dBm	OFF	OFF	OFF
-2 dBm	OFF	OFF	ON
-4 dBm	OFF	ON	OFF
-6 dBm	OFF	ON	ON
-8 dBm	ON	OFF	OFF
-10 dBm	ON	OFF	ON
-12 dBm	ON	ON	OFF
+3 dBm	ON	ON	ON

### S2-4 – Receiver Dynamic Range

- S2-4 ON = -10 to -43 dBm
- S2-4 OFF = +3 to -30 dBm (*default*)

For short distances or to select a strong receive signal, set S2-4 to OFF. For a long-distance cable or low receive signal level, set S2-4 to ON (-43 dBm).

## **S2-5 and S2-6 – Cable Equalizer (Fast-Poll Mode Only)**

- S2-5 ON = Enable TX Cable Equalizer  
S2-5 OFF = Disable TX Cable Equalizer (*default*)
- S2-6 ON = Enable RX Cable Equalizer  
S2-6 OFF = Disable RX Cable Equalizer (*default*)

If you use the DSP19.2 as a limited-distance modem over pilot wire or unloaded cables, you may need to improve or extend the modem's polling performance on long transmission lines by using the modem's internal fixed Compromise Cable Equalizer when polling on long metallic circuits. The cable equalizer is active only when the modem is in QAM fast-poll mode (2400 bps or higher).

## **S2-7 – Anti-streaming**

- S2-7 ON = Anti-streaming is active  
S2-7 OFF = Anti-stream is inactive (*default*)

Typically, anti-streaming is used in multi-point applications to prevent a malfunctioning slave data terminal or RTU from occupying the line indefinitely. When anti-streaming is active, the modem can transmit data for a maximum of 27 seconds before the transmitter turns off automatically. The modem then looks for an ON-to-OFF RTS transition before proceeding with normal operation. Anti-streaming can be selected in either high-speed or low-speed mode.

## **S2-10 – RTS-CTS Delay (Bell 202 Mode Only)**

- S2-10 ON = 33.0 ms delay
- S2-10 OFF = 8.0 ms delay (*default*)

Switches S2-10 determines the duration of the RTS-CTS delay in Bell 202 mode.

For V.23 mode, the RTS-CTS delay is fixed at 33 ms.

## Configuring the Jumper Blocks

### For Stand-alone Units

Jumper block JP1 is use to select RS-232/V24 or RS-485 interface with your DTE or RTU.

- RS-232: Two shorting jumpers are placed over pins 1 & 3, and 2 & 4 (*default*)
- RS-485: Place two shorting jumpers over pins 3 & 5, and 4 & 6

Jumper block JP3 is used to set the modem's receiver termination impedance

- 600 ohms: A shorting jumper is placed over pins 2 & 3 (*default*)
- High impedance: Place a shorting jumper over pins 1 & 2

### For Rack-Mount Plug-in Modules

Jumper block JP1 is used to set the modem's receiver termination impedance

- 600 ohms: A shorting jumper is placed over pin 2 & 3 (default)
- High impedance: A shorting jumper is placed over pin 1 & 2

Select high receiver impedance (Hi-Z) if multiple modems are connected in a multi-point configuration but without an impedance matching bridged such as private metallic circuit environment. In this configuration, only one receiver should be configured for 600 ohms.

## Connecting to a Transmission Line

The modem has a transmission line interface that can be configured for 2- or 4-wire analog connection, where one pair (Tx-A and Tx-B) is used to transmit data and the other pair (Rx-A and Rx-B) is used to receive data. The transmit pair and receive pair are non-polarized. Table 2-4 shows the pin numbers and corresponding signals for the modem. Figure 2-6 shows the transmission line interface.

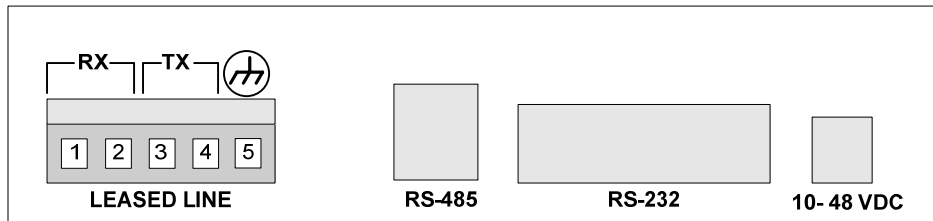
**NOTE:** For communication to occur, the Rx line of one modem must connect to the Tx line of the other modem. The modem's Tx/Rx pair are non-polarized.

