



WESTERN
Multiplex

INSTALLATION AND MAINTENANCE MANUAL



SONET/SDH WIRELESS BRIDGES
(5.3/5.8 GHz UNII / LE-LAN)



Regulatory Notice

Changes or modifications not expressly approved in writing by Western Multiplex may void the user's authority to operate this equipment.

Shielded cables and I/O cords must be used for this equipment to comply with the relevant FCC regulations.

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 not installed and used in accordance with the instruction manual, 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.

This device must be installed professionally.

1. How to Use This Manual

1.1 Manual Organization

1.2 Icons

1.3 IMPORTANT SAFETY INSTRUCTIONS

This product is intended to be installed, used and maintained by experienced telecommunications personnel only.

This product has been evaluated to the U.S. and Canadian (Bi-National) Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2, No. 950-95 * UL 1950, Third Edition, including revisions through revision date March 1, 1998, which are based on the Fourth Amendment to IEC 950, Second Edition. In addition, this product was also evaluated to the applicable requirements in UL 1950, Annex NAE.

WARNING - This unit is intended for installation in a Restricted Access location in accordance with Articles 110-18, 110-26, and 110-27 of the United States National Electric Code ANSI/NFPA 70.

This equipment should be installed in accordance with Article 810 of the United States National Electrical Code.

When installed, this equipment is intended to be connected to a Lightning/Surge Protection Device that meets all applicable national Safety requirements. **TO AVOID INJURY, RISK OF FIRE, AND DAMAGE, DO NOT CONNECT THIS PRODUCT DIRECTLY TO AN ANTENNA, AND ENSURE THAT PROPER LIGHTNING ISOLATION IS ALSO PROVIDED BETWEEN THIS UNIT AND OTHER EQUIPMENT.**

Equipment is to be used and powered by the type of power source indicated on the marking label only.

This product is intended to be connected to a ± 48 VDC power source which must be electrically isolated from any ac sources and reliably earthed. Only a DC power source that complies with the Safety Extra Low Voltage (SELV) requirements in the Standard for the Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2, No. 950-95 * UL 1950, Third Edition, can be used with this product. A 15-Amp circuit breaker is required at the power source. In addition, an easily accessible disconnect device should be incorporated into the facility wiring. Always use copper conductors only for all power connections.

WARNING - This equipment is intended to be earthed. If you are not using the power supply provided by Western Multiplex, you will need to connect the earthing conductor of your power source to the earthing terminal located on the back of the unit; or, connect an earthing conductor between the unit's earthing terminal and your earthing point. See III. for instructions. For safe

operation, always ensure that the unit is earthed properly as described in this manual and per Figure 1-1.

Do not connect or disconnect the power cable to the equipment when the other end of the cable is connected to the dc power supply.

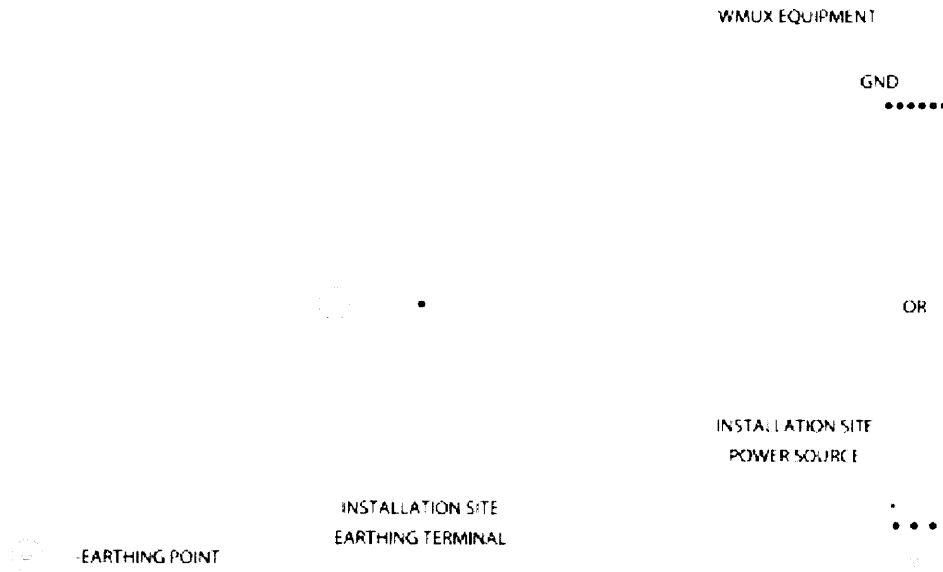


Figure 1-1: Proper Earthing/Grounding

Servicing of this product should be performed by trained personnel only. Do not disassemble this product. By opening or removing any covers you may expose yourself to hazardous energy parts. Incorrect re-assembly of this product can cause a malfunction, and/or electrical shock when the unit is subsequently used.

