



1.0 INTRODUCTION

The MDS™ Orbit ECR (Edge Connect Router) Series is a flexible industrial router for critical applications. The Orbit ECR offers advanced networking capabilities including concurrent bridging and routing, route failover, advanced QoS and GRE tunneling to enable the transport of GOOSE, SCADA, and other critical automation protocols over cellular and other RF uplinks reliably. The ECR's advanced cyber security capabilities include IPsec VPNs, stateful firewalling, MAC filtering, secure boot and tamper detection.

The Orbit ECR supports a single radio/modem uplink plus an optional Wi-Fi. Its diverse portfolio includes 900MHz ISM, multi-carrier cellular modems, WiFi, 400MHz/900MHz licensed narrowband. It further packs a flexible Terminal Server to transport serial/SCADA protocols over IP efficiently. Its user-friendly GUI device manager uses configuration wizards to simplify provisioning.

The Orbit ECR series shares the same firmware with the Orbit MCR as well as the same portfolio of radio modules for full compatibility. Units are offered with 1 Ethernet/1 Serial and USB interfaces.

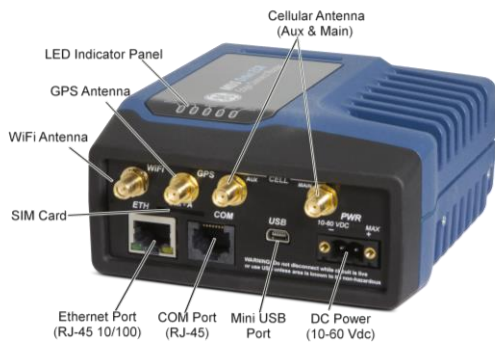


Figure 1: ECR Sample Unit, Showing Connectors & Indicators

1.1 Technical Manual

This Setup Guide covers basic installation and startup instructions for the unit. A more detailed Technical Manual is also available (05-6632A01). Refer to the Technical Manual for important warnings, cautions and notes. GE MDS manuals, Setup guides, Firmware, drivers and Application Notes are available free of charge at www.gemds.com.

GE MDS has produced a series of instructional videos for configuration and setup of the Orbit products on YouTube. These are available free of charge at: <http://tinyurl.com/pey2ull>



2.0 INSTALLATIONS

2.1 Main Requirements

⚠ WARNING: When the unit is to be installed in hazardous locations, use only the serial or Ethernet connections on the unit's front panel. Do not use the USB port in hazardous locations.

There are three main requirements for installation:

- Adequate and stable primary power (10-60 VDC).
- Efficient and properly installed antennas for configured options.
- Correct interface connections between the unit and associated data equipment.

2.2 Installation Steps

Installation details for the product may vary, depending on site-specific factors. The steps here provide the basic tasks needed at most sites.

1. **Mount the unit.** Attach the supplied brackets to the bottom of the case (if not already attached), using the screws provided. Mounting bracket dimensions are shown in Figure 2: Mounting Bracket Dimensions. If DIN Rail mounting brackets are to be used, consult the *Technical Manual* for details.

NOTE: To prevent moisture from entering the unit, 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 enclosure.

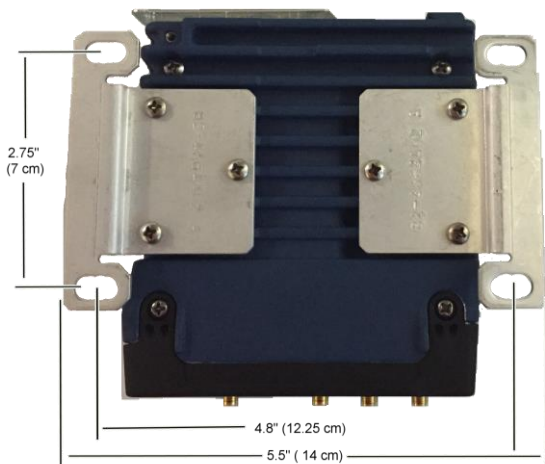


Figure 2: Mounting Bracket Dimensions

2. **Install the antennas and feedlines.** The antennas used must be designed to operate in the appropriate frequency band and be mounted in a location providing a clear path to the associated station(s). Antennas should be mounted away from large masses of metal and other obstructions.

