

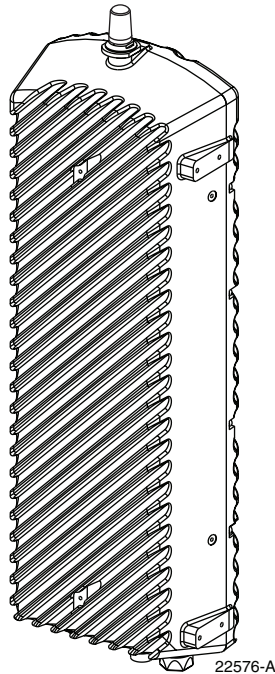


FlexWave™ Base Station System

2x1 microBTS

Installation Manual

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REVISION HISTORY

ISSUE	DATE	REASON FOR CHANGE
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LIST OF CHANGES

The technical changes incorporated into this issue are listed below.

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	-	Original release

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ABOUT THIS MANUAL

This publication provides a description of the FlexWave microBTS (Base Transceiver Station). Also provided are procedures for mounting and installing the microBTS. An overview of the FlexWave Base Station System (BSS), a description of the system components, the system turn-up and test procedures, and the system troubleshooting procedures are provided in other publications. The microBTS works in conjunction with the Base Station Controller (BSC).

RELATED PUBLICATIONS

Listed below are related manuals and their publication numbers. Copies of these publications can be ordered by contacting the ADC Technical Assistance Center at 1-800-366-3891, extension 73476 (in U.S.A. or Canada) or 1-952-917-3476 (outside U.S.A. and Canada).

Title	ADCP Number
ADC FlexWave BSS List of User Documentation	75-330
ADC FlexWave V3.1 BSS Overview	75-329
ADC FlexWave Base Station System Provisioning Guide	75-312
ADC FlexWave V3.1 Base Station System Configuration Guide	75-321
ADC FlexWave V3.1 BSS MIB Definitions	75-319
ADC FlexWave BSS nanoBTS OMC-R User Manual	75-331
ADC FlexWave SR3.1 BSS LCT Operations Guide	75-306
ADC FlexWave BSS BSC Configuration Utilities Guide	75-316

ADMONISHMENTS

Important safety admonishments are used throughout this manual to warn of possible hazards to persons or equipment. An admonishment identifies a possible hazard and then explains what may happen if the hazard is not avoided. The admonishments — in the form of Dangers, Warnings, and Cautions — must be followed at all times. These warnings are flagged by use of the triangular alert icon (seen below) and are listed in descending order of severity of injury or damage and likelihood of occurrence.



Danger: *Danger is used to indicate the presence of a hazard that **will** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*



Warning: *Warning is used to indicate the presence of a hazard that **can** cause severe personal injury, death, or substantial property damage if the hazard is not avoided.*



Caution: *Caution is used to indicate the presence of a hazard that **will** or **can** cause minor personal injury or property damage if the hazard is not avoided.*

GENERAL SAFETY PRECAUTIONS



Warning: *Wet conditions increase the potential for receiving an electrical shock when installing or using electrically-powered equipment. To prevent electrical shock, never install or use electrical equipment in a wet location or during a lightning storm.*

STANDARDS CERTIFICATION

1900 MHz microBTS Standards

FCC: The microBTS complies with the applicable sections of Title 47 CFR Part 24.

Caution: Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: To comply with Maximum Permissible Exposure (MPE) requirements, the maximum composite output from the antenna cannot exceed 1640 Watts EIRP and the antenna must be permanently installed in a fixed location that provides at least 6 meters (20 feet) of separation from all persons.

UL/CUL: The microBTS complies with NEMA Type 6, UL and CUL 50 Standard for Enclosures for Electrical Equipment.

The microBTS provides the degree of protection specified by IP67 as defined in IEC (International Electrotechnical Commission) Publication 60529.

This microBTS complies with UL and CUL 60950 and UL 50 as Communication Service Equipment under the DUZO category.

IC: The microBTS complies with the applicable sections of RSS-133. The term "IC:" before the radio certification number only signifies that Industry Canada Technical Specifications were met.

1800 MHz microBTS Standards

EU Harmonized Standards: Meets essential requirements of R&TTE 1999/5/EC.

- Article 3.1a – The protection of the health and the safety of the user and any other person, including the objectives with respect to safety requirements contained in Directive 72/23/EEC, but with no voltage limit applying.
- Article 3.1b – The protection requirements with respect to electromagnetic compatibility contained in Directive 89/336/EEC.
- Article 3.2 – In addition, radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communication and orbital resources so as to avoid harmful interference.

LIST OF ACRONYMS AND ABBREVIATIONS

The acronyms and abbreviations used in this manual are detailed in the following list:

AC	Alternating Current
AMR	Adaptive Multi-Rate
AWG	American Wire Gauge
BSC	Base Station Controller
BSS	Base Station System
BTS	Base Transceiver Station
C	Celsius
CUL	Canadian Underwriters Laboratories
DC	Direct Current
EDGE	Enhanced Data rates for GSM Evolution
EMS	Element Management System
ESD	Electrostatic Discharge
EU	European Union
F	Fahrenheit
FCC	Federal Communications Commission
GFCI	Ground Fault Circuit Interrupter
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
IEC	International Electrotechnical Commission
IC	Industry Canada
IP	Internet Protocol
LED	Light Emitting Diode
LNA	Low Noise Amplifier
LPA	Linear Power Amplifier
MHz	Megahertz
MPE	Maximum Permissible Exposure
MTBF	Mean Time Between Failure
NEM	Network Element Manager
NEMA	National Electrical Manufacturers Association
OMC-R	Operations and Maintenance Center - Radio
OSP	Outside Plant
POE	Power Over Ethernet
RF	Radio Frequency
RMA	Return Material Authorization
RX	Receive or Receiver
TAC	Technical Assistance Center
TRX	Transmit/Receive
UL	Underwriters Laboratories
VA	Volt Amps

VAC Volts Alternating Current
VDC Volts Direct Current

1 INTRODUCTION

The FlexWave 2x1 microBTS is an environmentally hardened outdoor base station solution that supports GSM/AMR voice traffic and GPRS/EDGE data traffic. An Internet Protocol (IP) backhaul provides the interface between the microBTS and the Base Station Controller (BSC). All voice and data traffic and all operation and maintenance functions are transported by the IP backhaul. A complete FlexWave Operations and Maintenance Center - Radio (OMC-R) management solution is available that provides total control of the microBTS, BSC, and other FlexWave system elements.

The microBTS, shown in [Figure 1](#), consists of an environmentally-sealed enclosure and various electronic modules that are housed within the enclosure. Excess heat is dissipated using a passive cooling system which eliminates the need for external cooling fans. The low profile design of the enclosure requires minimal real estate for installation. The enclosure may be mounted from a wall, pole, or overhead cable (strand). A separate base station antenna (not provided) mounts near the enclosure.

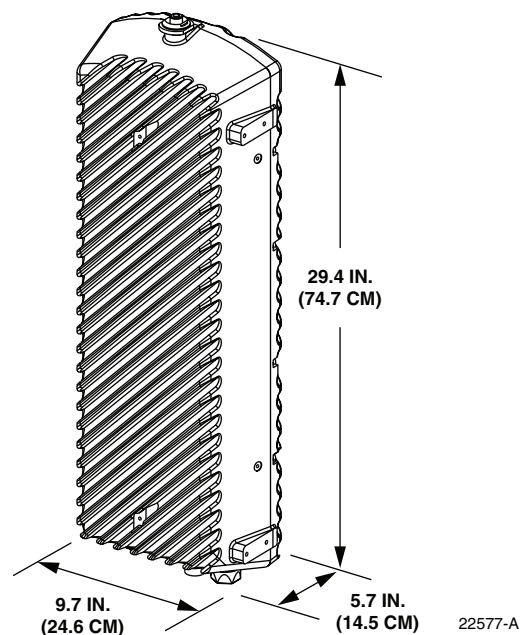


Figure 1. 2x1microBTS

2 MICROBTS DESCRIPTION

The 2x1 microBTS, supports or provides the following basic functions:

- Supports GSM/AMR voice traffic and GPRS/EDGE data traffic via two TRX units.
- Supports OMC-R functions including provisioning, alarm management, and performance management.
- Supports IP backhaul for voice and data traffic and OMC-R communications.

