1.0 INTRODUCTION

The MDS SD transceiver (Figure 1) is a software-configurable, industrial radio for use in wireless telemetry applications. Models offered at the time of printing include: **MDS SD2** (215-235 MHz), **SD4** (350-512 MHz), and **SD9** (928-960 MHz). The term *SD* is used for information common to all models of the radio.

The radio supports both polled and report-by-exception data networks, and interfaces with a variety of data control equipment such as remote terminal units (RTUs), programmable logic controllers (PLCs), flow computers, and similar devices. Data interface connections support both Ethernet and serial (RS-232/485) protocols.

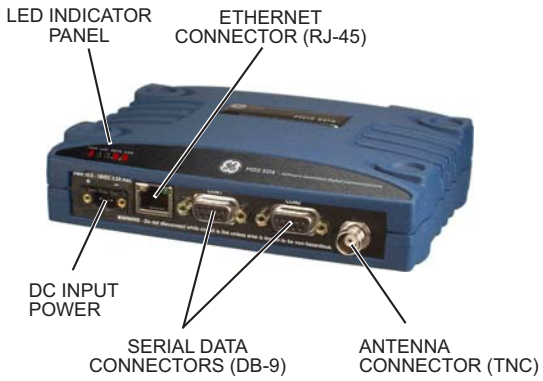

Figure 1. MDS SD Data Transceiver

1.1 About This Guide

This guide covers all SD transceivers except those operating in x710 mode. A more detailed *Technical Manual* is also available (05-4846A01). Before installing this product, refer to the Technical Manual for important warnings, cautions, and notes. SD manuals are available in printed or electronic form. All manuals are available free of charge at **www.gemds.com**.

1.1.1 x710 Mode—Different Manuals Required

The radio may be configured to emulate a corresponding MDS x710 transceiver. For x710 mode information, consult these manuals instead:

- *Setup Guide* (05-4669A01)
- *Technical Manual* (05-4670A01)

2.0 INSTALLATION

There are three main requirements for installing the transceiver:

- Adequate and stable primary power
- An efficient and properly installed antenna system
- Correct interface connections between the transceiver and the data equipment.

Figure 2 shows a typical installation of the radio.

NOTE: Retrofit Kits are available to ease installation at former MDS x710 digital and analog sites. Consult your factory representative for ordering details.

2.1 Installation Steps

In most cases, the steps given here are sufficient to install the transceiver. Refer to the *Technical Manual* for additional details, as required.

1. **Mount the transceiver.** Attach the supplied brackets to the bottom of the transceiver case (if not already attached), using the four 6-32 x 1/4 inch (6 mm) screws. Mounting bracket dimensions are shown in Figure 3. If DIN Rail mounting brackets are to be used, consult the *Technical Manual* for instructions.

NOTE: To prevent moisture from entering the radio, do not mount the case with the cable connectors pointing up. Also, dress all cables to prevent moisture from running along the cables and into the radio.

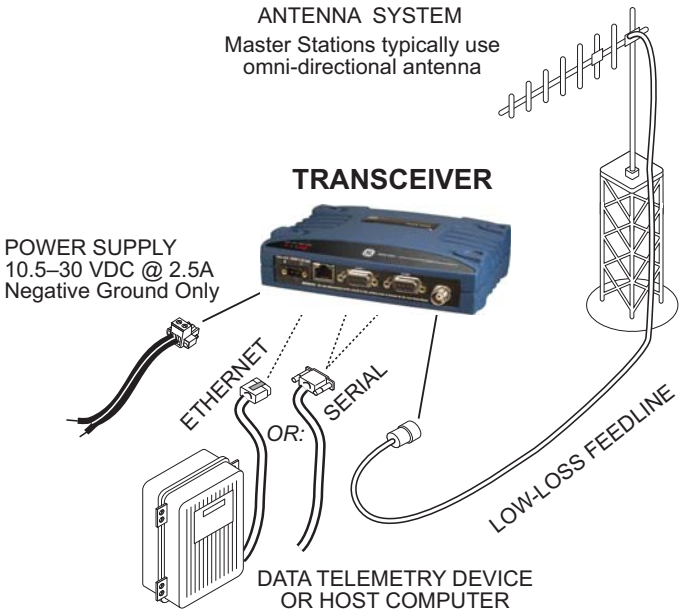

Figure 2. Typical Installation (Remote Site Shown)

