1.0 INTRODUCTION

MDS Mercury™ Series transceivers provide an easy-to-install wireless network service with long range and secure operation at adaptive data rates approaching 30 Mbps. The transceiver is designed for demanding applications in industrial environments, where reliability and range are paramount.

The transceiver comes in two primary models—**Base Station (BS) and Subscriber Unit (SU)**, each with unique hardware profiles. Both models support Ethernet and serial services. A BS is a wireless switch that usually provides connectivity into a wired Ethernet LAN/WAN.

Subscriber Units associate over the air with a BS and are typically connected to an Ethernet or Serial device via a local cable. The outward appearance of the standard SU is very similar to the BS.

NOTE: To determine whether a unit is an BS or Subscriber Unit, check the dome label on the top of the unit.

Refer to the Mercury Series Technical Manual (05-6302A01) for advanced procedures and additional information.

1.1 Connectors & Indicators

Figure 1 shows the connectors and indicators of a Standard BS. These items are referenced in the installation and operation steps that follow. Note that SU radios may have an additional connector present for Wi-Fi service, depending on order requirements. If Wi-Fi is *not* provided on an SU, the GPS connector will also be absent.

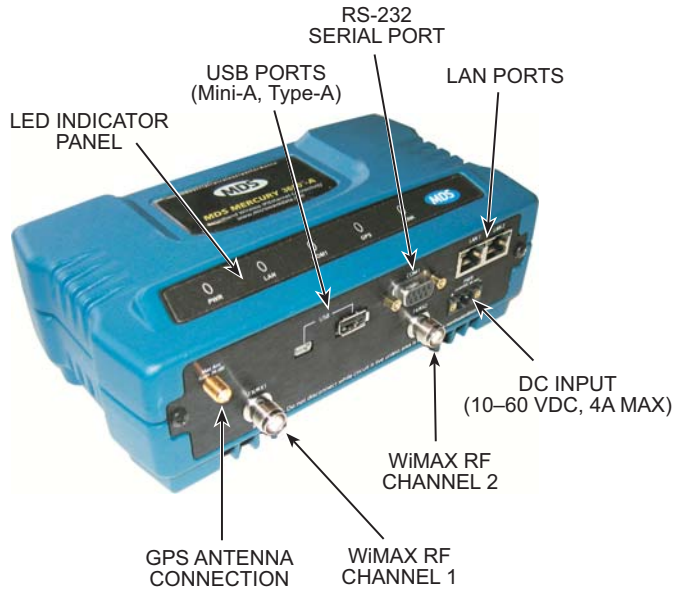

Figure 1. Connectors and Indicators
(Standard BS shown; SU Similar)

1.2 Weatherproof Subscriber Unit

In addition to the Standard Subscriber Unit, a weatherproof Outdoor Unit (ODU) model is offered (see Figure 2). The ODU is designed for mounting on a tower, pole, or other elevated structure, and includes an integral panel antenna.

DC power is typically applied to the ODU through a Category 5 Ethernet cable (Cat. 5E, Cat. 6 also acceptable) which provides Power-over-Ethernet (PoE) service. The cable can be up to 100 meters in length (328 feet). For non-PoE models, a separate DC power cable is required to supply 10-65 Vdc.

Figure 2. Mercury ODU Subscriber Unit

All operating parameters and commands for the ODU are identical to those of the indoor SU. The only difference is in the physical installation of the hardware on its support structure.

2.0 INSTALLATION—ALL UNITS

There are three main requirements for installing all units in the transceiver system—adequate and stable primary power, a good antenna system, and the correct interface between the transceiver and the data device. Figure 3 shows a typical Mercury installation.

2.1 Installation Steps

Listed below are the basic steps for installation. It is highly recommended that the BS be installed first so that you can quickly check the operation of each associated SU as it is placed on the air.