Do not insert any objects of any shape or size inside this product while powered. Objects may contact hazardous energy parts that could result in a risk of fire or personal injury.

Do not spill any liquids of any kind on or inside this product.

Side openings are provided for ventilation. To protect this product from overheating, do not cover or block any of the openings.

Always ensure that sufficient amount of space is provided above and below this product.

This product can be installed in a standard 19 inch rack. Check the size and clearance requirements for this product and ensure that enough clearance is provided for installation. Considerations should be given to the mechanical loading of the rack and the equipment to avoid potential hazards.

If this product is to be powered from the same source as other units, ensure that the power supply circuit does not get overloaded.

When installed in a rack, always ensure that proper air flow is provided for this product.

The maximum room ambient temperature (T_{mra}) for this product is 65°C. When installed in a closed or multi-unit rack, consideration should be given to installing this equipment in an environment compatible with the T_{mra} .

Equipment is suitable for mounting on concrete or other noncombustible surface only.

If you are using a handset not provided by Western Multiplex with this product, ensure that the handset is a UL-Listed (ITE) device, that has been evaluated to the Standard for the Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2, No. 950-95 * UL 1950, Third Edition.

2. Product Description

2.1 General Description

The *Lynx* licensed-exempt and licensed radios provide high capacity transmission and operational convenience in a digital communications network.

These *Lynx* radios provide SONET/SDH wireless bridging between two fixed coordinated locations.

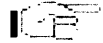
Because each owner controls the operation of the link, there is no reliance on any outside services. *Lynx* radio operators are able to operate whenever needed, and to be in control of their own network.

The *Lynx* offers two primary benefits:

- ❖ **CONVENIENCE** Easy to install and operate with **no user license requirements** in the USA. (Other countries may require a user license and/or frequency coordination).

- ❖ **CAPABILITY** Full transparent connections with no throughput reduction over any line-of-sight distance (within legal limits of government regulation)

2.2 Specifications



All specifications are subject to change without notice.

2.2.1 Transmitter

| | | |
|---------------------|--|-------------|
| Frequency Selection | A1 channel model 28020-D1A1 (center frequency Tx=5300) A2 channel model 28020-D1A2 (center frequency Tx=5775) | |
| Frequency Range | 5250 – 5350 MHz | (100MHz BW) |
| | 5725 – 5825 MHz | (100MHz BW) |
| Output Power | +10 dBm (5.3 GHz band) +16 dBm (5.8 GHz band) | |
| Control Range | 20 dB (at ODU, 5.8 GHz band) 14 dB (at ODU, 5.3 GHz band) | |



DO NOT exceed the maximum transmit power setting as set at the factory! Exceeding the factory-set power level will degrade the specifications of the radio and may also violate regulatory compliance. Output power may be attenuated from factory setting to comply with regulatory EIRP limits.

2.2.2 Antenna / Antenna Coupling Unit

| | |
|---------------------------------|--|
| Mechanics | Out-Door Unit (ODU) attached to a dual band antenna. Normally a single polarized type is used, but a dual polarized (either H or V) antenna can be used connected with one (1) short coax cable (minimum 16") – be sure on the dual polarized antenna that the unused N connector is properly weather-proofed. The In-Door Unit (IDU) is attached to ODU via one (1) coax cable. |
| Antenna Connection | A 'N' female connector |
| Impedance | 50 ohms |
| Typical Gain & Beamwidth (3 dB) | [Check Table 3-B for approved single pole or dual poled antennas] |
| 1.5 ft Flat | 25.5 dB / 8° |
| 2 ft Flat | 28 dB / 4.6° |
| 2 ft Parabolic | 28.5 dB / 6° |
| 4 ft Parabolic | 34 dB / 3° |
| 6 ft Parabolic | 37.5 dB / 2° |
| IDU-ODU Cable Maximums | Loss @ 700 MHz = 13 dB, voltage drop of 1.5 VDC(≤ 1 ohm) |