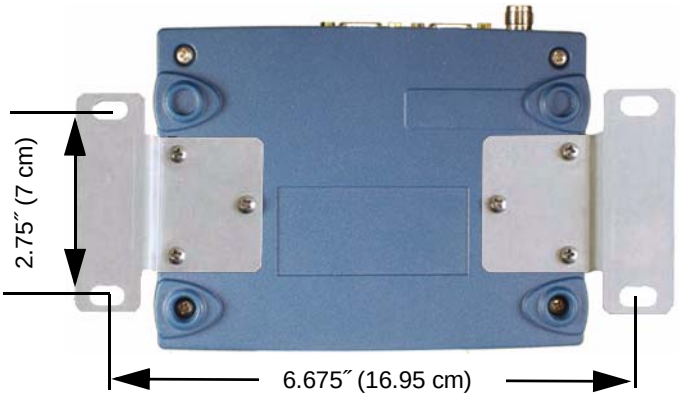

Figure 3. Mounting Bracket Dimensions

2. **Install the antenna and feedline.** The antenna must be designed to operate in the radio's frequency band, and be mounted in a location providing a clear path to associated station(s). At Remote sites, aim directional antennas toward the Master Station. Low loss coaxial feedline should be used and it should be kept as short as possible.
3. **Connect the data equipment.** Connection may be made using Ethernet signaling, Serial protocols (RS-232/RS-485), or both.
   - If Ethernet is to be used, connect your data equipment to the front panel Ethernet port next to the PWR connector.

- If serial is to be used, connect your data equipment to the COM1 or COM2 port on the front panel. (Typically, COM2 is used for connecting data equipment and COM1 is used for serial management of the radio. Other assignments are possible. (Refer to the *Technical Manual* for details.) In all cases, the radio is hardwired as a DCE device. A straight-thru cable may be used in most applications.

NOTE: Do not connect the Ethernet port to a LAN with high traffic levels. Excessive traffic will overload the port and Ethernet communications will be temporarily disabled.

4. **Connect primary power.** Input power must be 10.0 to 30 Vdc and capable of providing at least 2.5 Amperes. A power connector with screw-terminals is provided (see Figure 4). Strip the wire leads to 6 mm (1/4 inch) and insert them into the wire ports. Be sure to observe proper polarity as shown below. Tighten the binding screws securely.

NOTE: Some early models supported 10.5 to 16 Vdc power, not 10.0 to 30 Vdc. *Always check the labeling above the Power connector to verify the proper range for your unit.*

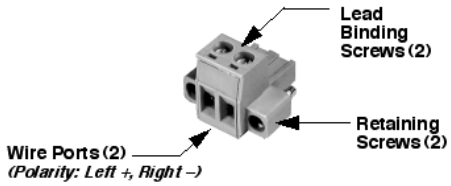

Figure 4. DC Power Connector

CAUTION: The unit is designed for use with negative-ground systems only. The power supply should be equipped with overload protection (NEC Class 2 rating), to protect against a short circuit between its output terminals and the radio's power connector.

2.1.1 Configuration Settings

The SD Radio contains a *Setup WIzard* for fast, easy configuration of key settings. On a new radio shipped from the factory, the wizard starts as soon as you are connected to the radio. Follow the steps below to connect and use the wizard.

1. Connect an Ethernet cable (straight-thru *or* crossover) between the radio and a PC as shown in Figure 5.

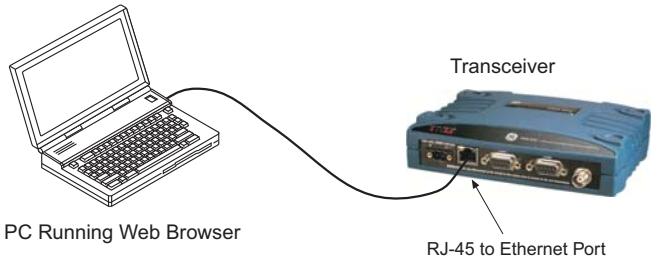

Figure 5. Setup for PC Configuration

2. Configure your PC network settings to an IP address on the same subnet as the radio. The default IP address on a new factory shipped radio is **192.168.1.1**. The default subnet mask is **255.255.255.0**.
3. Enter the radio's IP address in a web browser window, just as you would enter a website address. When the login screen appears (Figure 6), enter the User Name and Password for the radio. The default entries for a new radio are both **admin**. Click **OK**.

