GE Renewable Energy

GE MDS LLC

1.0 INTRODUCTION

The MDS SDM9-1 transceiver (Figure 1) is a software-configurable, industrial Master Station solution for use in wireless telemetry applications. In this guide, the term *SD* is used for information common to all models of the radio. This radio module is designed for use with a card cage and backplane similar to that shown in Figure 3, and to be used 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 may be made by both serial (RS-232/485) and limited Ethernet protocols.

Figure 1. GE MDS SDM9-1 Radio Module

1.1 About This Guide

This guide covers SDM9-1 transceivers operating in *x710-Compatible Mode.* All GE MDS manuals are available free of charge at **www.gemds.com**.

2.0 INSTALLATION

Requirements for module installation:
• The Master Station Chassis includes label as shown in Figure 6.
• Adequate and stable primary power
• An efficient and properly installed antenna system
• Correct interface connections between the transceiver and the data device.

Figure 2 shows a chassis with card cage and backplane that this module would be typically installed in. The backplane provides the 24V power connection to this unit and provides the customer data interfaces through the card edge connector on the rear of the SDM9-1.

Figure 2: Master Station Chassis. The SDM9-1 modules may be installed in any free peripheral slot of this chassis.

Figure 3 shows a typical installation of the radio. **NOTE:** Retrofit Kits are available to simplify installation at former MDS x710 digital and analog sites. Consult the *Reference Manual* for ordering details.
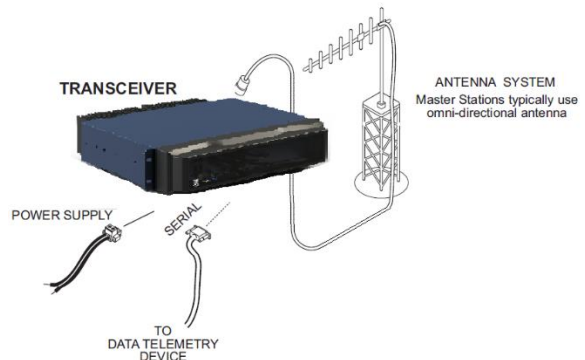

Figure 3: Typical Master Station Chassis with SDM9-1 radio card installed. NOTE: *Chassis has antenna connection in rear*, with power and data connections in the front.

2.1 Installation Steps

1. Install the transceiver into chassis as shown in Figure 2.
NOTE: To prevent damage to the SDM9-1 radio, wear a wrist strap to prevent ESD discharge to the card edge connector. Also, dress all cables as required to prevent moisture from running along the cables and into the radio.

2. **Install the antenna and feedline.** The antenna used with the radio must be designed to operate in the radio's frequency band, and be mounted in a location providing a clear path to the 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 to the COM port using Serial protocols (RS-232/RS-485). RJ45 to DB9/DB25 adapters may be required depending on physical data port connector type used on the data telemetry device to be attached as shown in Figure 3.

4. **Connect primary power to the Orbit Chassis.** Input power must within the ranges specified for the power supply module installed in the Orbit chassis: 12VDC, 24VDC, 48VDC, 125VDC, or 90-264VAC. These supplies all convert incoming power to +24V for SDM9-1 Module operation.

5. Set the radio's configuration. Connect a PC to the radio's COM1 and COM2 ports as shown in Figure 4. A straight-thru cable may be used for this connection with an RJ45 to DB9 adapter. **NOTE:** Consult your System Administrator if you are unsure of the settings required for your network.
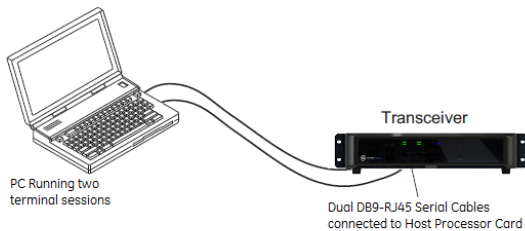

Figure 4. Setup for PC Configuration

2.1.1 Software Configuration

There are two methods for communicating with the radio for configuration and management: **Serial** (COM1, COM2 RJ45 connector) and **Telnet** (ETHERNET RJ-45 connector). Both present identical functionality and use the same commands, but the method to configure access is different for each.