2.2.3 Receiver

| <u>All Models</u> | |
|--|---|
| Nominal Receive Level | -30 to -68 dBm (5 dB fade margin allowed on very short links) |
| Maximum Receive Level | -30 dBm error free, 0 dBm no damage |
| Frequency Selection | None-use A1 or A2 models |
| Threshold Rx Level (typ.) (BER = 10 ⁻⁶) | -73 dBm |
| Operating Frequency | 5300 MHz (100MHz BW) 5775 MHz (100MHz BW) |
| Bandwidths | <100 MHz |
| RSL Voltage (corresponds to -73 to -30 dBm) | 0.00 to 4.50 VDC , see section 3 for conversion to RSL in dBm |

2.2.4 System (Single Hop Performance)

| | |
|------------------------------------|------------------------|
| Error Floor | 10^{-11} |
| Transmission delay (radio only) | 250 μ sec, maximum |
| (5 mile path) | 300 μ sec, maximum |

2.2.5 Line Interfaces

| | |
|-------------------------------|---|
| <u>SONET/SDH Port:</u> | |
| Data Interface | OC-3/OC-3c/STM-1 (155.52 Mbps) One channel compliant to SONET Bellcore specification GRE-253 for OC-3/3c, and applicable SDH documents for STM-1 |
| Connectors | SC (fiber) female, multimode LED (1300 nm) Output power Tx: -23.5 to -14 dBm Input power Rx: -31 to -14 dBm (DO NOT EXCEED) |
| Configuration | Full duplex |
| Blue Code | AIS injection if no valid OC3 signal and AIS injection is ENABLED |
| Loopback | Near or far-end (both the OC3 and T1 channels) |



DS-1 (T1) Port:

| | |
|---------------------|---|
| Data Rate | 1.544 Mbps (each of four ports) |
| Digital Interface * | 4 x DSX-1 |
| Connector(s) | 8-pin modular jack female (RJ-48C) Pins: 1=TT, 2=TR, 4=RT & 5=RR |
| Line Code | AMI / B8ZS (selectable) |
| Line Build Out | 0-655 feet (selectable) |
| Blue Code ** | Alarm Indication Signal (AIS) |
| Loopback | Near or far end (selectable) |

* Meets AT&T Pub 62411, Bellcore TR-TSY-000499.

** Signal is selectable (on/off) and is generated only on data loss or link failure when enabled.

2.2.6 Auxiliary Connections

| | |
|---------------------------------|---|
| Orderwire Interface | 2-wire, 4-pin modular jack, female (RJ-11) |
| REN (Ringer Equivalency Number) | 1.0 B |
| DTMF tones | within $\pm 1.5\%$ of nominal freq. (+0-6 dB) |
| Ringing Voltage | 48 VDC, typical |

(use telephones with solid state ringers, NOT adequate for older style mechanical ringers)

| | |
|----------------------------------|--|
| VF Orderwire Bridge | 600 ohm balanced, 4-wire, 0 dBm, DB-9, male |
| Config Port | RS-232, DB-9, male (VT-100 terminal interface) |
| Aux Data (clear service channel) | RS-232, ≤ 9600 baud, DB-9, female |
| Alarm | 2 x Form C, DB-9, female |

10/100BaseT Network Management System (NMS) Ethernet Port:

| | |
|--------------------|---|
| T Data Interface | 10/100BaseT (fully compatible with IEEE 802.3u), auto negotiation |
| T Connectors | RJ-45/48c (wire) Pins: 1=Tx+, 2=Tx-, 3=Rx+ & 6=Rx- |
| F Data Interface | 100BaseT (fully compatible with IEEE 802.3), non auto negotiation |
| F Connector | Fiber (1300 nm, multimode) SC type |
| In-band Management | Dynamic routing (RIP I) through radio link |