**NOTE:** The modem does not support leased-line operation with DC shielding current. Leased-line connector pin assignments for the rack-mount module can be found in the documentation for your Motorola/UDS RM16M.

**Table 2-4. Transmission Line Connector Pin Assignments**

This Pin Number...	Corresponds to This Signal...
1	Rx
2	Rx
3	Tx (Tx/Rx)
4	Tx (Tx/Rx)
5	Earth Ground (optional)

**NOTE:** When 2-wire half duplex is used, the TX pair must be used for both transmit and receive.



**Figure 2-6. DSP19.2 Modem Transmission Line Interface**

## Connecting to a Voltage Source

The back panel of the modem provides a 2-position screw terminal power interface connector. For your convenience, the DC voltage of the input power is non-polarized. To meet your specific application, the modems can be powered from the following power sources:

- Model DSP19.2 (with AC-DC power converter): 90 to 265 Volts AC, 50 to 60 Hz, single phase or 100 to 400 VDC. The output of the converter is a 12 VDC source that will power the modem.
- Model DSP19.2-LV (DC version): 10 to 60 Volts DC. The model DSP19.2-LV comes with a power cord for making this connection.

Figure 2-2 on page 10 shows the connection to the Model DSP19.2FP's power interface shows the connection to the Model DSP19.2-LV's power interface.

**WARNING:** Before you connect a voltage source, observe the following power supply voltage guidelines. Otherwise, you will void your warranty if the wrong voltage is applied.

- Be sure the voltage source is within the permitted ranges shown above. Otherwise, your modem and any attached devices may be damaged.
- Customer-supplied cables must be suitable for the site environmental conditions.
- Screw terminals on the power interface accept 24 to 16 AWG. However, surge protection is effective only if there is a solidly earthed ground connection greater than 18 AWG.
- Be sure the power source is not controlled by a wall switch, which can be inadvertently turned off, shutting off power to the modem.

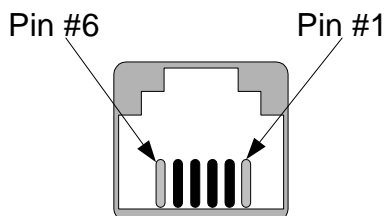
## Connecting to an RS-232 Device

The modem back panel provides a female, 9-pin RS-232 connector that accepts an attached RS-232 device (see Figure 2-2 on page 10). This connector accepts a standard connection to a DTE (RTU) that conforms to the pin assignments shown under “RS-232 (DTE) Interface” on page 28.

## Connecting to an RS-485 Device

The modem rear panel provide an RJ-11C module jack connector for a 4-pin RS-485 or RS-422 interface in the event that your DTE or RTU does not support the RS-232 interface (see Figure 2-2 on page 10 and Figure 2-7).

The pin assignments for the RS-485 interface are listed in Table 2-5.



**Figure 2-7. Pin Locations on the Modem’s RJ-11C Jack**

**Table 2-5. RJ-11C Modular Jack Pin Assignments**

RJ-11 Pin Number...	Corresponds to Signal Name	Modem Input or Output
1	Not Used	NA
2	RxD+	Output
3	RxD-	Output
4	TxD+	Input
5	TxD-	Input
6	Not Used	NA

## LEDs

The front panel of the modem provides the LEDs shown in Table 2-5.

**Table 2-6. Modem LEDs**

LED	Color	Description
RTS	Yellow	Request To Send
CTS	Yellow	Clear To Send
TD	Yellow	Transmit Data
RD	Yellow	Receive Data
CD	Yellow	Carrier Detect
MR	Yellow	Modem Ready
ALB	Red*	Analog Loopback
DLB	Red*	Digital Loopback

\* When the modem is in remote loopback, both the **ALB** and **DLB** LEDs go ON.