- Provides Power Over Ethernet (POE) to the IP backhaul device
- Provides an RF interface (antenna port) for the base station remote antenna.
- Provides an RF interface (antenna port) for the Network Listen antenna.
- Accepts AC power input.
- Provides a visual indication of unit status

2.1 Primary Components

The microBTS is a fully integrated base station solution that includes the following: radio transceivers (2), Linear Power Amplifier (LPA), RX Low Noise Amplifier (LNA), duplexer, power supply, IP switches, Network Listen unit, processor board, carrier board, and enclosure. The enclosure houses the electronic assemblies, controls RF emissions, seals out dirt and moisture, and provides passive cooling. The internal components are not user replaceable or accessible. The base station antenna cable connector, IP backhaul connector, AC power connector, and the unit status indicator are located on the bottom of the enclosure. The Network Listen antenna connector is located on the top of the enclosure.

2.2 Mounting

The microBTS may be mounted on a flat vertical surface (such as the side of a building), on a utility pole, or from a strand. A combination wall/pole mounting bracket is provided with each unit. Wall or pole-mount installation consists of securing the bracket to the mounting surface and then hanging the enclosure from the bracket. The bracket may be attached to a variety of surfaces such as wood, concrete, or masonry. Various fasteners including hex-head capscrews, tee-nuts, and concrete anchors are provided. A separate strand-mount kit (accessory item) is available if it is necessary to mount the microBTS from a cable. The microBTS should be mounted in a restricted access location only.

2.3 Fault Detection and Alarm Reporting

The microBTS detects and reports fault and alarm information. A single bottom-mounted Light Emitting Diode (LED) indicator turns from off to red if a major fault is detected. The status of the microBTS, the alarm state, and other fault information is summarized and reported over the IP backhaul. Fault and alarm information may be accessed using the FlexWave OMC-R management solution.

2.4 IP Backhaul Connection

The IP backhaul cable connection is through an Ethernet port that consists of a single bottom-mounted hardened RJ-45 female connector. The IP backhaul cable carries the voice and data traffic plus all OMC-R provisioning, alarm, and performance monitoring communications between the microBTS and the BSC. The IP backhaul connection also provides DC power (POE) to the IP backhaul device with a 15 Watt maximum power output at 48 VDC. The maximum drop cable length is 300 feet (91.4 m).

2.5 Network Listen Antenna Connection

The Network Listen antenna (depending on the option ordered) connection is through a single top-mounted NMO (female) RF connector. The Network Listen antenna attaches directly to the NMO connector.

2.6 Base Station Antenna Cable Connection

The base station antenna cable connection is through one 50-ohm N-type female connector. The microBTS includes an internal duplexer which allows a single antenna cable to carry both forward and reverse path RF signals between the base station antenna and the microBTS.

An externally-mounted lightning protector is available as an accessory. The surge/antenna connector on the lightning protector is an N-type female connector. The microBTS enclosure must be properly grounded for the lightning protector to function properly.

2.7 Powering

The microBTS is powered by 90 to 265 VAC (nominal 115 or 230 VAC), 47 to 63 Hz power. The AC power is supplied through a 15-foot three-wire power cable that is provided with the enclosure. The power cable connects to a mini 3-pin AC power connector mounted on the bottom of the microBTS enclosure. The power cable is rated for indoor or outdoor use and must **not** be placed within electrical conduit as this will impede the cooling of the cable during usage.

The stub end of the power cable must be routed to an external junction box (not provided) for connection to the AC power source. A circuit breaker rated at 15 Amps (150 VAC) should be used to provide overcurrent protection for the microBTS power circuit. It is also recommended that an external AC outlet (not provided) be installed near the microBTS enclosure to power test equipment and power tools.

2.8 Grounding

A grounding terminal (hex socket capscrew and washer) is provided on the bottom of the enclosure for connecting a grounding cable to the enclosure. A 1.5 meter #6 stranded copper wire terminated with a ring terminal is provided with the microBTS for linking the enclosure to an earth ground source.

2.9 Cooling

Passive cooling of the electronic assemblies is provided by conducting excess heat from the internal electronic components to the aluminum enclosure. The heat is then dissipated to the outside air by radiation and convection air flow over the enclosure's external cooling fins. An alarm is generated if a high temperature condition occurs within the enclosure.

2.10 User Interface

The microBTS user interface consists of the connectors, grounding lug, and LED that are provided on the exterior of the enclosure. The microBTS user interface points are indicated in [Figure 2](#) and described in [Table 1](#).

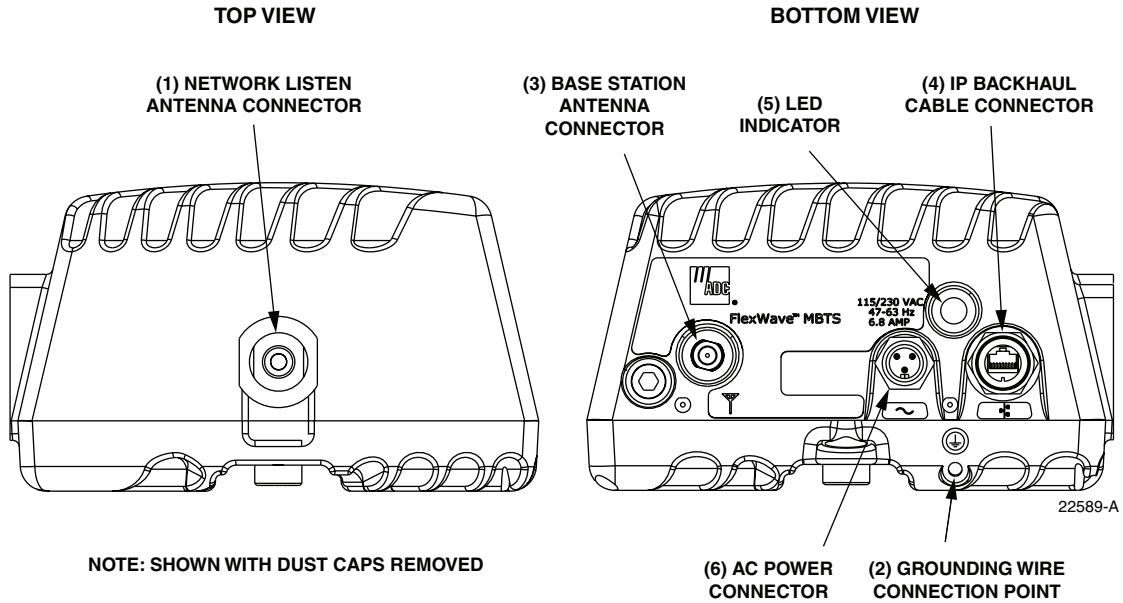


Figure 2. 2x1 microBTS User Interface

Table 1. 2x1 microBTS User Interface

REF NO	USER INTERFACE DESIGNATION	DEVICE	FUNCTIONAL DESCRIPTION
1	No designation	NMO female RF connector	Connection point for the Network Listen antenna.
2	Ground symbol	Threaded hole with hex socket screw	Connection point for the grounding wire.
3	Antenna symbol	N-type female RF coaxial connector	Connection point for the base station antenna cable.
4	Network symbol	Sealed RJ-45 female connector	Connection point for the IP backhaul cable.
5	No designation	Red LED (off/red)	Indicates if the microBTS is powered and normal (off) or if a major fault is detected (red).
6	115/230 VAC 47-63 Hz 6.8 AMP	Sealed 3-wire AC power connector	Connection point for the AC power cord.

2.11 Specifications

The specifications for the 2x1 microBTS are listed in [Table 2](#).