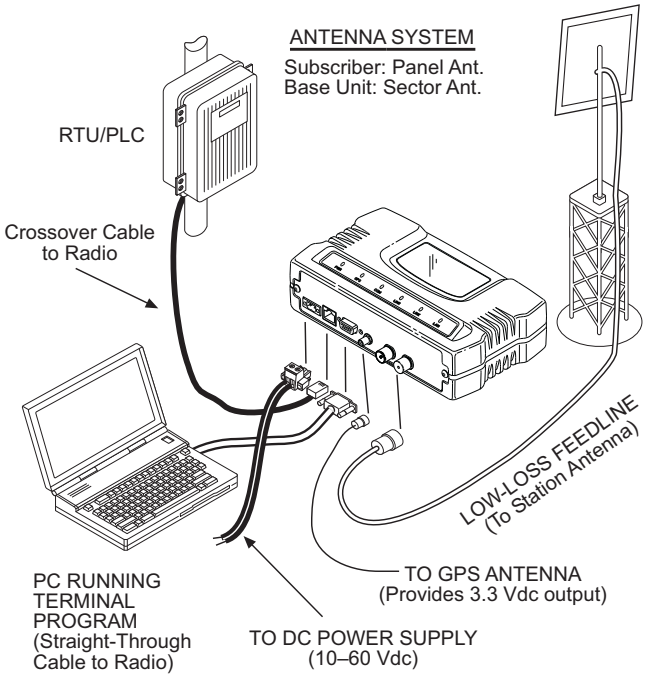

Figure 3. Typical Mercury Installation (SU Shown; BS Similar)

2.1.1 Step 1a—Mount the Transceiver (BS/SU)

Use the supplied 6-32 x 1/4 inch (6 mm) screws to attach the mounting brackets to the bottom of the radio. Figure 4 shows the mounting dimensions of the unit. Mount the radio to a stable surface. (Fasteners not supplied.)

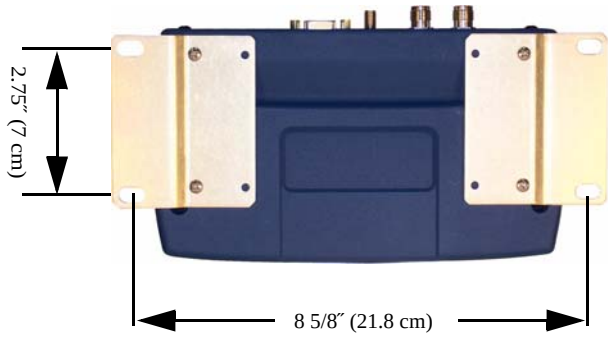

Figure 4. Transceiver Mounting Dimensions
(Dimensions for BS and SU identical)

2.1.2 Step 1b—Mount the ODU (if applicable)

The ODU is a one-piece unit with an integrated, dual polararized panel antenna. It measures approximately 27 cm wide X 27 cm deep X 8 cm high.

Using the bracket on the back of the unit, mount the ODU securely to a tower, pole or other stable surface that provides a clear path in the direction of the associated Base Station.

2.1.3 Step 2—Install the Antenna (Non-ODU models)

BS units typically use sector antennas, while SU's typically use a directional panel antenna. All antennas should be mounted in the clear to a sturdy support. Connect the antenna's feedline cable to the transceiver's WiMAX Antenna Port. To minimize RF interference, the antenna should be at least 9 inches (> 23 cm) away from connected device(s), sensors and other external components.

Install GPS Antenna (if required)

Install the GPS antenna in accordance with the manufacturer's instructions. Connect it to the GPS Port on the unit's front panel.

2.1.4 Step 3—Measure & Connect DC Power

The DC input to the transceiver must be within 10–60 Vdc and capable of continuously providing at least 50 watts. ODUs, except for non-PoE units, receive power over the Ethernet cable. Power cabling for ODUs must be properly secured to the support structure the unit is mounted on. In addition, the ODU's ground post must be connected to a low impedance Earth ground.

For other models, a power connector with screw-terminals is provided with each unit. Strip the wire leads to 6 mm (1/4 inch). Be sure to observe proper polarity with the positive lead (**+**) on the left, and the negative on the right. The unit is designed for use in negative ground systems only.

CAUTION
POSSIBLE EQUIPMENT DAMAGE

The power supply should be equipped with overload protection (NEC Class 2), to protect against a short circuit between its output terminals and the radio's power connector.

NOTE: It takes about 30 seconds for the unit to fully power up, and a few minutes to associate with another unit, especially if GPS is required for time synchronization.