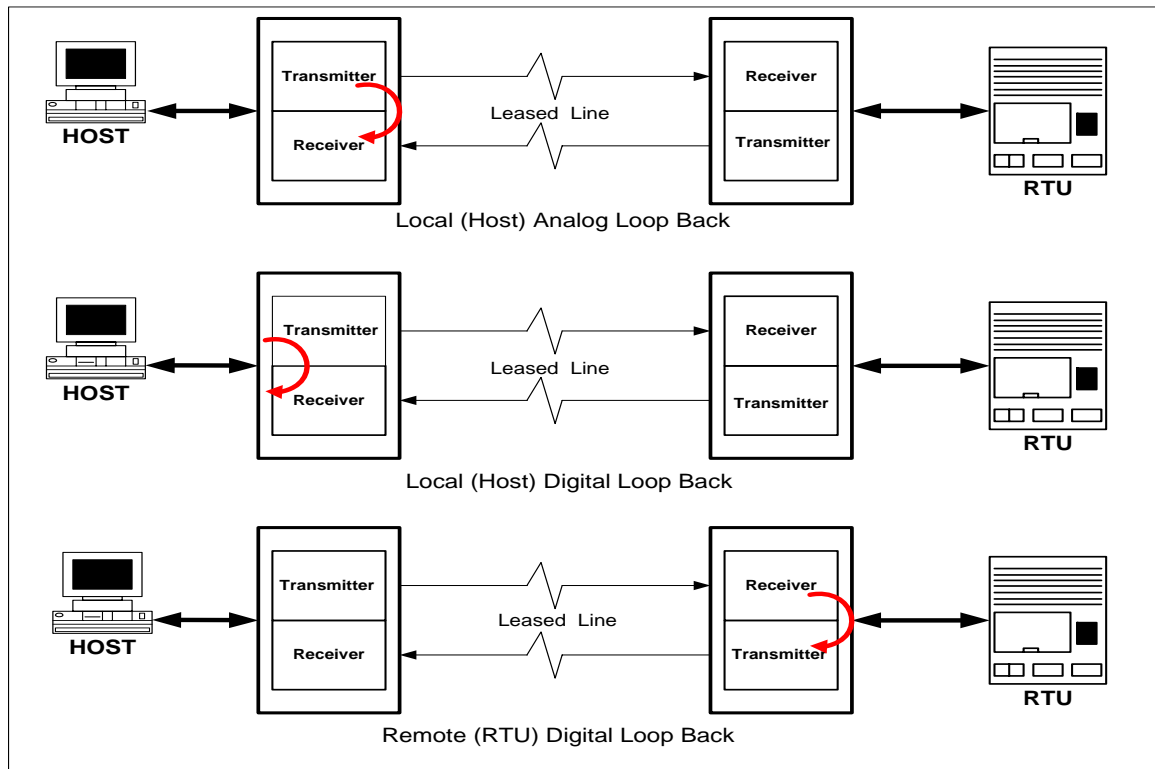
## Loopback Control Switch

The front panel of the modem has a push button for initiating the following loopback diagnostic tests:

- Local analog loopback — started by pressing the button one time. The **ALB** LED should be ON. When a DTE is connected to the RS-232 port of the modem, the transmit data is loop back to the DTE as receive data. This test will verify the modem transmitter, receiver, and its RS-232 interface along with the connecting cable.
- Local digital loopback — started by pressing the button two times. The **DLB** LED should be ON. When a DTE is connected to the RS-232 port of the modem, the transmit data is loop back to the DTE as receive data. This test will verify the modem's RS-232 interface along with the cable attached.
- Remote digital loopback — set the local modem's RTS signal to low. Press the local modem's diagnostics test button three times. Both the **ALB** and **DLB** LEDs should be ON. Then raise the local modem's RTS signal to start the test. The **ALB** and **DLB** LEDs of the remote modem should go ON when the modem is responded to remote digital loopback. This test will verify both modems' transmitters, receivers, and the leased line

**NOTE:** Be sure switch S1-9 is set to the ON position to enable the remote modem to respond to remote digital loopback requests. This test is only available in fast-poll mode at 2400 bps or higher.

Figure 2-8 shows these three loopback diagnostics.



**Figure 2-8. Loopback Diagnostic Modes**



# Appendix A Troubleshooting

In the event you encounter a problem using your DCE modem, refer to the troubleshooting information in this appendix.

**IMPORTANT:** If you encounter a problem with your modem, be sure the switches on the modem are set to the appropriate positions (see Table 2-1 on page 14). If a switch is halfway between an on and off setting, the modem will not operate properly.

## Problem Solving

Table A-1 offers troubleshooting solutions for modem problems.