Table 2. 2x1 microBTS Specifications

PARAMETER	SPECIFICATION	REMARKS
Physical/Environmental/ Electrical		
Enclosure dimensions (L×W×D)	29.4 × 9.7 × 5.7 inches (747 × 246 × 145 mm)	0.94 cu. ft. (26.6 L)
Mounting	Wall, pole, or strand	Strand mounting requires an accessory mounting kit.
Weight	40 lbs (18.2 kg)	Without shields installed
Weather resistance (see Note 1)	NEMA-6, IEC IP67	Indoor or outdoor installation
Operating temperature	−30° to +55° C (−22° to +131° F)	
Storage temperature	−40° to +70° C (−40° to +158° F)	
AC power connector	Sealed 3-pin AC power	
Antenna cable connector	50 ohm N-type (female)	50 ohms input/output impedance
IP backhaul connector	Sealed RJ-45 (female)	Ethernet port
Power over Ethernet port	48 VDC with 15 Watt maximum	
Network Listen antenna connector	NMO (female)	
Lightning suppression (for antenna cable connector)	20 kA IEC 1000-4-5 8/20 μs waveform	Provided by external lightning protector (accessory)
Voltage input	90 to 265 VAC, 47 to 63 Hz	
Power consumption (maximum)	600 VA at 120 VAC	
Current rating (maximum)	6.8 Amps at 90 VAC	Requires 15 Amp circuit for 115 VAC operation
Downlink		
System bandwidth	60 MHz	
Frequency range for 1800 MHz	1805 – 1880 MHz	
Frequency range for 1900 MHz	1930 – 1990 MHz	
Out-of-band emissions	< −13 dBm per 1 MHz bandwidth from 30 MHz to 20 GHz	
Passband gain	21 dB	In addition to +13 dBm gain setting on each nanoBTS
Composite RF output power (maximum)	41.5 dBm (14.13 Watts) max at antenna port	40.5 dBm (11.22 Watts) for Industry Canada using two-tone method
Gain variation	± 3 dB over temperature and unit-to-unit	

Table 2. 2x1 microBTS Specifications, continued

PARAMETER	SPECIFICATION	REMARKS
Gain flatness Band flatness Channel flatness	± 1.5 dB across frequency range ± 1.0 dB across any 1.25 MHz channel	
Uplink		
Frequency range for 1800 MHz	1710 – 1785 MHz	
Frequency range for 1900 MHz	1850 – 1910 MHz	
RX sensitivity (CS-1 M)	<-110 dB	
RX sensitivity (MCS-1M)	< -110 dB	
RX sensitivity (MCS-5 M)	< -102 dB	

Note 1: The microBTS has been tested to assure it meets the dust and water resistance requirements of IP67 as specified by IEC Publication 60529. These tests were conducted using closure caps attached to the cable ports. To assure the dust and water resistance level is maintained, it is the responsibility of the user to select AC power, antenna, and IP backhaul cable assemblies that have a dust and water resistance level of IP67 or higher. If user is uncertain of cable manufacturers that meet this requirement, please contact ADC Technical Assistance.

3 ACCESSORY ITEMS

This section provides a description of the accessory items that are available separately for the microBTS. The accessory items may or may not be required depending on the application.

3.1 Strand Mount Kit

A strand-mount kit is available if the application requires that the microBTS be mounted from a horizontal cable system. Mounting pads are provided on the side of the enclosure for securing a pair of cable-attachment clips. Screws are used to secure the cable-attachment clips to the enclosure. All fasteners required for installation are provided with the kit.

3.2 Lightning Protector

An external lightning protector is available separately for the microBTS. It is recommended that a lightning protector be installed at the base station antenna port to reduce the chance of damage to electronic components should a lightning strike occur. The lightning protector surge/antenna port is an N-type female connector.

3.3 Solar Shields

A solar shield kit is available if the microBTS must be mounted in full sunlight for extended periods of time with extremely high ambient temperatures. The solar shields attach to the exterior of the microBTS enclosure and shade the enclosure from direct exposure to the sun. The solar shields are constructed of sheet metal and are painted to match the color of the enclosure. All fasteners and brackets required for installation are provided with the kit.

4 UNPACKING AND INSPECTION

This section provides instructions for opening the shipping boxes, verifying that all parts have been received, and verifying that no shipping damage has occurred. The basic microBTS includes the following items:

- microBTS enclosure
- Network Listen antenna
- Fasteners, cables, strapping, and mounting bracket as specified in [Table 3](#), [Section 5](#), and [Table 4](#), [Section 6](#).

The following accessories may also be shipped with the microBTS:

- Strand mount kit
- Lightning protector
- Shields

Use the following procedure to unpack and inspect the microBTS components:

1. Open the shipping cartons and carefully unpack each component from the protective packing material.
2. Check each component for broken or missing parts. If there are damages, contact ADC (see [Section 7](#)) for an RMA (Return Material Authorization) and to reorder if replacement is required.

5 MOUNTING PROCEDURES

This section provides instructions for mounting the FlexWave microBTS. The microBTS may be secured to an interior or exterior wall, attached to a utility pole, or attached to a horizontal cable (strand-mount). Mounting the microBTS from a cable requires an accessory kit not included with the unit.

5.1 Before Mounting the microBTS

5.1.1 Mounting Considerations

Before mounting the microBTS, verify that the installation site is in conformance with the system design plan (not documented here). If a system design plan has not been prepared, consult the Wireless Technical Assistance Center (TAC) for technical assistance (see [Section 7](#)). The site chosen must conform to all local codes and any permits required must be obtained prior to the start of mounting. The location must be accessible and provide adequate parking for worker and vehicle safety. The installed unit must not create a visual or physical obstruction to vehicular or pedestrian traffic or block pole-climbing access.

► **Note:** The microBTS is intended for restricted access locations only.

The microBTS must be located as specified in the system design plan and must have ready access to the specified AC power source. The site must provide adequate ventilation and must comply with the unit environmental specifications. A minimum of **18 inches** of clearance must be provided on all sides (except the back) of the enclosure to allow free air circulation. In addition, the bottom (cable entry end) and **either** the top, the front, or one of the sides **must be open to free air space**. Adequate clearance must be allowed at the bottom of the enclosure to provide access for attaching cables and for viewing the LED indicator.

5.1.2 Mounting Hardware Provided With the microBTS

The microBTS is shipped with the mounting hardware required for a typical wall-mount or pole-mount installation. [Table 3](#) lists the mounting hardware provided. Additional hardware may have to be provided by the installer depending on the site requirements.

Table 3. microBTS Mounting Hardware and Fasteners

ITEM	QUANTITY
Hoist ring	1
Hoist ring mounting screws	2
Mounting bracket	1
Strapping	2
3/8-inch concrete anchors	4
3/8 x 1-inch cap screws	4
3/8 x 1.5-inch lag screws	4

Table 3. microBTS Mounting Hardware and Fasteners, continued

3/8-inch flat washers	4
3/8-inch lock washers	4
5/16 x1.25-inch cap screw	1
5/16-inch flat washer	1
5/16-inch lock washer	1
5/16-inch nut	1

5.1.3 2x1 microBTS Dimensions

The basic dimensions of the 2x1 microBTS are shown in [Figure 3](#).

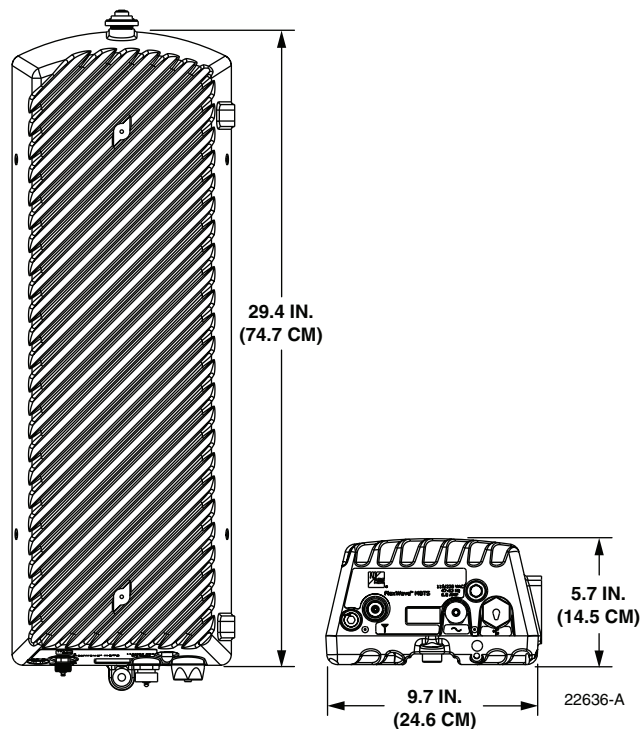


Figure 3. 2x1 microBTS Dimensions

5.1.4 Tools and Additional Materials Required For Mounting

The tools and any additional materials required for mounting the 2x1 microBTS are dependent on the mounting system. The following sections list the tools required for the various mounting systems.