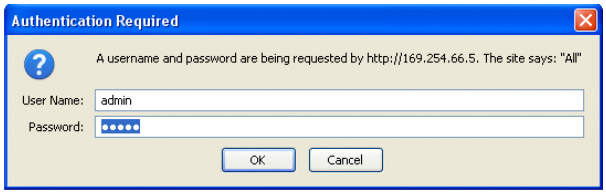

Figure 6. Login Screen

4. The Basic Setup Wizard (Figure 7) begins automatically upon connection to a new factory shipped radio. It displays a series of screens with key selections as follows:

   - TX/RX Frequencies (entries must match station license)
   - RF Power Output
   - Operating Mode
   - Modem Type
   - Serial Port Configuration
   - Ethernet Bridging
   - Encryption Setting
   - AP or Remote Service

   Continue through each wizard screen until all selections have been made. (You may back up to previous screens if required, to review or change settings.) Contact your network administrator if you are unsure about a setting.

Figure 7. Basic Setup Wizard

5. At the conclusion of the wizard, click **Done**. Configuration is now complete for this radio. Run Remote Management Wizard, if required, for other installed radios in the network.

   A summary of all SD settings (Figure 8) may be viewed, by clicking **Overview**. The Overview screen may be formatted for printing, by clicking **Printer friendly configuration** at the bottom of the screen.

6. When finished, log out of the Device Manager by clicking **Logout** in the upper right hand side of the screen.

Figure 8. Overview Summary Screen

NOTE: The radio may also be programmed using serial or Telnet management methods. Refer to the *Technical Manual* for details.

2.2 Initial Checkout

In-service operation of the transceiver is completely automatic. The only operator actions required are to apply DC power and observe the LEDS for proper indications. Table 1 summarizes the radio's LED functions.

2.2.1 LED Functions

NOTE: LED labeling may vary on early units. LED position and functionality remains as described below.

Figure 9. LED Status Indicators

Table 1: Description of LED Status Indicators

LED Name	Description
PWR	• Continuous—Power applied, no problems detected. • Rapid flash (5 times-per-second)—Alarm indication.
LAN	• Flashing—Ethernet data activity is detected. • Off—Ethernet signals not detected, or excessive traffic is present.
DATA1/DATA2	The DATA LEDs show data activity on the DB-9 serial payload port(s).
LINK	When lit, indicates that a communication link exists with the another station.

NOTE: In addition to the LEDs above, the Ethernet connector also has two embedded LEDs. A flashing green indicates Ethernet data activity. A yellow indicates 100 Mbps operation.

2.2.2 Antenna SWR Check

The antenna system's standing wave ratio (SWR) should be checked on new installations using a wattmeter suited to the frequency of operation. High SWR (above 2:1) may indicate an antenna or feedline problem.

2.2.3 RSSI Check *(for Remotes)*

Using the **Maintenance & Status>>Performance** screen, check the received signal strength indication (RSSI). The radio must be receiving a signal from the associated Master Station (LINK LED on or blinking). In general, signal levels stronger than –80 dBm will provide reliable communication and allow for a degree of "fade margin."

Optimize the RSSI at Remotes by slowly adjusting the direction of the station antenna. Watch the RSSI indication for several seconds after making each adjustment, so that the RSSI accurately reflects the new heading. With RSSI readings, the less negative the number, the stronger the incoming signal.

NOTE: The radio's RSSI facility limits the maximum displayed signal strength to -60 dBm. A receive signal attenuator is available in the **Configuration>>Radio>>Advanced Settings** screen.

3.0 TROUBLESHOOTING

All radios in the network must meet the basic requirements listed below for proper operation. Check these items first when troubleshooting a system problem:

- Adequate and stable primary power
- Secure connections (RF, data and power)
- A clear transmission path between Master and each Remote
- An efficient and properly aligned antenna system providing adequate received signal strength.
- Proper programming of radio settings
- The correct interface between the transceiver and the connected data equipment (correct cable wiring, proper data format, timing, etc.)

3.1 LEDs

The radio's LED indicator panel provides useful information when troubleshooting a system problem. Refer to Table 1 for LED indications.