2.2.7 Temperature and Environment

| | |
|-----------------------------------|-----------------------|
| Operating Temperature Range (IDU) | 0° to +50°C |
| Operating Temperature Range (ODU) | -30° to +60°C |
| Humidity | 95% non-condensing |
| Altitude | 4,500 meters, maximum |

2.2.8 Power

| | |
|-------------------|-----------------------------|
| DC Input Voltage | ±37 to ±63 VDC |
| Power Consumption | <100 Watts |
| Connector | Barrier strip, plug-in type |

2.2.9 Regulatory Information

| | |
|--------------------|-----------------|
| FCC Identifier | HZB-U5358-155 |
| FCC Rule Parts | 15.407 (U-NII) |
| Industry Canada ID | |
| IC Rule Parts | RS-210 (LE-LAN) |

2.2.10 Mechanical

| | |
|---------------------------------------|--|
| Width (for 19-inch EIA rack mounting) | 437 mm (17.2") rack mounting brackets supplied |
| Height (IDU) | 89 mm (3.5") (1RU) |
| Depth | 368 mm (14.5") |
| Weight (IDU) | 5 kg. (11 lbs.) ODU w/o Antenna 9 kg. (20 lbs.) |

2.3 Front Panel Description

2.3.1 General

The *Lynx* radio front panel (no user access on rear panel), as shown in Figure 2-1, has LED indicators, test points, controls and connections that are used for installation, maintenance, operation and troubleshooting. Prior to installation, it is best to be familiarize yourself with the front panel of your particular model. Sections 2.3.2 through 2.3.5 describe the front panel access and indicators.

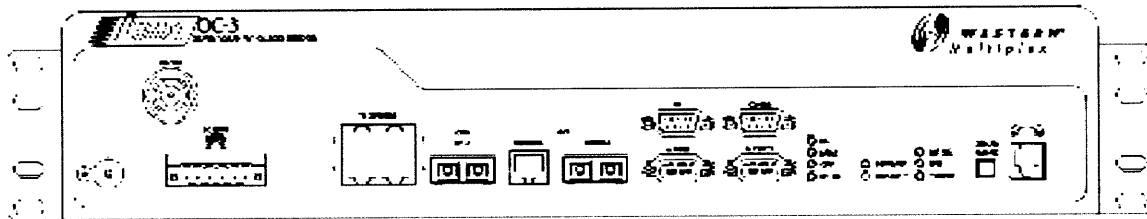


Figure 2-1: IDU Front Panel

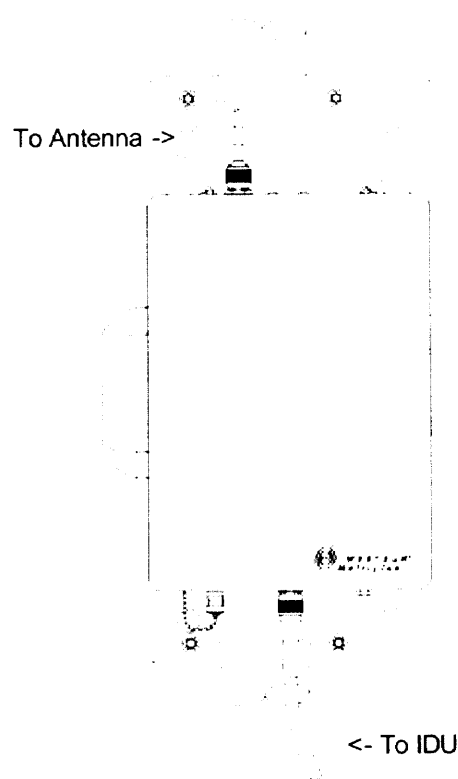
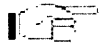


Figure 2-2: ODU connections

2.3.2 Test Points on ODU



The Lynx radio products do not have an on/off switch. Power to the ODU is provided by the IDU via the two coax cables.

GND

This is a grounding post to connect to earth ground.

RSL

This is a test point (BNC connector on the ODU) that relates to the Received Signal Level (RSL). The voltage is measured with a voltmeter (using the GND test point for reference) which corresponds to the actual power level of the incoming received signal. See RSL chart that gives volts to RSL conversion in Figure 3.8.



This voltage only applies to the near-end and does not allow measurement of the far-end output transmit power, even when the DISPLAY FAR END button is pressed unlike other models of the Lynx family.