Wood-Framed Wall Mounting

- 9/16-inch wrench
- 1/2-inch wrench (2)
- Torque wrench with 3/16-inch hex key socket
- Drill
- Pencil or marker
- 4 foot x 2 foot sheet of pressure-treated 3/4-inch plywood
- Fasteners and tools for securing the 3/4-inch plywood to wall
- 3/16-inch standard drill bit

Masonry Wall Mounting

- 9/16-inch wrench
- 1/2-inch wrench (2)
- Torque wrench with 3/16-inch hex key socket
- Drill
- Pencil or marker
- 5/8-inch masonry drill bit

Wooden Utility Pole Mounting

- 9/16-inch wrench
- 1/2-inch wrench (2)
- Torque wrench with 3/16-inch hex key socket
- Drill
- Pencil or marker
- 3/16-inch standard drill bit

Metal Utility Pole Mounting

- Clamp banding tool (BT1HT from Panduit)
- 1/2-inch wrench (2)
- Torque wrench with 3/16-inch hex key socket

5.2 Lift Ring Installation

A lift ring is provided with the microBTS. Secure the lift ring to the side of the enclosure as shown in [Figure 4](#) using the two 5/8-inch long 1/4-20 socket head screws and two 1/4-inch split washers provided. Use a torque wrench with a 3/16-inch hex key socket to tighten the cap screws to 40 – 45 lbs/force-inches (4.5 to 5.1 Nm) of torque. Do not overtighten. If the threads show signs of damage, yielding, or stripping when tightening the cap screws, discontinue lift ring installation and remove the lift ring. Always use appropriate lifting equipment when hoisting the enclosure into position for mounting. Remove the lift ring after the enclosure has been mounted.

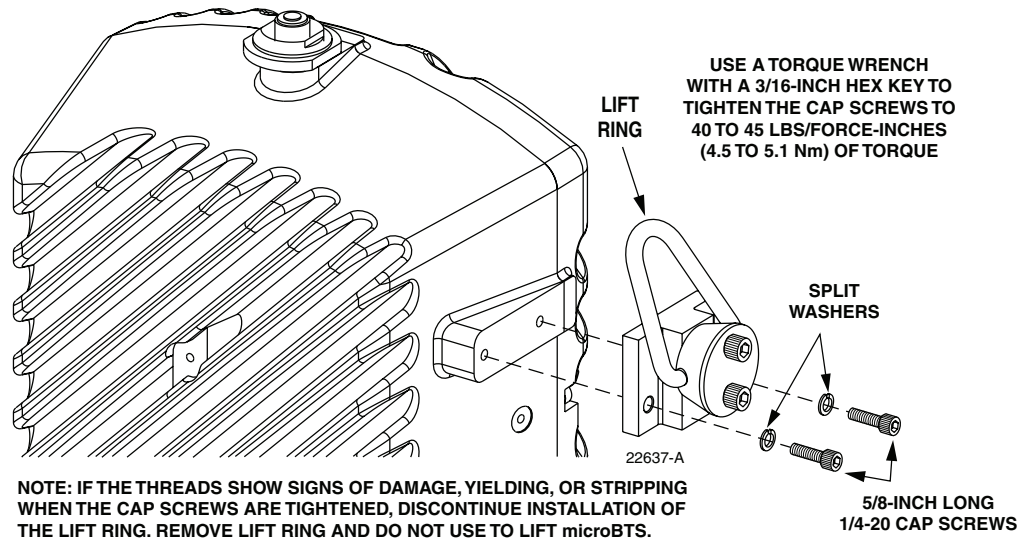


Figure 4. Hoist Ring Installation

5.3 Standard Mounting Bracket Installation

A standard mounting bracket is provided with each enclosure. The standard mounting bracket may be mounted **vertically or horizontally**. If mounted horizontally, it is recommended that the bracket be oriented so the enclosure cooling fins will face upward or to the side with respect to the ground. The following sections provide instructions for installing the standard mounting bracket on a wood-framed wall, masonry wall, wooden utility pole, or metal pole. Refer to the procedure that applies to the installation.

5.3.1 Wood-Framed Wall Mounting

When mounting the enclosure on a wood-framed wall, it is recommended that pressure-treated plywood with a minimum thickness of 0.75-inch (19.0 cm) be used as a backer board. The backer must be firmly secured to the interior framing of the wall. Use the following procedure to install the standard mounting bracket on a wood-framed wall:

1. Mount the plywood backer (not-provided) on the wall and firmly secure it to the wall's interior studs.
2. Hold the enclosure mounting bracket in position for installation on the plywood backer as shown in [Figure 5](#). The end with the V-notch should be at the top.

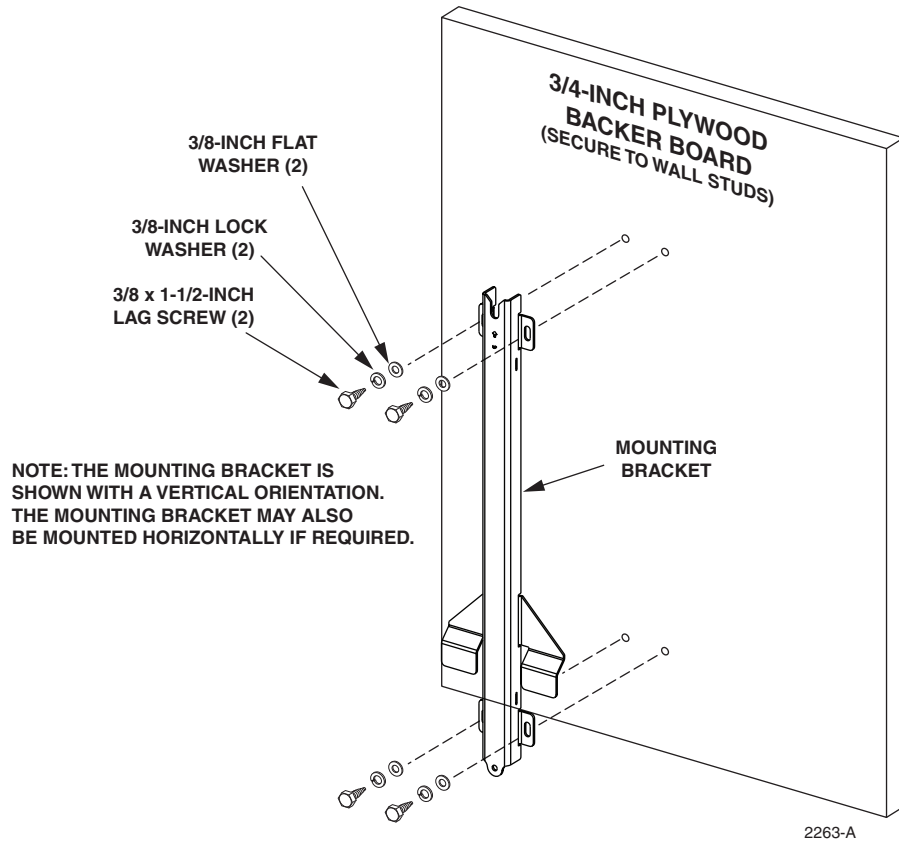


Figure 5. Secure Standard Mounting Bracket To Plywood Backer

3. Mark the location of the mounting bracket's two mounting holes on the plywood backer.
4. Drill a 3/16-inch hole in the backer board at each of the locations marked in step 3.
5. Locate the two 3/8 x 1-1/2-inch lag screws (provided with the enclosure) and place a 3/8-inch lock washer and 3/8-inch flat washer on each screw.
6. Secure the mounting bracket to the plywood using the screws and washers prepared in step 5. Tighten screws until bracket is securely attached to the plywood.
7. Hang the enclosure from the mounting bracket as described in [Section 5.4](#).

5.3.2 Masonry Wall Mounting

When mounting the enclosure on a masonry surface, locate the mounting anchors as close as possible to the center of any bricks or blocks, especially the upper anchors. Use the following procedure to install the standard mounting bracket on a masonry wall:

1. Hold the enclosure mounting bracket in position for installation on the masonry wall as shown in Figure 6. The end with the V-notch should be at the top.
2. Using a pencil, mark the location of the mounting bracket's two mounting holes on the wall.
3. Drill holes in the wall (at the locations marked in step 2) that are the correct diameter for the type of anchors being used. The recommended hole size for the ADC-provided concrete anchors is 5/8-inch (15.9 mm).
4. Set the anchors in the wall.