Often, at least one of the antennas will be connected directly to one of the coaxial connectors on the unit's front panel. When remotely mounted antennas are used, coaxial feedlines should be low loss and be kept as short as possible.

Proper grounding techniques should be applied. As an added convenience, there is a tapped 6-32 hole on the underside of the unit that can be used an 1/4" screw and braid or ground strap.

3. **Connect the data equipment.** Connection may be made using any combination of **Serial** protocols (RS-232/RS-485), **Ethernet** signaling, or **USB**. Refer to the *Technical Manual* for wiring details.
 - **Serial connection:** Attach data equipment to the front panel COM port. The unit is hardwired as a DCE device, thus a straight-through Ethernet cable can be used with an RJ45 to DB9-F adapter (GE MDS part no. 73-2434A12).
 - **Ethernet connection:** Attach data equipment to the front panel ETH port. The auto-sensing MDIX feature allows either a straight-through or crossover cable to be used.

- **USB connection:** Attach data equipment to the front panel mini USB port. The unit supports USB 2.0 with proper drivers installed. Drivers available at www.gemds.com.
4. **Connect primary power.** Input power must be 10.0 to 60 Vdc and capable of providing at least 15 watts. A power connector with screw-terminals is provided (Figure 3, DC Power Connector). 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. Tighten the binding screws securely.

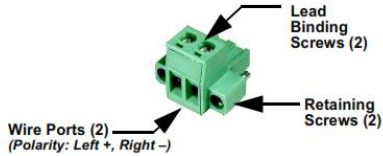


Figure 3, DC Power Connector

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

2.3 Unit Configuration

2.3.1 Default Settings

As shipped from the factory, the unit is configured with a set of pre-defined defaults. For example, when equipped with Cell, the unit is configured to operate as a WiFi hotspot. (3G requires carrier-specific configuration.) For "4G WiFi hotspot" operation, the unit normally contains the following settings:

- WiFi enabled as an Access Point (AP)
 - SSID = **GEMDS_SERNUM** (SERNUM refers to the unit's serial number, printed on a chassis sticker.)
 - SSID broadcast enabled
 - Security = WPA2-PSK, CCMP with passphrase: **GEMDS_ORBIT**
- Default Ethernet IP address **192.168.1.1/24**
- Firewall/NAT/DNS proxy enabled
- DHCP enabled (192.168.1.2 to 192.168.1.10)
- If 900 MHz radio present (unlicensed), radio set to **Remote**

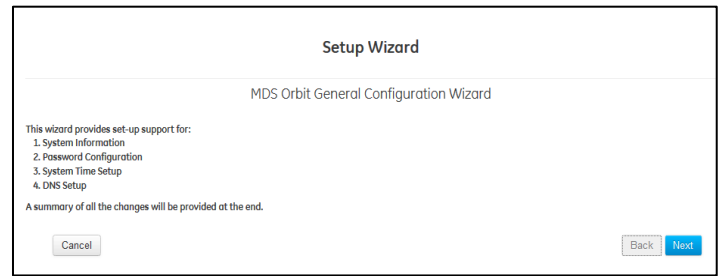
This configuration allows connection of a PC to the unit via WiFi or the LAN port and access to the Internet via cellular, if equipped and supported by a suitable service plan.

2.3.2 Connecting via Ethernet/WiFi

The configuration PC may be connected to the unit by hardwired cable (USB, serial or Ethernet), or by WiFi. The following steps describe a WiFi or Ethernet connection to the built-in web server. This connection can be made using the WiFi or Ethernet information above. The initial sign-in prompt appears as shown below:

The screenshot shows a 'Sign in' form with two input fields: 'Username' and 'Password'. Below the fields is a 'Sign in' button.

1. Enter the username (default is **admin**).
2. Enter the Password (default is **admin**). Press **Sign in**. Upon successful login, the Device Overview page appears.
3. For initial configuration the Setup Wizard appears and provides guidance in typical setups. This will be disabled after the initial setup, but may be re-run at any time from the **Wizards** page.