The Lynx system requires professional installation. Transmitted output power limits may apply when using this radio. Consult FCC, IC, Western Multiplex or other regulatory authorities for limits which may apply. See Section 3.13.1 for details on setting output power.

Do not adjust output power above factory settings.

2.3.3 Alarm and Status Indicators

| | |
|----------------------|---|
| IDU | Green = Indoor Unit OK Yellow = warning condition in IDU (over-temp and/or both fans failed) Red = Indoor Unit detected hardware or NMU/IDU communication failure |
| Cable | Green = ODU Cable OK Red = ODU Cable shorted |
| ODU | Green = Outdoor Unit OK Red = IDU to ODU communication failure, DC power loss, or Outdoor Unit detected hardware failure Yellow = Over temperature alarm |
| RF Link | Green = Link established with BER <10E-6 Yellow = BER 10E-6 Red = BER >10E-3 or Loss of Sync Blinking = Security ID mismatched |
| OC-3 Input | Red = loss of input signal Green = Input OK |
| Loopback | Yellow = Any T1 or OC port has loopback enabled Off = no OC or T1 in loopback |
| Far End | Red = Alarm(s) present on the far-end radio** Green = No far end alarm(s) detected |
| NMS (10/100BaseT) | Green = Tx or Rx data present on the NMS interface Off = No NMS interface connection detected |
| T1 INPUT | Green = T1 connection detected on enabled channels (any/all of 4 T1s) or channel(s) disabled Red = Alarm(s) enabled (any/all of 4 T1s) and no T1 connection detected Note: consider above as all OK (green), or something wrong (red) |

** Radio Fail, RF Link (yellow or red), T1/OC Input (yellow or red)



Upon startup, all front panel lights will flash through a sequence – this may take up to 2 minutes before the radio is operational.

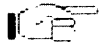
2.3.4 Controls

DISPLAY FAR END This push-button provides the capability to determine alarms and status of the far-end radio. When pressed and held, the front panel alarm and status LEDs correspond to the far-end radio's status. This can be used for installation, maintenance and troubleshooting. To check the FAR END, push the FAR END switch and if all LEDs flash, the far-end radio is not available (link is down). Therefore, no far-end information is available. This typically indicates that there is no link between near-end and far-end radios.

2.3.5 Connections

RF CONNECTION

The RF port of this *Lynx* radio is an Ntype female connector that is used to connect to the ODU using coaxial transmission line.



Use LDF4-50, LMR-400 or equivalent up to 100 meters (300 ft.)

Use LDF4.5-50, LMR-1200 or equivalent up to 300 meters (1000 ft.)

DATA CONNECTION

The connection that carries the signals in and out of the radio.

DC POWER CONNECTION

The input accepts positive or negative DC power at any voltage between 37 and 63 Volts.

OPTIONAL CONNECTIONS

There are several connections that are not required for operation, but provide additional facilities to the user.

EOW This connection is used to access the electronic orderwire function. This is a facility for "telephone" style service from one radio to another. A standard electronic telephone [one with a handset and DTMF (push-button tone) dialing] plugs into this connector. The user can dial the orderwire address of the far-end radio (or any radio in the *Lynx* network) to establish telephone communication between sites. This communication does not interrupt or interfere with the other radio communications. The radio link must be operational to use this facility. The orderwire feature can be very useful for installation, maintenance and troubleshooting.

VF This connector is used to link two *Lynx* radios at a repeater site for Orderwire operation. This would allow orderwire "telephone" calls to and from any point in the *Lynx* network.



The Lynx orderwire circuit can also be connected to other existing orderwire networks. See Section 3.14.1 for details.

ALARMS This connector is used for monitoring alarms electrically. The Form C relays can be connected to other transmission equipment for monitoring alarm status locally or remotely.

-
- CONFIG** This is a serial interface port (RS-232) to the *Lynx* radio. This port provides configuration and maintenance information about the *Lynx* radio(s) to a connected computer or terminal. See section on SERIAL session in this manual.
- AUX DATA** This is a serial interface port (RS-232, ≤9600 baud) which allows the user to connect auxiliary serial data from one point in the radio network to another. It can be used for separate data connection for serial devices.
- 10/100 BaseTX** This Ethernet connection is for access to the Lynx NMS (SNMP or HTML). See section 4.8 for more detail for operation.
- T1** There are four wayside T1 channels for auxiliary traffic. These use the standard RJ-45C modular jack.