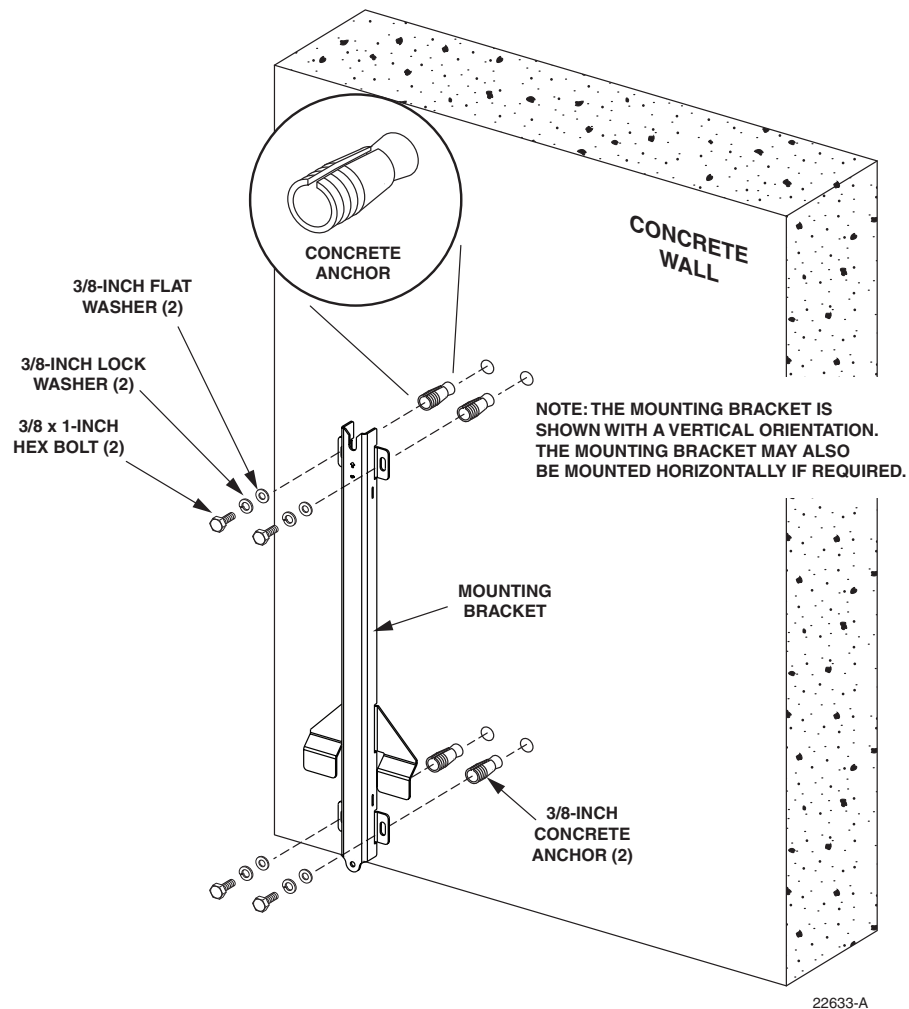


Figure 6. Secure Standard Mounting Bracket to a Masonry Wall

5. Locate the two 3/8 x 1-inch cap screws (provided with enclosure) and place a 3/8-inch lock washer and 3/8-inch flat washer on each screw.
6. Place the mounting bracket in position for mounting on the wall and then thread the 3/8 x 1-inch cap screws (with installed washers) into the two anchors. Tighten cap screws until secure.
7. Hang the enclosure from the mounting bracket as shown in [Section 5.4](#).

5.3.3 Wooden Utility Pole Mounting

When mounting the enclosure from a wooden utility pole, make sure the pole is sound and has not been damaged or weakened by decay. Use the following procedure to install the standard mounting bracket on a wooden utility pole:

1. Hold the enclosure mounting bracket in position for installation on the wooden pole as shown in [Figure 7](#). The end with the V-notch should be at the top.
2. Using a pencil, mark the location of the mounting bracket's two mounting holes on the pole.
3. Mark the location of the mounting bracket's two mounting holes on the wooden pole.

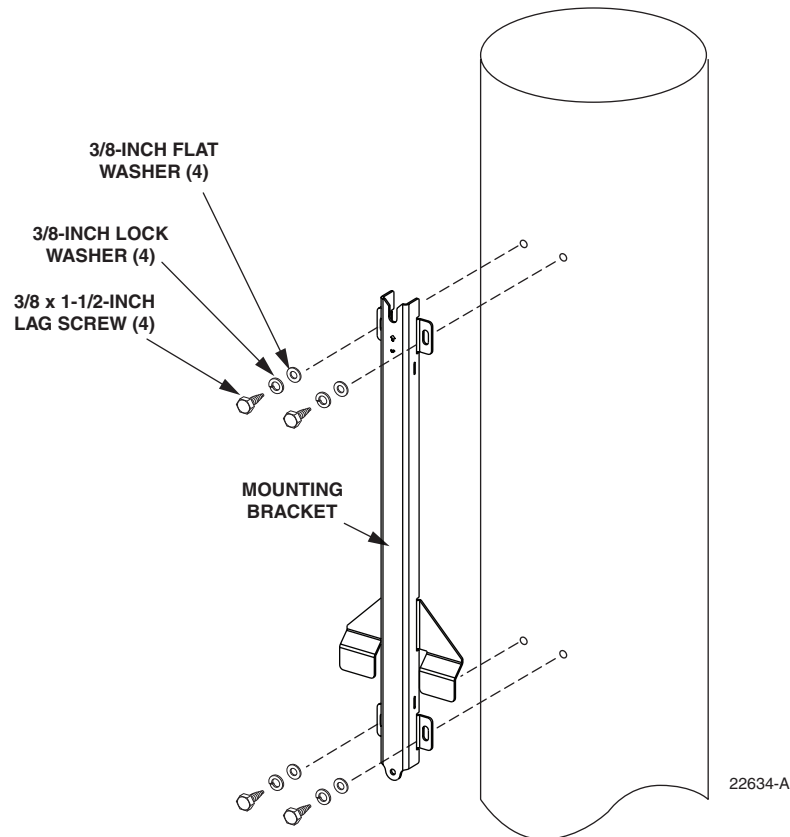


Figure 7. Secure Standard Mounting Bracket to a Wooden Pole

4. Drill a 3/16-inch hole in the utility pole at each of the locations marked in step 3.
5. Locate the two 3/8 x 1-1/2-inch lag screws (provided with the enclosure) and place a 3/8-inch lock washer and 3/8-inch flat washer on each screw.
6. Secure the mounting bracket to the pole using the screws and washers prepared in step 5. Tighten screws until bracket is securely attached to the plywood.
7. Hang the enclosure from the mounting bracket as shown in [Section 5.4](#).

5.3.4 Metal Utility Pole Mounting

Stainless steel strapping is provided for securing the mounting bracket to a cylindrical object (such as a metal utility pole) that cannot be pierced with a screw or bolt. A special tool (Panduit BT1HT) is required to properly secure and tension the strapping. Use the following procedure to install the mounting bracket on a metal utility pole:

1. Insert the two sections of stainless steel metal strapping (provided with the enclosure) through the slots in the mounting bracket and place in position for mounting as shown in [Figure 8](#). The end with the V-notch should be at the top.

► **Note:** Two sections of stainless steel metal strapping are provided with the enclosure. If additional strapping is required, use 5/8-inch wide 304 AISI stainless steel strapping with a minimum tensile strength of 700 lbs force.

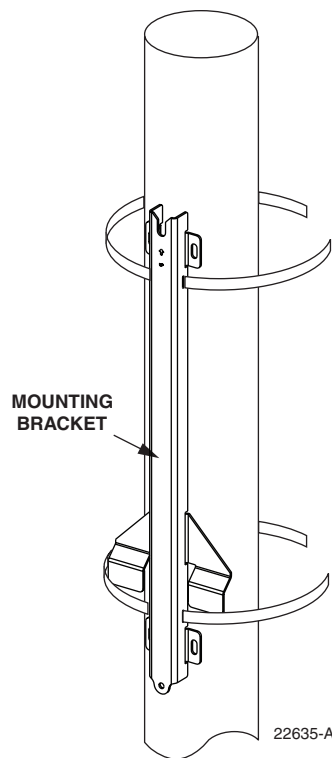


Figure 8. Secure Standard Mounting Bracket To a Metal Pole

2. Wrap the top section of strapping around the pole and secure using Panduit tool # BT1HT. Adjust the tool tension setting to #7. Follow the instructions provided with the tool by the tool manufacturer (see MS Strapping Tool Operation Instructions PA24808A01).
3. Repeat step 2 for the bottom section of strapping.
4. Hang the enclosure from the mounting bracket as shown in [Section 5.4](#).