3.2 Event Codes

When an alarm condition exists, the transceiver creates a message readable on the **Maintenance & Status** Screen. From this screen, select **Event Log** to view the current alarm(s). Consult the *Technical Manual* for details.

3.2.1 Types of Alarms

***Minor Alarms*—**These alarms report conditions that, under most circumstances will not prevent transceiver operation. This includes out-of-tolerance conditions, baud rate mismatches, etc. The cause should be investigated and corrected to prevent system failure.

Major Alarms—These alarms report serious conditions that generally indicate a hardware failure, or other abnormal condition that will prevent (or seriously hamper) further operation of the transceiver. Major alarms may require factory repair. Contact your factory representative for assistance.

3.3 Built-In Spectrum Analyzer/Graph

A Spectrum Analyzer/Graph is available to display other radio signals near the SD radio's operating frequencies. This can be a helpful tool in cases of interference. The graph may be accessed from the **Maintenance & Status>>Radio Test** screen.

To use the graph, simply enter the frequency you wish to use as the center point of the graph (**Center Frequency**), and enter the frequency range you wish to cover (**Span Frequency**). Select **Show Spectrum** to display the results.

The display creates a received signal strength indication (in dBm) vs. frequency plot for signals near the center frequency (see Figure 10).

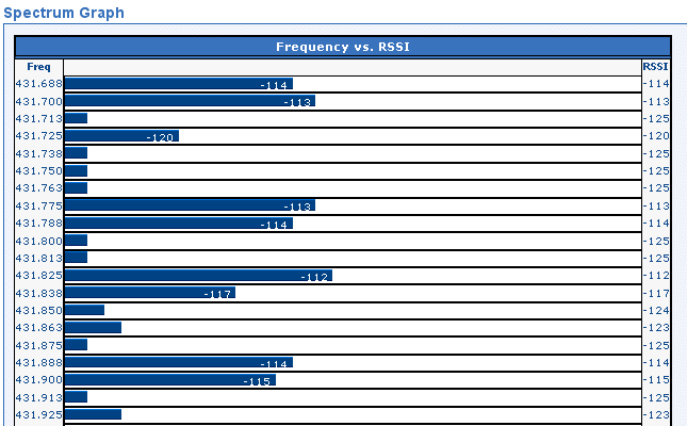

Figure 10. Spectrum Analyzer/Graph (Portion of Display)

4.0 COM1/COM2 REFERENCE

The COM1/COM2 connectors (Figure 11) are typically used to connect an external DTE telemetry device to the radio, supporting the RS-232 or RS-485 (balanced) format, depending on how the radio is configured. The radio supports data rates of 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 bps (asynchronous data only) on these connectors.

These connectors mate with a standard DB-9 plug available from many electronics parts distributors.

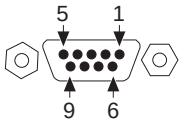

Figure 11. COM1/COM2 Connector (DB-9F)
As viewed from outside the radio

4.0.1 Pin Descriptions—RS-232 Mode

Table 2 provides pin descriptions for the connector when operating in RS-232 mode. For RS-422/485, refer to the *Technical Manual*.

Table 2: COM1/COM2 Pin Descriptions—RS-232

Pin Number	Input/ Output	Pin Description
1	OUT	**DCD (Data Carrier Detect/Link)**—A low on this pin indicates signal received.
2	OUT	**RXD (Received Data)**—This pin supplies received data to the connected device.
3	IN	**TXD (Transmitted Data)**—This pin accepts TX data from the connected device.
4	IN	**Sleep Mode Input**—Grounding this pin turns off most circuits in a remote radio. This allows for greatly reduced power consumption, yet preserves the radio's ability to be quickly brought on line.
5	--	**Signal Ground—**This pin connects to ground (negative supply potential) on chassis.
6	OUT	**Alarm Output (DSR)—**An RS-232 high/space (+5.0 Vdc) on this pin indicates an alarm condition. An RS-232 low/mark (–5.0 Vdc) indicates normal operation. This pin may be used as an alarm output.
7	IN	Reserved.
8	OUT	Reserved.
9	--	User I/O for special applications; not normally used.

NOTE: The radio is hard-wired as a DCE device.

GE MDS, LLC
175 Science Parkway
Rochester, NY 14620
General Business: +1 585 242-9600
FAX: +1 585 242-9620
Web: www.gemds.com