2.1.5 Step 4—Review the Transceiver's Configuration

One setting must be known before beginning configuration on a unit; The IP address. Check with your System Administrator for this information. (Default address is **192.168.1.1**) An overview of this, and other parameters commonly needing review or adjustment are listed below, followed by Log-in and Configuration procedures.

- **IP Address**—Must be a unique address to allow for IP access through the LAN port or over-the-air.
- **RF Output Power Level** (BS Only)—Check and adjust as necessary for compliance with regulatory limits. (Default power is +30 dBm for 1800 model, +23 dBm for 3650 model.) Note that Subscriber Units auto-adjust power output based on target receive signal level (set at the BS).
- **Password**—Used for remote access and Menu System. (The default password and username is **admin**.)
- **Frequency**—Operating frequency in MHz.
- **TDD Sync Mode** (BS only)—Selections are: **Free Run** and **GPS Required**.

  Free Run allows rapid configuration and initial testing.

  GPS Required synchronizes the BS's transmissions to the GPS timing. **GPS Required** is only needed to synchronize multiple Base Stations.

Log-in and Configuration Procedure

The following is an overview of the log-in and configuration procedures for the transceivers. A unique IP address and subnet are required to access the Menu System, either through the LAN port, or remotely over-the-air.

a. Connect a computer's serial port to the unit's COM1 Port.

b. Launch a terminal communication program, such as HyperTerminal, on the computer. Configure it to: 115,200 bps/8N1/no handshaking/VT100.

c. Press **ENTER**. A login prompt is displayed that requires a username and password.

d. Enter the username and password.

e. Review other settings and make changes as necessary, such as the unit password, IP address, and security.

f. Under the Radio Configuration Menu at the Base Station, set/verify the following:

   Transmit Power—Settable from: -30 dBm to +30 dBm (BS); 0 dBm to +30 dBm (SU); +23 dBm for 3650 models.

   Receive Power—Target receive signal of the BS which SUs will seek to adjust to, based on distance.

g. Under the **Frequency Control** Menu of the **Radio Configuration** Menu, set/verify as required. Ensure that the SU's radio parameters are consistent with the BS's Frequency Parameter.

Repeat above steps for each radio in the network. An overview chart of the Menu System is shown in Figure 5 *on Page 4.*

NOTE: Using **Configuration Scripts** under the **Maintenance/Tools** menu can aid in configuring multiple units.

2.1.6 Step 5—Connect the Data Equipment

Connect data equipment to the unit's LAN port (10/100 BaseT), or the serial port, depending on the type of equipment used.

Use a *straight-through* Ethernet cable to connect the LAN port to a hub or switch; use a *crossover* cable to connect it directly to an Ethernet device (PC, PLC, RTU).

2.1.7 Step 6—Check for Normal Operation

This step verifies the proper operation of wireless communications between a BS and associated SUs.

At All Units...

Observe the transceiver's LED panel for the proper indications (see Table 1). In a normally operating system, the radio will typically become associated in about two minutes from start-up.

At the Base Station...

a. If the BS is the first unit you are installing, send a **PING** command to it through the LAN port. This verifies basic LAN connectivity.

b. If you have already installed an SU, try sending a **PING** to that unit through the Menu System **PING** utility or a device connected to the unit on the same subnet.

At Subscriber Units...

a. Look for the LINK LED to illuminate and stay on. This indicates the unit has successfully associated with the network's Base Station. (May take up to 30 seconds.)

b. View the **Starting Information** screen for the **Device Status** and **Connection Status**). It will show one of these:

Initializing—This is the first phase after boot-up.

Scanning—The unit is looking for a BS beacon signal.

Ranging—Unit is adjusting power, timing, & frequency with a BS.

Authenticating—(When Device Authentication is used.) The SU is authenticating to the network to obtain clearance.

Associated —The unit has successfully synchronized and associated with a BS. This is the normal state of the radio.

Alarmed—The unit has detected one or more uncleared alarms.

c. When the network is operating properly based on observation of the unit's LEDs, connect a computer to the transceiver's data port that will be used by the local terminal equipment. Send the **PING** command to verify communications integrity with the BS.

d. After the **PING** is successful, connect the terminal equipment to the radio's data port and verify normal operation.

If above checks are OK, you are finished with the installation at this site.