5.4 Installing the Enclosure on the Standard Mounting Bracket

Use the following procedure to install the microBTS on the standard mounting bracket.

1. Hang the enclosure from the mounting bracket as shown in [Figure 9](#). The shoulder screw in the rear side of the enclosure fits into the notch at the top of the mounting bracket.

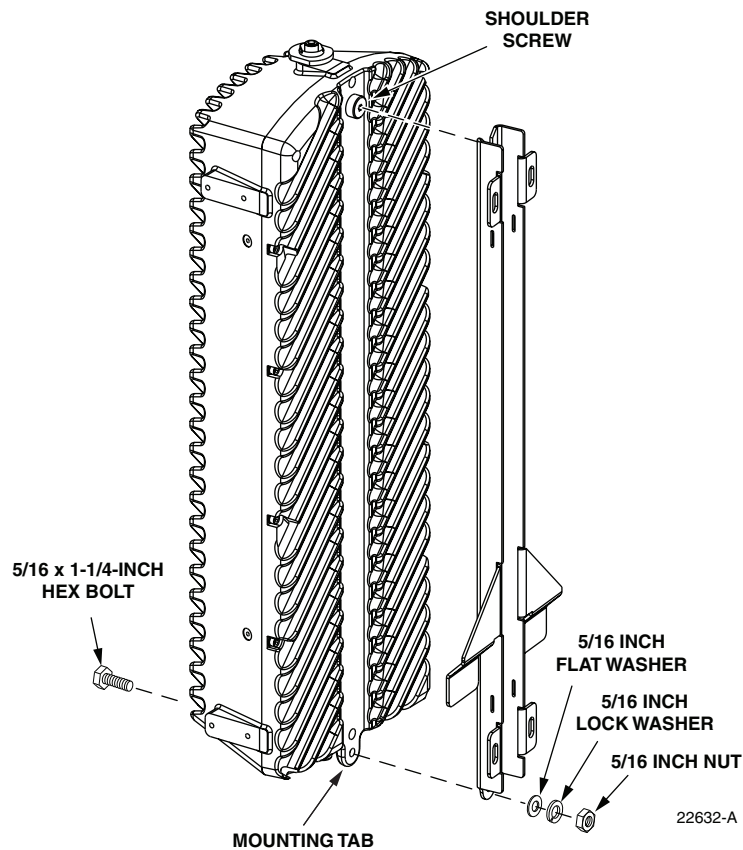


Figure 9. Secure Enclosure To Mounting Bracket

2. Insert a 5/16 x 1-1/4-inch hex bolt through the hole in the mounting tab located at the bottom of the enclosure.
3. Place a 5/16-inch flat washer and 5/16-inch flat washer on the hex bolt.
4. Thread a 5/16-inch nut onto the hex bolt and tighten securely.

5.5 Strand-Mount Installation

An accessory kit is available for mounting the microBTS enclosure from an overhead wire or strand. The strand-mount kit can accommodate wire cable that ranges in size from 0.25 to 0.625 inches in diameter. A minimum break strength of 4400 lbs. is recommended. Stainless steel cable is preferred.

An installation drawing is provided with each strand-mount kit. Follow the instructions provided on the drawing when installing the strand-mount kit. For all strand-mount installations, form a drip-loop in the cables entering the enclosure.

6 INSTALLATION PROCEDURES

This section provides procedures for installing the Network Listen antenna; connecting the grounding, base station antenna, IP backhaul, and AC power cables; and installing the shields. Installation of the microBTS may proceed separately from the installation of the corresponding BSC. When the installation of the microBTS is completed, refer to the appropriate manuals (see Related Publications section) for the system turn-up and test procedures.



Danger: *Wet conditions increase the potential for receiving an electrical shock when installing or using electrically-powered equipment. To prevent electrical shock, never install or use electrical equipment in a wet location or during a lightning storm.*

6.1 Installation Overview

Installation of the microBTS consists of the following basic steps:

- ▶ **Note:** To insure that all connectors and ports remain dust-free during installation, leave all dust caps and dust protectors in place until directed to remove them.
 - ▶ **Note:** If the microBTS will be horizontally mounted, provide drip loops for all cables that connect to the enclosure.
1. Connecting a grounding cable to the microBTS grounding point.
 2. Installing the Network Listen antenna.
 3. Connecting the IP backhaul cable.
 4. Connecting the base station antenna coaxial cable to the microBTS antenna port.
 5. Installing the AC power cable and connecting it to the microBTS power port.
 6. Installing the shields.

6.1.1 Installation Hardware Provided with microBTS Enclosure

The installation hardware that **is provided** with the microBTS is listed in [Table 4](#).

Table 4. microBTS Installation Hardware

ITEM	QUANTITY
M8 x 10 hex socket capscrew (for grounding cable)	1
M8 washer (for grounding screw)	1
Grounding cable (1.5 m)	1
AC Power Cable (15 feet)	1
Network Listen antenna	1

6.1.2 Tools and Materials Required

The following tools are required in order to complete the procedures in this instruction:

- #6 metric socket key or 7/32-inch hex key wrench
- Wire cutters
- Wire stripper
- Compression pliers for splicing grounding cable
- Tools for installing exterior AC circuit
- Tool kit for attaching N-type connectors to coaxial cable

The following materials are required in order to complete the installation procedures:

- #6 AWG (4 mm) copper wire and splice
- Connector for attaching #6 grounding wire to approved earth ground source
- Junction box, conduit, fasteners, connectors, and wire to install a 120/240 Volt, 15 Amp, exterior AC circuit.
- N-type male connector

6.2 Ground Wire Installation

A hexagon socket-head capscrew is provided on the underside of the cabinet for attaching a #6 copper grounding wire to the enclosure. A 1.5 meter long #6 AWG copper wire terminated with a ring terminal is provided for connecting the enclosure to an approved grounding source. Use the following procedure to install the grounding wire:



Caution: *For proper and safe equipment operation, an approved earth ground connection must be provided. The recommended minimum wire size is #6 AWG copper wire.*

1. Locate the 1.5 m #6 AWG (4 mm) copper grounding wire provided with the microBTS enclosure.
2. Locate the grounding point provided on the underside of the enclosure as shown in [Figure 10](#).
3. Remove the socket-head capscrew and flat washer from the enclosure using a #6 metric key or a 7/32-inch hex key wrench.
4. Secure the ring terminal end of the grounding wire to the enclosure using the screw and washer removed in step 3. Tighten securely.
5. Route the free end of the grounding wire to an approved earth ground source.
6. Cut the ground wire to length and connect it to the earth ground source as specified by local code or practice.

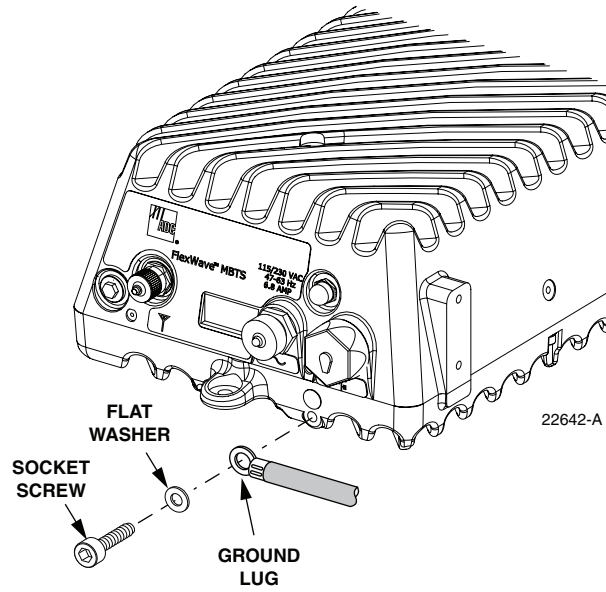


Figure 10. Connecting Grounding Cable to Enclosure

6.3 Network Listen Antenna Installation

The microBTS is shipped with either a Network Listen antenna. Install the antenna by threading it onto the NMO connector located on the top of the microBTS as shown in Figure 11. Tighten antenna by hand until secure.