***NOTE:** Transmitter and Receiver configuration are handled through separate DSP devices, thus two serial ports or two Telnet sessions will be required to handle configuration of these two functions.*

The focus here is on *Serial* access, but Telnet may be used by following these additional points, which replace Steps 1 and 2 below:
> • For Telnet, connect to the radio with a PC that is on the same IP network as the transceiver. Launch a Telnet program, and connect to the radio using its programmed IP address for the Transmitter and Receiver.
> • The default IP address of the Transmitter configuration is 192.168.1.1. The default IP address of the Receiver configuration is 192.168.1.2. If you do not know the IP address of the radio, use the serial configuration steps below to view the address with the **IPCONFIG** command.

1. With a PC connected to the COM1 serial port, launch a terminal program, such as HyperTerminal (included withmost pre-Windows7®-based PCs) and set the following parameters: **8 bits, no parity, one stop bit (8N1), flow control disabled, VT100 emulation**. The COM port automatically finds the connected baud rate (within 1200–115200 bps).

2. Press the ESCAPE key followed by a series of ENTER keypresses (at 1/2 second intervals) until the **>** prompt appears. The radio is now ready to accept commands.

3. Set/verify the **RX** (receive) and **TX** (transmit) frequencies. To set the receive frequency, enter **RX** followed by the correct frequency in MHz (**xxx.xxxxx**). Press ENTER . To set the transmit frequency, enter **TX** followed by the correct frequency in MHz (**xxx.xxxxx**). Press ENTER.

4. The factory default modem settings support 9600 bps transmission in a 12.5 kHz bandwidth channel. Many other options are available. The current setting may be viewed using the **MODEM** command. Use **MODEM [xxxx]** if changes are required.

When finished with the steps above, review the other configuration options to determine if other settings are required for your system. Table 3 lists key software commands for the radio.

MDS SDM9-1

Quick Start Guide (x790 Mode)

2.2 Initial Checkout

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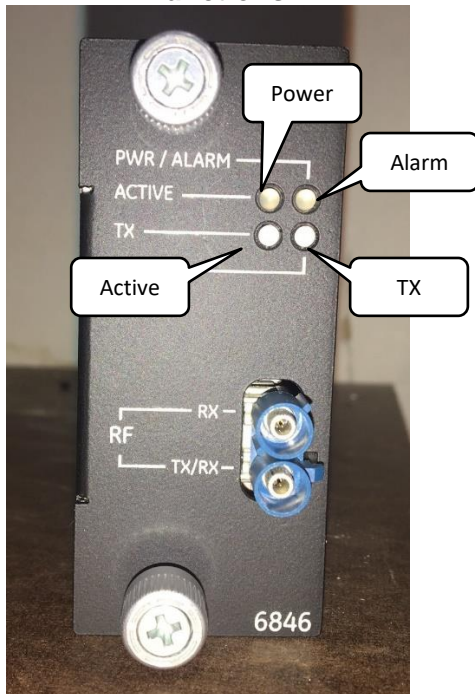
2.2.1 LED Functions

Figure 5. LED Status Indicators

Table 1: Description of LED Status Indicators
POWER: Green Continuous—Power applied, no problems detected.
ALARM: Red Flashing (5x-per-second) Alarm Indication
ACTIVE: Blue Continuous – Transceiver is operational
TX: Blue Flashing/Continuous – This LED illuminates whenever the transmitter is active

2.2.2 Antenna SWR Check

Before placing the unit in final operation, the antenna system's standing wave ratio (SWR) should be checked using a wattmeter suited to the frequency of operation. High SWR (above 2:1) may indicate an antenna or feedline problem, and should be corrected.

2.2.3 RSSI Check *(for SD Remotes)*

Use the **RSSI** command (received signal strength indication), command to check for adequate signal strength. 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 any change in signal strength. With RSSI reading, the less negative the number, the stronger the incoming signal (*i.e.,* -70 dBm is stronger than -80 dBm).

3.0 TROUBLESHOOTING

All radios in the network must meet the following requirements for proper operation. Check these items first when troubleshooting a communication problem:
• Adequate and stable primary power
• Secure cable 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 the transceiver's parameters
• 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 information.

3.2 Event Codes

When an alarm condition exists, the transceiver creates a message that can be read on a connected PC by using the **ALARM** command. Consult the *SD Reference Manual* for further details.