Key items that should be set/reviewed:

- Create one-time programmable passwords for device recovery.
- Change login passwords (to maintain security).
- Evaluate default factory configuration and lock it down to required security level.

Refer to the *Technical Manual* for detailed information on the above items.

2.3.3 Connecting via Serial

The configuration PC may be connected to the unit by hardwired cable (USB, serial, or Ethernet), or by WiFi. The following steps describe a cabled serial cable connection, as illustrated in Figure 5.

Note that not all PCs have a serial port. If one is not available, a USB-to-Serial adapter and appropriate driver software may be used to provide serial connectivity

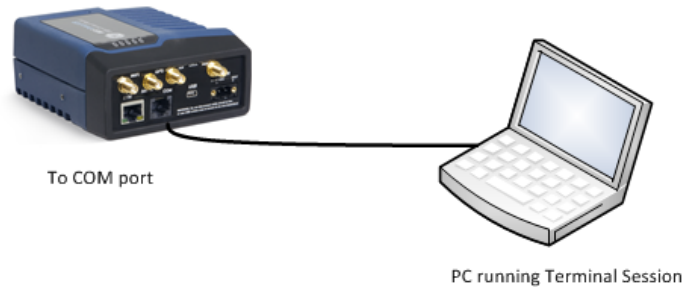


Figure 4. Setup for PC Configuration—Serial Port
(RJ-45 adapter is required)

1. Connect a PC to the unit's COM port and establish a console terminal session, using HyperTerminal or a similar communications program. The following parameters must be used: 115200 bps, 8 bits, no parity, one stop bit (8N1), flow control disabled, VT100 emulation.

NOTE: As an alternative, the unit may be configured via a *Secure Shell (SSH) terminal*. For enhanced security, the unit does *not* support Telnet configuration. Refer to the *Technical Manual* for further information.

2. Press the **ENTER** key to receive the **login** prompt. The COM LED flashes to indicate data communications.
3. Enter the username (**admin** is the default) and press **ENTER**.
4. At the **Password** prompt, enter the password (**admin** is the default). Press **ENTER**. Upon successful login, the connection message appears.
5. Enter the configuration mode by typing **configure** followed by the **ENTER** key.
6. Review and configure all key settings for the required application. Built-in help is available by pressing the **Tab** key. A summary of all unit settings may be viewed by entering the **% show | details** command.

Tab-completion is a useful feature that presents CLI users with assistance while typing commands. Depending on the text that was already entered, tab-completion will display different possible completions. When the **Tab** key is pressed and no text

has been entered, the CLI shows all possible commands that can be typed.

Key items that should be set/reviewed for the unit are:

- Create one-time programmable passwords for device recovery.
- Change login passwords (to maintain security).
- Evaluate default factory configuration and lock it down to required security level.

Refer to the *Technical Manual* for detailed information on the above items.

7. When finished, log out of the console session and disconnect from the PC.

2.3.4 Cellular Setup and Connection

The MDS Orbit ECR is available with the following Cell options:

- 4G LTE, HSPA+,GSM/GPRS, CDMA (North America)
- 4G LTE, HSPA+,GSM/GPRS (EMEA/APAC)
- 3G GSM/UMTS/HSPA+ (Global)

Insert the SIM card with the power OFF and then information regarding the cell—including IMEI and ICCID—can be found in the Cell Status section. Navigate to:

Home / Interfaces State / Interface = Cell

or type the following at the CLI prompt:

```
> show interfaces-state interface Cell cell-status
```

NOTE: 3G Dual SIM functionality is a selective order-entry feature. Default units are shipped with only SIM-A enabled; SIM-B is not supported.