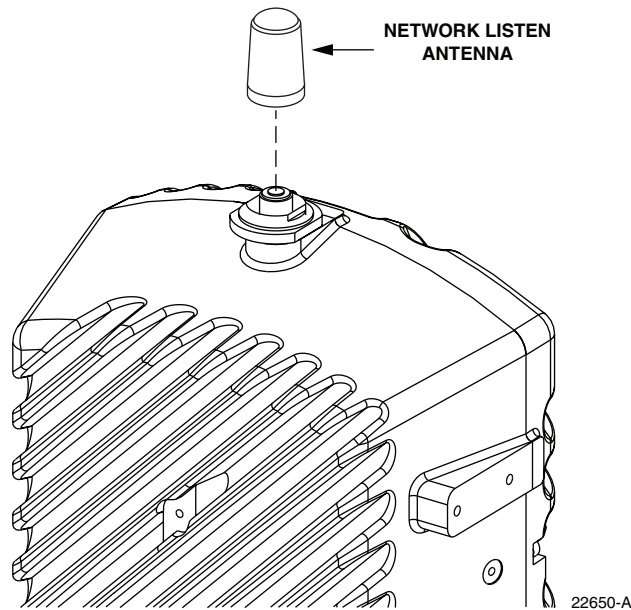


Figure 11. Network Listen Antenna Installation

6.4 IP Backhaul Cable Installation

A backhaul cable must be routed from the backhaul device to the microBTS enclosure. The backhaul cable must be terminated with a hardened RJ-45 male connector for connection to the microBTS backhaul port. The maximum cable length is 300 feet (91.4 m).

Use the following procedure to install the backhaul cable:

1. Remove the dust cap from the RJ-45 connector located at the bottom of the enclosure as shown in [Figure 12](#).
2. Route the backhaul cable from the backhaul device to the underside of the enclosure.
3. Align the plug end of the RJ-45 cable connector with the RJ-45 port receptacle and then insert the cable plug into the port receptacle.
4. Slide the connector nut up to the port until it engages the connector locking mechanism.
5. Tighten the connector nut in a clockwise direction (if necessary, use a wrench or pliers to grip the connector nut) until it snaps past the detent position and locks into place.

► **Note:** It may be necessary to apply 30 to 50 lbs/force-inches (3.4 to 5.6 Nm) of torque to the connector nut in order to turn it past the detent position.

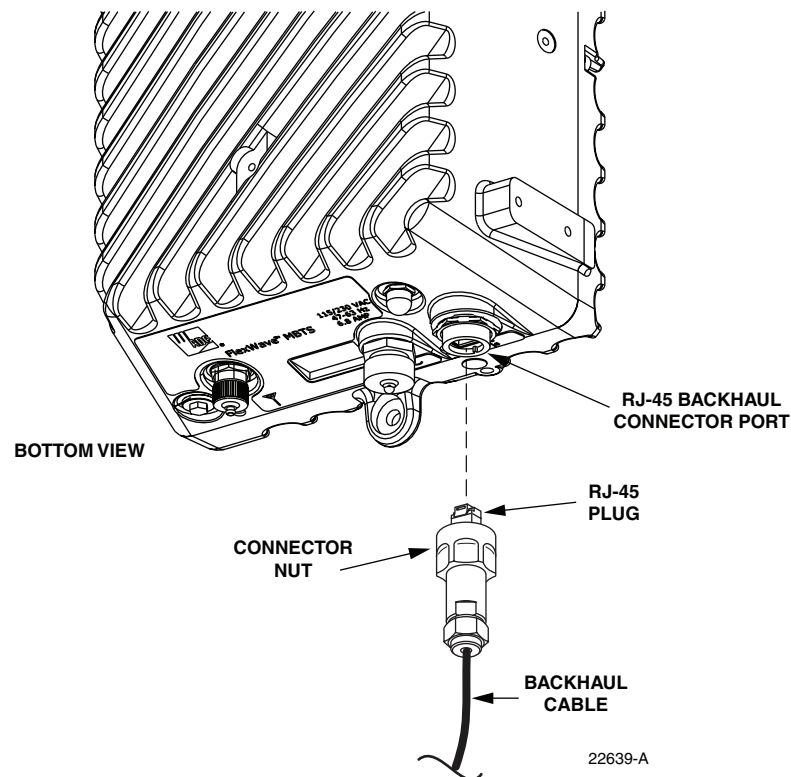


Figure 12. IP Backhaul Cable Installation

6.5 Base Station Antenna Cable Installation

A coaxial antenna cable must be routed from the base station antenna to the microBTS enclosure. The cable must be terminated with an N-type male connector for connection to the microBTS antenna port or the lightning protector (accessory).

- ▶ **Note:** To comply with Maximum Permissible Exposure (MPE) requirements, the maximum composite output from the antenna cannot exceed 1640 Watts EIRP and the antenna must be permanently installed in a fixed location that provides at least **6 meters** (20 feet) of separation from all persons.

Use the following procedure to install the antenna cable(s):

1. Remove the dust cap from the N-type female connector located on the underside of the enclosure as shown in [Figure 13](#).
2. If specified, connect a lightning protector (accessory) to the antenna port.
3. Route the coaxial antenna cable from the base station antenna to the underside of the enclosure.
4. Cut the antenna cable to the required length and terminate with an N-type male connector.
5. Connect the antenna cable to the lightning protector or to the antenna port.

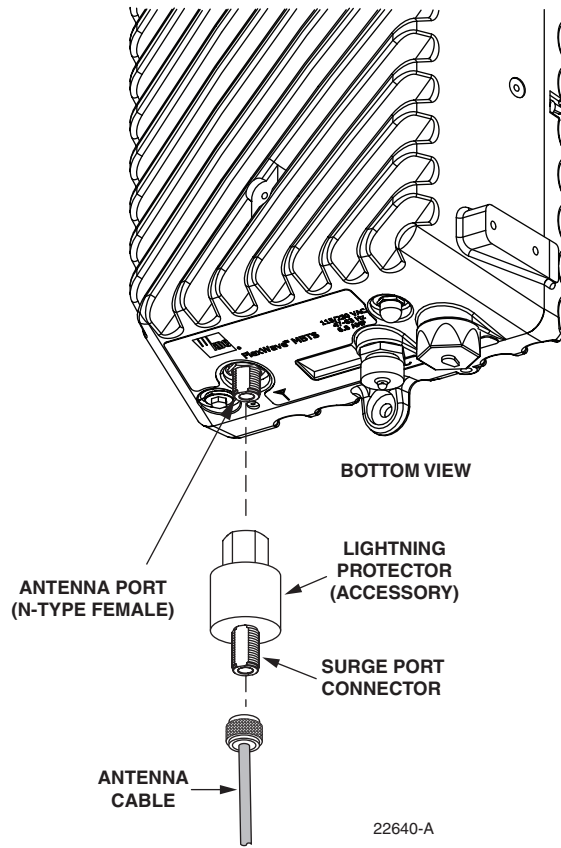


Figure 13. Connecting Base Station Antenna Cable to Antenna Port

6.6 AC Power Wiring Installation

A 15-foot connectorized 3-wire cable (also available in lengths of 40, 60, or 100 feet) is provided for the AC power connections. The connectorized end of the cable connects to the AC power port located on the bottom of the enclosure. The stub end of the cable must be routed to an external junction box (not provided) for permanent connection to the AC power system wiring.

- ▶ **Note:** It is recommended that an AC outlet be installed near the enclosure for powering tools and test equipment. This outlet must include a GFCI device for protection.

The AC power source must supply 120 or 240 VAC, 50 or 60 Hz, single-phase power through a 15 Amp circuit breaker. The AC power cable provides three wire leads for line, neutral, and ground connections. The power cable is rated for indoor or outdoor use and must not be placed within electrical conduit as this will impede the cooling of the cable during usage. The electrical junction box and any conduit, wire, and fittings required must be provided by the installer.

- ▶ **Note:** All electrical work must comply with local codes and requirements. A locally licensed electrical contractor is best qualified to perform this work. For additional information, consult with the ADC Technical Assistance Center.