2.2 ANTENNA AIMING

Directional antennas usually require some fine-tuning of their bearing to optimize the received signal strength. The SU has a built-in received signal strength indicator (RSSI) that can be used to optimize the received signal level. It is available under the **Performance Information** menu.

In general, signal levels stronger than –80 dBm will provide reliable communication in the network. RSSI measurements and Wireless Packet Statistics are based on multiple samples over a period of several seconds. The average of these measurements is displayed by the RSSI screen. Follow the steps below to aim the antenna for best received signal level.

2.2.1 Procedure

1. Verify the SU is associated with a Base Station unit by observing the LINK LED. It should be on or blinking.
2. a) View and record the **Wireless Packets Dropped** and **Received Error** rates (**Main Menu>Performance Information>Packet Statistics**). This information will be used later.

   b) Read the RSSI level at the Subscriber Unit (**Main Menu>Performance Information>Internal Radio Status**).
3. Optimize RSSI by slowly adjusting the direction of the antenna. Watch the RSSI indication for several seconds after making each adjustment so that the RSSI accurately reflects any change in the link signal strength. The less negative the dBm number, the stronger the signal.
4. View the **Wireless Packets Dropped** and **Received Error** rates at the point of maximum RSSI level (**Main Menu>Performance Information>Packet Statistics**). They should be the same or lower than previously noted.

   If the RSSI peak results in an increase in the **Packets Dropped** and **Received Error** numbers, the antenna may be aimed at an undesired signal. Try a different antenna heading.

2.3 TROUBLESHOOTING

It is best to begin troubleshooting at the BS, as the rest of the system depends on it for network synchronization and configuration. If the BS has problems, the operation of the entire network will be affected.

All radios in the network must meet these basic requirements:

- Adequate and stable primary power
- An efficient and properly aligned antenna system
- Secure connections (RF, data & power)
- Proper programming of the unit's operating parameters, especially Frequency Selection and IP Address
- The correct interface between the radio and the connected data equipment (proper cable wiring, data format and timing)

A chart of LED functions is provided on Page 4 of these instructions. Refer to the *Technical Manual* for suggestions on resolving common system difficulties using the radio's LEDs and Menu system as a guide.

If problems cannot be resolved using the guidance provided here, review the GE MDS website's technical support area for recent software/firmware updates, general troubleshooting help, and service information. Additional help is also available from our Technical Services Department.

2.3.1 Resetting to Factory Defaults

In trouble cases where several menu parameters have been changed and there is no track of changes, it may help to return the unit to a known, factory default state. Configuration can then be attempted again. Use this function with care, as *all* user-customized settings will be cleared.

To reset to factory defaults, select **Maintenance/Tools>Reset to Factory Defaults**.

2.4 APPROVAL INFORMATION

2.4.1 FCC Part 15 Notice

The transceiver series complies with Part 15 of the FCC Rules for a Class A digital device. 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. Any unauthorized modification or changes to this device without the express approval of GE MDS may void the user's authority to operate this device. Furthermore, the Mercury Series 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 the device.

2.4.2 Industry Canada Notice

Industry Canada rules (SRSP 301.7) require that the power to the antenna on an 1800-1830 MHz installation shall not exceed 2 watts in any 1 MHz channel bandwidth.

2.4.3 RF Exposure Notices (English and French)

1800 MHz Models

Professional installation required. 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 0.4 meters (15 inches) to the antenna when the transmitter is operating in indoor or outdoor environments. More information on RF exposure is available on the Internet at www.fcc.gov/oet/info/documents/bulletins.

3650 MHz Models

Professional installation required. The transceiver described here 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 25 cm (9.8 inches) to the antenna when the transmitter is operating. This calculation is based on an 18 dBi panel antenna. Additional information on RF exposure is available on the Internet at www.fcc.gov/oet/info/documents/bulletins.

Co-location Requirements: To meet FCC co-location requirements for transmitting antennas, a 20 cm (7.87 inch) separation distance is required between the unit's Wi-Fi and fundamental antennas.

L'énergie concentrée en provenance d'une antenne directionnelle peut présenter un danger pour la santé. Ne pas permettre aux gens de s'approcher à moins de 25 cm à l'avant de l'antenne lorsque l'émetteur est en opération. On doit augmenter la distance proportionnellement si on utilise des antennes ayant un gain plus élevé . Ce guide est destiné à être utilisé par un installateur professionnel.