**Table A-1 Problem Solving**

If...	Perform These Procedures...
No LEDs are ON at the front panel	Check the power supply source. Be sure the input power to the modem's power connector is between 10 to 60VDC
Modem does not respond to the attached DTE and the all LEDs are off.	Check the connecting RS-232 or RS-485 cable between the DTE and the modem. The MR LED (Modem Ready) on the front panel should be ON when the modem is idle.
Modem does not receive data, and the <b>DCD</b> and <b>RxD</b> LEDs are off.	Check the DIP switches of both modems to make sure that the same data rate and operating parameters are identical on both modems. The receive line pair may be disconnected from the modem. Make sure the transmission line connection to the modem is accurate and secure.  The receive signal level may be below the CD threshold. Set switch S1-5 ON to see whether configuring the modem for a -43 dBm threshold resolves the problem.  If this problem remains unresolved, perform a local ALB loopback test to determine if the modem's receiver is functioning correctly.
The <b>RTS</b> , <b>CTS</b> , and <b>TxD</b> LEDs do not blink.	The attached terminal or DTE may not be sending data to the modem. Verify that data is being transmitted. If data is being transmitted, make sure the RS-232 cable is sound and securely connected to the modem and terminal or DTE.

## Appendix B Specifications

### General Specifications

<b>Data rate:</b>	19200, 9600, 2400, 0-1800 (Bell 202T), or 1-1200 bps (V.23) asynchronous
<b>Data format:</b>	8 or 9 data bits with 1 or more stop bits, or 7 data bit with parity bit
<b>DTE interface:</b>	EIA RS-232/V.24, or RS-485 compatible
<b>Line conditions:</b>	TELCO voice band 4- or 2-wire leased line, conditioned or unconditioned Private metallic circuits up to 9.5 miles at 9600 bps (24 AWG) without cable equalizer. Up to 15.0 miles (24 AWG) with TX and RX cable equalizer. Up to 25 miles for FSK modes.
<b>Operating modes:</b>	2-wire half-duplex or 4-wire full-duplex
<b>Modulation:</b>	QAM High-speed fast poll mode FSK, Bell 202T or V.23 compatible <ul style="list-style-type: none"> <li>• Mark = 1200 Hz (1300 Hz, V.23)</li> <li>• Space = 2200 Hz (2100 Hz, V.23)</li> <li>• Soft Carrier = 900 Hz (Bell 202T only)</li> </ul>
<b>Equalizer</b>	Automatic, adaptive
<b>RTS-CTS Delay:</b>	23 ms. (fast poll at 2400 bps and above) 8 or 33 ms (Bell 202T) 33 ms (V.23)
<b>Receiver dynamic range:</b>	0 to -30 dBm or -10 to -43 dBm
<b>Operating temperature:</b>	-40°C to +85°C
<b>Power supply:</b>	Wide range switching power supply: <ul style="list-style-type: none"> <li>• DSP19.2 (AC version): 90 to 265 Volts AC, 50/60 Hz, single phase or 90 to 400 VDC</li> <li>• DSP19.2-LV (DC version): 10 to 60 Volts DC</li> </ul>
<b>Surge protection:</b>	Leased line, up to 15KV
<b>Carrier control:</b>	Constant or switched, DIP switch selectable
<b>Carrier loss recovery:</b>	Train on data automatically
<b>Throughput delay:</b>	Less than 10 milliseconds for fast polling
<b>Auto RTS:</b>	Support DTE without hardware RTS
<b>Anti-streaming:</b>	27-second timer to prevent transmitter lock-up network

## Mechanical Specifications

- Enclosure:** Aluminum with removable front and rear panels
- Dimensions:** 5.0" wide x 6.5" long x 1.30" high
- Weight:** 1.0 lbs without AC to DC power converter module

### Interface connectors

- Leased Line:** 5-position screw terminal (includes earth ground)
- Data Terminal Equipment:** DB-9 female connector (for RS-232)  
RJ-11C module jack (for RS485)

## Interface Connector Pin Assignments

Table B-1. Leased Line Terminal Block Pin Assignments

This Pin Number...	Corresponds to This Signal...
1	Rx
2	Rx
3	Tx
4	Tx
5	Earth Ground (optional)