2.4 Indoor Unit (IDU) Rear Panel Description

The *Lynx* radio rear panel, is blank. with the exception of the optional open slot for accessing the CompactFlash device mounted on the circuit card within the IDU. All connections and indications are on the front panel for "single panel" access.

If the compact flash has be removed inadvertently, the radio will not power up correctly.

2.5 Installation Accessories

Each *Lynx* radio is shipped with several accessories commonly required for the radio as described below:

Rack Mount Brackets Two brackets (along with required mounting screws) are provided which allow 19-inch rack mounting of the *Lynx* radio. Be sure the 4x40 pan head screws are 5/16".

Terminal Connector This is a 6-pin mating connector used for external DC power supply.

D Connector 9-pin Four of these mating connectors are provided. One is used for the VF port, one for the CONFIG port, one for the ALARMS port and one for the AUX DATA port. Note: the CONFIG port requires a NULL modem cable adapter to talk to a PC.

Other accessories are available, such as orderwire handsets, connector adapters and special cables. These can be ordered separately upon request.

3. Installation & Adjustments

3.1 Shipping Container

3.2 Packing Items Identification

The primary shipping container houses the radio along with other items including:

- ❖ This manual
- ❖ Installation accessory kit (see Section 2.5)

3.3 Before Installation Task List

There are several tasks that should be accomplished prior to installing the *Lynx* radio system. This section briefly describes the following:

- Site selection
- Line-of-Sight and Path Clearance determination
- Anticipated RSL calculation
- Fade margin calculation
- Availability calculation
- Frequency plan determination
- Power supply planning
- Antenna (and accessories) purchase



Only directional antennas should be used with Lynx radios. These are typically flat panel or solid parabolic antennas. Western Multiplex recommends a maximum beamwidth of 10 degrees for directional systems.

3.3.1 Site Selection Requirements

The radio site must have:

- access to the appropriate power
- close proximity to the telephone or computer system you wish to interconnect
- line-of-sight to the other radio location with adequate clearance
- location for mounting the antenna

3.3.2 Line-of-Sight and Path Clearance Guidelines

The *Lynx* radios will not operate properly unless they have line-of-sight between their corresponding antennas. The *Lynx* radio transmission will not pass through trees or other obstacles. Factors to consider include:

- Earth curvature
- Future growth of trees
- Height of buildings

In addition to the line-of-sight requirement, a well-engineered path will also have additional path clearance to allow for signal loss due to partial obstructions, atmospheric ducting and ground reflections. To maximize radio reception, 0.6 times the first Fresnel zone should be calculated and this distance added to the path clearance (in addition to trees or buildings).

3.3.3 RSL Calculation and Link Budget

The received signal level (RSL) can be estimated using the following formula:

$$\text{RSL (dBm)} = P_{\text{out}} - FL_1 + G_1 + G_2 - FL_2 - L_p$$

where: P_{out} is the transmitter output power (in dBm)

FL_1 is the feeder loss of the transmit side (in dB)

G_1 is the gain of the transmit antenna (in dB)

G_2 is the gain of the receive antenna (in dB)

FL_2 is the feeder loss of the receive side (in dB)

L_p is the Path loss, defined by:

$$L_p \text{ (dB)} = 96.6 + 20 \log_{10} F + 20 \log_{10} D$$

where: F = Frequency in GHz (2.4 or 5.8)

D = Distance of path in miles

This link budget is very important for determining any potential problems during installation. If you have calculated the expected RSL, you can see if it has been achieved during installation, and troubleshoot if necessary.

3.3.4 Fade Margin Calculation

The fade margin is the difference between the actual received signal and the radio's threshold. Using the formula provided in Section 3.3.3, the anticipated RSL can be calculated. Compare this RSL to the specified threshold of the *Lynx* radio (shown in Section 2.2) and calculate the fade margin as the difference between the two signal levels.