For most setups all that is needed is to set the Access Point Name (APN). Use the Interface Setup Wizard



Figure 5. Cell Basic Setup Info

On the Web UI navigate to:

Interfaces / Cell / Basic Config / Cellular / Connection Profile

In the **Bearer Config** - enter the APN and press the **Finish** button then the green **Save** button at the top of the window. (If Verizon 4G, this field is pre-configured to **vzwinternet.**)

Or, use the following commands at CLI prompt:

4G LTE (Verizon Only):

```
> configure
% set interfaces interface Cell cell-config connection-profile PROFILE-1 bearer-config apn <APN>
% commit and-quit
```

3G GSM (Global) and 4G LTE (EMEA/APAC):

```
> configure
% set interfaces interface Cell enable true
% set interfaces interface Cell cell-config connection-profile PROFILE-1 bearer-config apn <APN>
% commit and-quit
```

2.3.5 900 MHz Unlicensed Operation

An Orbit device configured as an ECR-900 provides next-generation LAN extension operating in the FCC 900 MHz ISM band. Similar to the older MDS™ iNET-II 900 transceivers, it supports connection of Ethernet and/or Serial devices in the field in a Point-to-Multipoint or Point-to-Point wireless network topology.

In its simplest configuration, the **Network Name** (3rd item down) must be changed in all units. For the AP, you must change **Device Mode** to **AP** and change **Network Name** to a valid entry. All other parameters can remain at their default settings.

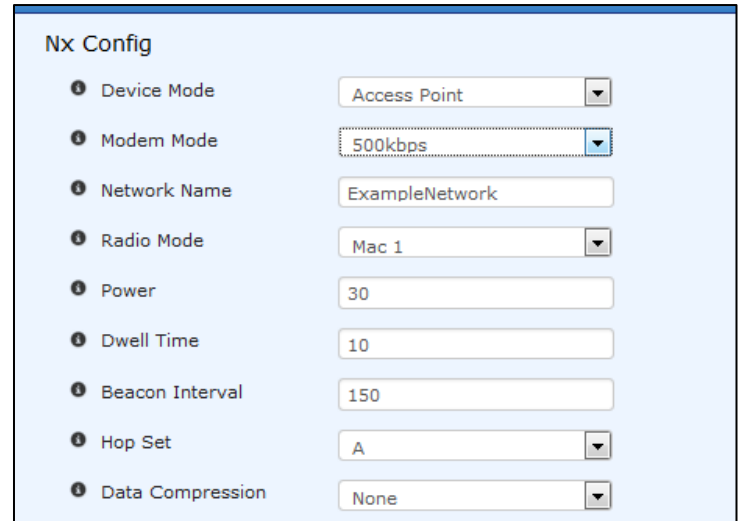


Figure 6. Orbit ECR-900 -Remote Setup

Configure the remote to match the AP:

1. Set **Device Mode** to Remote.
2. Set **Modem Mode** - choices: **125kbps, 250kbps, 500kbps, 1000kbps, 1000Wkbps - 1250kbps, or auto.**
3. Set **Network Name** - The name of the network.
4. Set **Radio Mode** to Mac 1.
5. Set **Power** - Valid values: 20 to 30 dBm.
6. Set **Data Compression** - LZO or none.

Review settings for the required application. Press the green **Save** button at the top of the window.

NOTE: For ECR-900 MHz configurations, DHCP is typically disabled to allow for configuration of a specific IP address. On the Web UI, navigate to **Services / Dhcp Server / Basic Config /General**, click on the Enabled box and press the green Save button at the top of the window.

2.4 Initial Checkout

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

LED Functions



Figure 7. LED Status Indicators

Table 1: Description of LED Status Indicators

LED Name	LED State	Description
PWR (DC Power)	Off	No power to unit
	Solid Green	Unit is powered, no problems detected
	Solid Amber Fast Blink/Red	Initializing-boot-up Alarm indication

(1x/sec.)

ETH (Ethernet)	Off	No Ethernet link to network
	Solid Green	Ethernet link present
	Blinking Green	Ethernet traffic in/out

COM (Serial Comm. Port)	Off	No serial connection, or idle
	Blinking Green	Serial traffic in/out

NOTE: As shown below, NIC1 and NIC2's operation will vary depending on the interfaces installed. Refer to the Technical Manual for further details.