**NOTE:** When 2-wire half-duplex is used, the TX pair must be used for both transmit and receive.

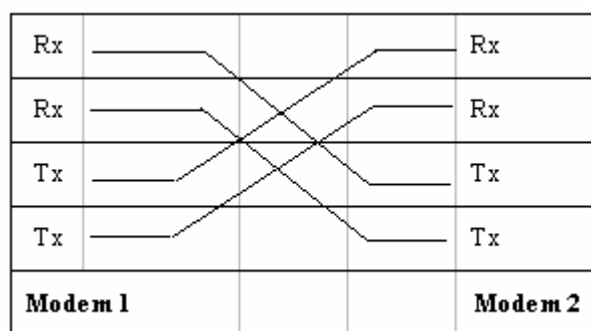


Figure 2-9. Back-to-Back Connection to a Second Modem

## RS-232 (DTE) Interface

Table B-2. RS-232 (DTE) Interface

Signal Name	Modem Input/Output	DB-9 Pin	Description
DCD	Output	1	Data Carrier Detected
RXD	Output	2	Receive Data
TXD	Input	3	Transmit Data
SG	—	5	Signal Ground
DSR	Output	6	Data Set Ready (Modem Ready)
RTS	Input	7	Request To Send
CTS	Output	8	Clear To Send

## RS-485 (DTE) Interface

Table B-3. RS-485 (DTE) Interface

RJ-11 Pin Number...	Corresponds to Signal Name	Modem Input or Output
1	Not Used	NA
2	RxD+	Output
3	RxD-	Output
4	TxD+	Input
5	TxD-	Input
6	Not Used	NA

## Environmental Specifications

<b>Operating temperature:</b>	-40 to + 85° C
<b>Storage temperature:</b>	-40 to +125° C
<b>Operating humidity:</b>	5 to 95 %, non-condensing
<b>Line isolation:</b>	3750 V RMS
<b>Surge protection:</b>	Leased line up to 15K VA

## Appendix C Limited Product Warranty

DCE warrants that the Product sold will be free from defects in material and workmanship and perform to DCE' applicable published specifications for a period of 24 months from the date of delivery to Customer. The liability of DCE hereunder shall be limited to replacing or repairing, at its option, any defective Products that are returned F.O.B. to DCE's Olney, Maryland facility (or, at DCE's option, refunding the purchase price of such products). In no case are Products to be returned without first obtaining permission and a customer return order number from DCE. In no event shall DCE be liable for any consequential or incidental damages.

Products that have been subject to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation are not covered by the warranty. DCE shall make the final determination as to the existence and cause of any alleged defect. No liability is assumed for expendable items such as lamps and fuses. No warranty is made with respect to custom products or Products produced to Customer's specifications except as specifically stated in writing by DCE in the agreement for such custom products.

**Warranty is voided if the serial number label on the printed circuit assembly of the returned modems is removed, defaced, or destroyed. This label contains the serial number that will provide proof of the date of manufacturing.**

This warranty is the only warranty made by DCE with respect to the goods delivered hereunder, and may be modified or amended only by a written instrument signed by a duly authorized officer or DCE and accepted by Customer.

This warranty and limitation extends to customer and to users of the product and is in lieu of all warranties with respect to the product whether express, implied, or statutory, including without limitation the implied warranties of merchantability and fitness for a particular purpose.

## Appendix D RMA Procedure

Before returning any DCE product, an RMA number must be obtained. Before asking for an RMA number, ascertain that the product was purchased from DCE. If you bought the product from a Distributor or Systems Integrator, the product should be returned to that vendor.

The most convenient method to obtain an RMA authorization for a product purchased from DCE is to submit a request by fill in the form from [www.data-connect/returns.htm](http://www.data-connect/returns.htm). Information required must include

- Company name
- Address (including any Mail Stop or specific delivery information)
- Name, contact information, and e-mail address for the technical contact(s) at your company

If the above information is on your letterhead, that format is acceptable.

For each item you wish to return, please include:

- The product model number (usually found on the serial number tag)
- The serial number for each item you wish to return
- A description of the problem you are encountering
- The cause of the problem (if known)

A product support specialist may call to verify that the product is properly installed or may ask you to perform tests to insure that the product has actually failed. After reviewing the problem, DCE will assign an RMA number and you will be notified by email or FAX.

The product must be properly packed and returned to:

**Data Connect Enterprise.  
3405 Olandwood Court,  
Olney, MD 20832  
Attn: RMA Technical Support**

The RMA number must be legibly displayed on the shipping carton. No RMAs will be issued without a product review. DCE will not be responsible for any product returned without an RMA number.

If you believe the product may be out of warranty, include a method of payment for repairs (either a Purchase Order number or credit card number), card holder name, date of expiration on the RMA request. Repairs currently require 5 working days and are returned UPS second day air.

Contact us by e-mail [mspellerberg@data-connect.com](mailto:mspellerberg@data-connect.com) or call: (301)924-7400 x 25 if you should have any questions.