Danger: Use extreme caution when working with high voltage AC power. Ensure all power is disconnected before working on power circuits.

Use the following procedure to install the AC power wiring:

1. Locate the AC power cable that is provided separately with the enclosure.
2. Route the power cable between the AC power port, located on the underside of the enclosure and the nearest AC power junction box as shown in [Figure 14](#). It may be necessary to install a new junction box if an existing junction box is not available.

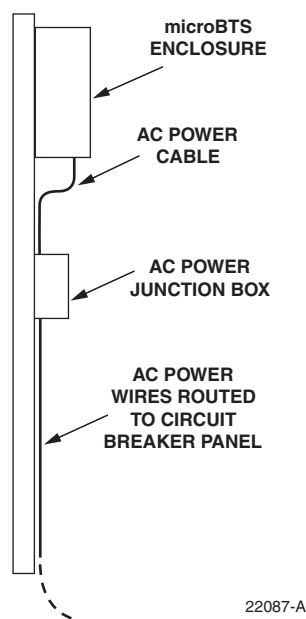


Figure 14. Typical AC Power Cable Routing

3. Secure the cable between the AC power port and the AC power junction box per local practice. Leave sufficient slack in the cable to allow it to be easily connected and disconnected from the AC power port.
- ▶ **Note:** The power cable is rated for indoor or outdoor use and must not be placed within electrical conduit as this will impede the cooling of the cable during usage. The cable run distance to the AC power source must not exceed 100 feet.
4. Install any AC power supply wires that may be required between the AC junction box and the AC circuit breaker box.
- ▶ **Note:** It is recommended that an AC outlet be installed near the enclosure for powering tools and test equipment. This outlet must include a GFCI device for protection.
5. Connect the AC power cable wires to the AC power supply wires. Refer to [Figure 15](#) to identify the color code and wire designations.

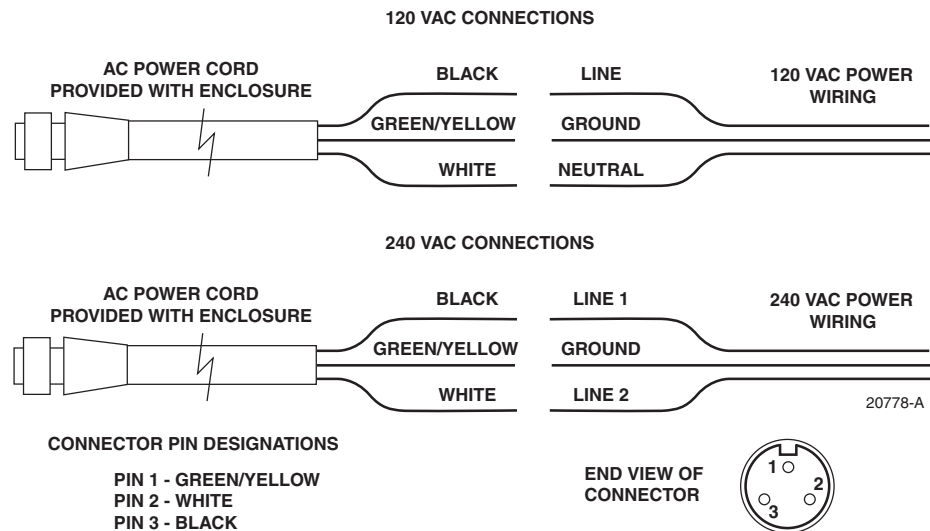


Figure 15. AC Power Cable Connections

6. At the AC circuit breaker box, connect the AC power supply load wires to a 15 Amp circuit breaker.
7. Place the circuit breaker in the ON position and then test the connectorized end of the AC power cable for proper voltage levels and correct polarity.
8. When testing is complete, place the circuit breaker in the OFF position.
9. Remove the dust cap from the AC power port located on the bottom of the enclosure as shown in [Figure 16](#).



Danger: While trying to connect the AC power cable to the remote unit AC power port, it is possible for the line terminal on the cable connector to contact the ground pin on the power port. If the AC cable is energized, this will result in a direct short to ground for the AC power. To avoid possible personal injury and equipment damage, always turn the AC power **off** before connecting the AC power cable to the AC power port.

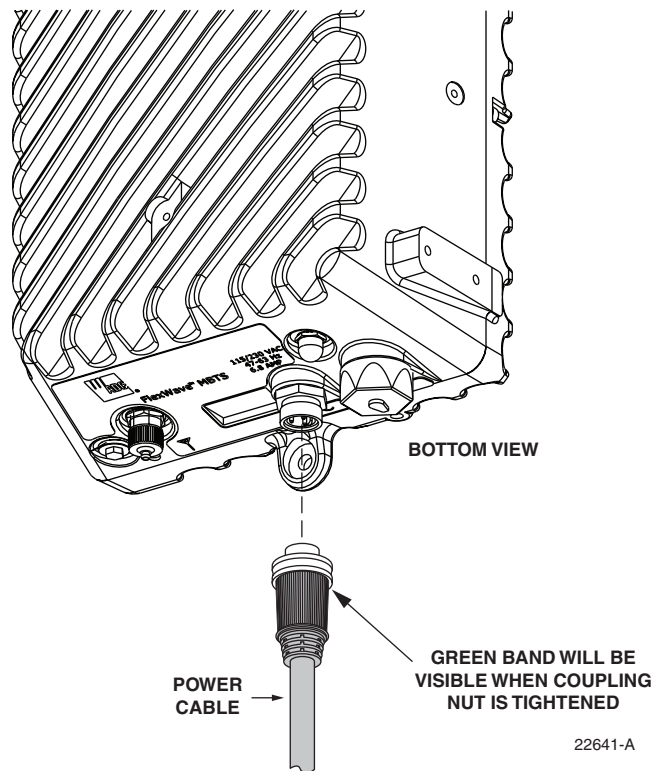


Figure 16. Connecting AC Power Cable to Enclosure

10. Connect the power cable connector to the AC power port.
11. Tighten coupling nut until the green band at the top of the connector body is visible.

6.7 Touch-Up Painting

A brush-in-cap type bottle of paint (ACE-ACC-PTLAMD) is available for touching-up nicks and scratches in the factory coat of paint. Lightly sand the area to be painted and then clean it thoroughly to remove dirt, dust, or foreign matter. Shake the paint bottle until thoroughly mixed and then apply a light coat of paint to the damaged area using the small brush attached to the cap. Wait until the paint is dry and apply a second coat if necessary. When finished painting, replace the paint bottle cap and tighten securely.

6.8 Power-Up and Testing

When the installation is complete, refer to the applicable publications for the system turn-up and test procedures. To verify that the microBTS is ready to be placed into service, place the AC breaker in the closed (on) position and observe the LED indicator light on the bottom of the enclosure. The LED indicator should turn **red** immediately following power-up. The LED will continue to stay red for up to 30 minutes following the initial power-up during which time the microBTS will synchronize with an external clock source. When the microBTS timing has been synchronized, the LED will turn off.

6.9 microBTS Replacement

The microBTS enclosure contains no user-replaceable or field-serviceable components. Failure of any internal component will require replacement of the entire unit. The enclosure mounting hardware, the various cables, and any attached antenna systems may be reused with the replacement unit. **Opening the microBTS enclosure for any reason may cause the product warranty to be null and void.**

7 CUSTOMER INFORMATION AND ASSISTANCE



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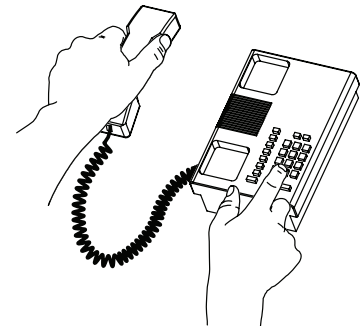
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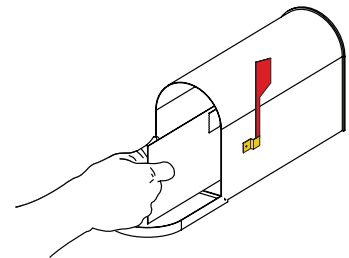
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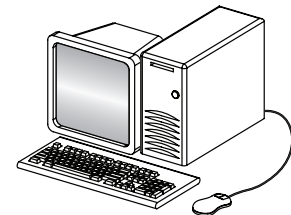
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