LED -WiFi	State	Description
WiFi Interface	Off	Interface disabled
Access Point Mode	Solid Green	Operating as AP and at least one client connection
	Solid Red	Operating as an AP and no client connection
Station Mode	Off	No connection
	Solid Green	Wi-Fi connection established.

LED - NIC - Cell	State	Description
Cell Interface	Off	No cellular connection
	Solid green	Cell connection

LED - NIC -900 MHz (NX915)	State	Description
	Off	Interface disabled
Access Point Mode	Blink Red	NIC Initialization
	Solid Red	No Remotes connected
	Solid Green	Linked with at least 1 Remote
Remote Mode	Blink Red	NIC Initialization / Not linked to an Access Point
	Solid Green	Linked with Access Point

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

3.0 INSTALLATIONS

For proper operation, all units must meet the basic requirements which follow. Check these items first when troubleshooting:

- Adequate and stable primary power
- Secure connections (antennas, data and power)
- A clear transmission path between associated units
- An efficient, properly installed antenna system
- Proper configuration of unit settings
- Correct interface between the unit and other equipment

3.1 LEDs & Event Logging

The unit's LED indicator panel can provide useful information when troubleshooting. Refer to Table 1 for LED status indicators.

An event (such as an alarm condition) is a notification that something significant occurred on the unit. Events can be stored locally and/or transported to a remote server. Consult the *Technical Manual* for details on Event Logging, including Common Event Expression (CEE™) syntax.

4.0 COM PORT REFERENCE

The COM port (

Figure 8) is commonly used to connect an external DTE telemetry device to the unit, supporting either the RS-232 or RS-485 (balanced) format, depending on how the device is configured. The unit supports data rates of 300,1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 and 230,000 bps (asynchronous data only).

This connector mates with a standard RJ-45 plug available from many electronics parts distributors.

1 2 3 4 5 6 7 8

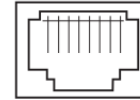


Figure 8. Com Connector (RJ-45)
As viewed from outside the unit.

4.1 Pin Descriptions—RS-232 Mode

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

Table 2: COM1 Pin Descriptions—RS-232

Pin #	Input/Output	Pin Description
1	Reserved	-- (Do not connect)
2	OUT	DCD (Data Carrier Detect)
3	Reserved	-- (Do not connect)
4	Ground	Connects to ground (negative supply potential) on chassis
5	OUT	RXD (Received Data)—Supplies received data to the connected device
6	IN	TXD (Transmitted Data)—Accepts TX data from the connected device
7	OUT	CTS (Clear to Send)
8	IN	RTS (Request to Send)

NOTE: The unit is hardwired as a DCE device

Technical Assistance

Technical assistance is available by contacting the Technology group GE MDS during business hours (8:30 AM to 6:00 PM Eastern Time). Please use one of the following means to contact the factory:
Telephone: (800) 474-0964 Option #3
E-mail: gemds.techsupport@ge.com
Web: www.gedigitalenergy.com/Communications
FAX: (585) 242-8369

REGULATORY AND PRODUCT INFORMATION—MDS ORBIT ECR

Hazardous Locations Notice



When installed in hazardous locations, use only the serial and Ethernet connections on the unit's front panel. Do *not* use the USB port in hazardous locations.

RF Exposure Notice

To comply with RF exposure requirements, the antenna shall be installed to ensure a minimum separation distance of 20 cm from persons. The antenna may not be co-located or operated in conjunction with other transmitting devices.

All RF modules contained within the Orbit ECR have a conducted RF power maximum limit of 2W.

Approved Antennas

Only approved antennas may be used on the unit's RF output connectors, examples are listed below. The use of non-approved antennas may result in a violation of FCC rules and subject the user to FCC enforcement action.