3.2.1 Types of Alarms

*Minor Alarms—*report conditions that, under most circumstances, will not prevent transceiver operation. These include out-of-tolerance conditions, baud rate mismatches,etc. The cause of these alarms should be investigated and corrected to prevent system failure.
*Major Alarms—*report serious conditions that generally indicate a hardware failure, or other abnormal condition that will prevent (or hamper) further operation of the transceiver. Major alarms may require factory repair. Contact your factory representative for assistance.

4.0 COMMAND OVERVIEW

Table 3 lists key software commands for the transceiver. Detailed descriptions are provided in the SD *Reference Manual*. Commands can typically be used in two ways:
1. The basic command (shown first) may be entered alone to issue a query or execute a simple command.
2. The basic command may be appended with additional arguments (shown in brackets, if applicable) to further define a setting.

Master Station Chassis Labeling Notice

The Master Station Chassis of Figure 2 shall include the following text on the label and as shown in Figure 6, below:
"Contains SDM9-1:
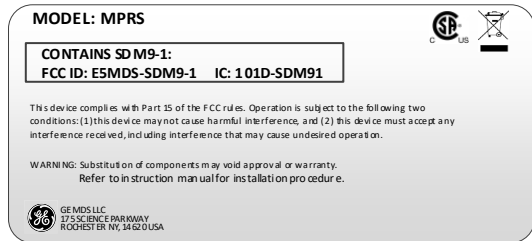*FCC ID: E5MDS-SDM9-1   IC ID: 101D-SDM91"*

MODEL: MPRS

CONTAINS SDM9-1:
FCC ID: E5MDS-SDM9-1   IC: 101D-SDM91

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING: Substitution of components may void approval or warranty.
Refer to instruction manual for installation procedure.

GE MDS LLC
175 SCIENCE PARKWAY
ROCHESTER NY, 14620 USA

Figure 6: Label listing modules contained

RF Exposure Notice

The radio equipment described in this guide emits radio frequency energy. Although the power level is low, the concentrated energy from a directional antenna may pose a health hazard. Do not allow people to come closer than **1.7 meters** to the front of the antenna when the transmitter is operating with a 7dBd (9.15dBi) gain antenna. Use of higher gain antennas means increasing the distance accordingly.

FCC Part 15 Notice

Operation of this device subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) (2) this device must accept any interference received, including interference that may cause undesired operation. Any unauthorized modification or changes to this device without the express approval of the manufacturer may void the user's authority to operate this device. Furthermore, this device is intended to be used only when installed in accordance with the instructions outlined in this guide. Failure to comply with these instructions may void the user's authority to operate this device.

Table 3: Key Software Commands
Command Function
ALARM Read current operating condition of the radio.

BAUD [xxxxx abc] Set/display the data rate and control bits.

BUFF [ON, OFF] Enables or disables the internal radio data buffer.

CTS [0-255] Set/display the Clear-to-Send delay in seconds.

DEV Display modem control deviation.

DEVICE [DCE, CTS KEY] Set/display device mode.

DKEY Dekey the radio (transmitter OFF). This is generally used as a radio test command.

DUMP Display all programmable settings.

HELP Shows available commands.

KEY Key the radio (transmitter ON). This is generally used as a radio test command.

MODEM [xxxx] Set the modem characteristics of the radio.

PORT [RS232, RS485] Set/display COM2 data port interface settings.

PTT [0-255] Set/display the Push-to-Talk delay in milliseconds.

PWR [20-40] Set/display the transmit power setting.

RSSI Display the Received Signal Strength Indication.

RTU [ON/OFF/0-80] Re-enables or disables the radio's internal RTU simulator and sets the RTU address.

RX [xxx.xxxx] Set/display the receive frequency.

SCD [0-255] Set/display the Soft-Carrier Dekey delay in milliseconds.

SHOW [DC, PWR] Display the DC voltages and transmit power level.

SNR Signal-to-Noise Ratio, expressed in dB

SPECTRUM [xxx.xx] Display the transceiver's built-in spectrum analyzer, where xxx.xx denotes center frequency.

STAT Display radio status and alarms.

TEMP Display the internal temperature of the radio in degrees C.

TOT [1-255, ON, OFF] Set/display the Time-out Timer delay in seconds.

TX [xxx.xxxx] Set/display the transmit frequency.

UNIT [10000...65000] Set/display the transceiver's unit address.