Plus d'informations sur l'exposition aux rayons RF peut être consulté en ligne à l'adresse suivante: www.fcc.gov/oet/info/documents/bulletins

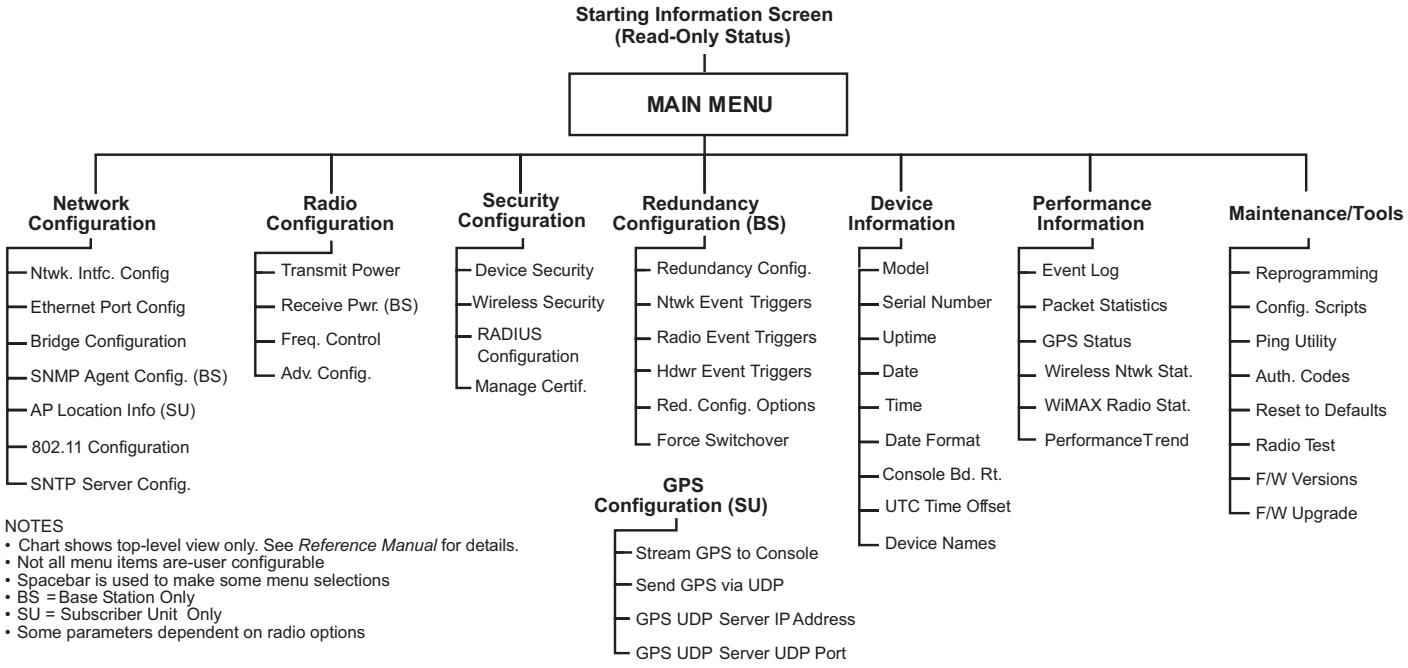

Figure 5. Menu Overview

Table 1: Description of LED Status Indicators

LED Name	Description
PWR	• ON—Power applied, no problems detected. • FLASHING—Alarm present • OFF—Primary power absent
LAN (See Note below)	• ON—LAN detected. • FLASHING—Data TX/RX • OFF—LAN not detected
COM1	• FLASHING—Data TX/RX activity • OFF—No data activity
GPS	• ON—Has GPS satellite fix • FLASHING—Synchronizing timing reference • OFF—No GPS satellite fix
LINK (BS)	• ON—Operational state • FLASHING—Data TX/RX
LINK (Subscriber)	• ON—Associated to BS • FLASHING—Data TX/RX • OFF—Not Associated with BS
USB	• ON—USB activity on either port • OFF—No USB activity
NOTE: The unit's LAN port also has two embedded LEDs to indicate signal activity as follows: A steady green indicates that a link has been achieved; a flashing green indicates data activity; a yellow indicates 100 Mbps operation.	

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