Antenna Application	GE MDS Part Number
WiFi (indoor direct connect), RP SMA, 2.4-2.5 GHz Antenna, 3.2dBi Gain	97-4278A34
WiFi (Magnetic Mount) 5 ft./1.52 m Cable, RP SMA Plug (accessory) use with above	97-4278A78
WiFi (outdoor external mount), Omni Ant. N M Term., 2.4-2.5 GHz, 2 dBi Gain	97-4278A48
Cell (direct connect), 960/2170/2700MHz 2dBi - SMA Paddle antenna (indoor)	97-2485A04
3G/4G Cellular (outdoor external mount, ground plane),960/2170/2700MHz 4.5 DBi, N-FEMALE	97-2485A05
900 MHz NX915 - 5/8-wavelength Omni Ant. with 16" coax to N-Female connector	97-3194A17

Warning: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC Class A Notice

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Modifications: Any modifications made to this device that are not approved by GE MDS LLC, Inc. may void the authority granted to the user by the FCC to operate this equipment.

Industry Canada Notice

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Servicing Precautions

When servicing energized equipment, be sure to wear appropriate Personal Protective Equipment (PPE). During internal service, situations could arise where objects accidentally contact or short circuit components and the appropriate PPE would alleviate or decrease the severity of potential injury. When servicing radios, all workplace regulations and other applicable

standards for live electrical work should be followed to ensure personal safety.

Manual Revision and Accuracy

This manual was prepared to cover a specific version of firmware code. Accordingly, some screens and features may differ from the actual unit you are working with. While every reasonable effort has been made to ensure the accuracy of this publication, product improvements may also result in minor differences between the manual and the product shipped to you. If you have additional questions or need an exact specification for a product, please contact GE MDS, using the information at the back of this guide.

In addition, manual updates can be found on our web site at www.gemds.com.

Environmental Information

The manufacture of this equipment has required the extraction and use of natural resources. Improper disposal may contaminate the environment and present a health risk due to hazardous substances contained within. To avoid dissemination of these substances into our environment and to limit the demand on natural resources, we encourage you to use the appropriate recycling systems for disposal. These systems will reuse or recycle most of the materials found in this equipment in a sound way. Please contact GE MDS or your supplier for more information on the proper disposal of this equipment.

Product Test Data Sheets

Test Data Sheets showing the original factory test results for this unit are available upon request from the GE MDS Quality Leader. Contact the factory using the information at the back of this manual. Serial numbers must be provided for each product where a Test Data Sheet is required.

CSA/US Notice

This product is approved for use in Class 1, Division 2, Groups A, B, C & D Hazardous Locations. Such locations are defined in Article 500 of the National Fire Protection Association (NFPA) publication NFPA 70, otherwise known as the National Electrical Code. The transceiver has been recognized for use in these hazardous locations by the Canadian Standards Association (CSA) which also issues the US mark of approval (CSA/US). The CSA Certification is in accordance with CSA STD C22.2 No. 213-M1987.

CSA Conditions of Approval: The transceiver is not acceptable as a stand-alone unit for use in the hazardous locations described above. It must either be mounted within another piece of equipment which is certified for hazardous locations, or installed within guidelines, or conditions of approval, as set forth by the approving agencies. These conditions of approval are as follows: The transceiver must be mounted within a separate enclosure which is suitable for the intended application. The antenna feedline, DC power cable and interface cable must be routed through conduit in accordance with the National Electrical Code. Installation, operation and maintenance of the transceiver should be in accordance with the transceiver's installation manual and the National Electrical Code. Tampering or replacement with non-factory components may adversely affect the safe use of the transceiver in hazardous locations and may void the approval. A power connector with screw-type retaining screws, as supplied by GE MDS, must be used.



Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. Refer to Articles 500 through 502 of the National Electrical Code (NFPA 70) for further information on hazardous locations and approved

Division 2 wiring methods.

Grounding Requirements

To minimize the chance of damage to the unit and connected equipment, a safety ground (NEC Class 2 compliant) is recommended which bonds the antenna system, chassis, power supply and connected data equipment to a *single-point* ground, keeping all ground leads as short as possible.

Normally, the unit is adequately grounded if the supplied flat mounting brackets are used to mount it to a well-grounded metal surface. If the unit is not mounted to a grounded surface, it is recommended that a safety ground wire be attached to one of the mounting brackets or a screw on the enclosure.

The use of a lightning protector is recommended where the antenna cable enters the building. Bond the protector to the tower/support ground, if possible. All grounds and cabling must comply with applicable codes and regulations