3.3.5 Availability Calculation

3.3.6 Power Supply Planning

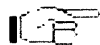
3.3.7 Antenna Planning

Using path planning mathematics, proper antenna size can be determined which will yield the desired path performance. In general, the larger the antenna that is used with the *Lynx* radio, the better the link will perform. Larger antennas have narrower beamwidth and higher gain, which will yield better link performance (higher fade margin, better availability) and improve immunity to interference (due to the smaller beamwidths). However, larger antennas are more costly to purchase and install than smaller antennas, in some cases requiring special equipment for installation. All of these factors should be taken into consideration when selecting antennas.



In areas where transmitted output power restrictions apply, the use of larger antennas will maintain the benefit of narrow beamwidths and receive gain. However, output power may need to be reduced to meet regulations. (See Section 3.13.1)

Prior to installation, the specific antenna location and mounting should be determined. This advanced planning also yields the transmission line requirements.



*Both single and dual-band/dual-polarized directional antennas can be used with these *Lynx* radios. Use dual-polarized only if planning to upgrade to a higher capacity radio link later on. Both single and dual-polarized are presented on the following pages.*

Refer to the table on the following pages for antenna manufacturer information:



| Antenna Type | Manufacturer | Model Number | Mid-band Gain (dBi) | Notes |
|-------------------|--------------|--------------|---------------------|-------|
| 1 Foot Flat Panel | Gabriel | DFPD1-52 | 23.5 | |
| | Andrew | FPA5250D12-N | 23.6 | |
| 2 Foot Flat Panel | Gabriel | DFPD2-52 | 28 | |
| | Andrew | FPA5250D24-N | 28.2 | |
| 2 Foot Parabolic | Gabriel | SSP2-52B | 28.5 | |
| | Gabriel | SSD2-52A | 28.4 | |
| | Gabriel | HSSP2-52 | 28.1 | |
| | Radio Waves | SP2-5.2 | 28.3 | |
| | Radio Waves | SPD2-5.2 | 28.1 | |
| | Andrew | P2F-52 | 29.4 | |
| | Andrew | PX2F-52 | 29.4 | |
| 3 Foot Parabolic | Radio Waves | SP3-5.2 | 31.4 | |
| | Radio Waves | SPD3-5.2 | 31.1 | |
| | Andrew | P3F-52 | 33.4 | |
| | Andrew | PX3F-52 | 33.4 | |
| 4 Foot Parabolic | Gabriel | SSP4-52A | 34.2 | |
| | Gabriel | SSD4-52 | 34.1 | |
| | Gabriel | HSSP4-52 | 33.9 | |
| | Radio Waves | SP4-5.2 | 34.6 | |
| | Radio Waves | SPD4-5.2 | 34.4 | |
| 6 Foot Parabolic | Gabriel | SSP6-52A | 37.5 | |
| | Gabriel | SSD6-52 | 37.4 | |
| | Gabriel | HSSP6-52 | 37.2 | |
| | Radio Waves | SP6-5.2 | 37.7 | |
| | Radio Waves | SPD6-5.2 | 37.5 | |
| 8 Foot Parabolic | Gabriel | SSP8-52 | 39.8 | |
| | Gabriel | SSD8-52 | 39.7 | |
| | Gabriel | HSSP8-52 | 39.6 | |

Formula for determining maximum output power setting at the antenna input for 5.25-5.35 GHz Transmitters (@
 Max Tx (dBm) is the lesser of 3.6dBm and $30 - G$

Formula for determining maximum output power setting at antenna input for 5.725-5.825 GHz Transmitters (@
 Max Tx (dBm) is the lesser of the 17.1Bm and $53 - G$

where: G = Antenna Gain
 Tx is the output power measured at the antenna input

Note:

All Western Multiplex radios require professional installation.
 Antennas with gain less than 23.5 dBi are not allowed
 Antennas of other make may be used with the HZB-U5358-155 device, but must be of the same type, dimensions and gain as those listed

Table 3-B: Antennas for Lynx OC3

3.4 Tools Required

3.5 Mounting the Lynx Radio

The *Lynx* radio can be mounted at any height in a standard 19-inch rack. Blank rack-mounting spaces above and below the *Lynx* are recommended, especially if the surrounding equipment dissipates a considerable amount of heat.

The *Lynx* radio may be set up for mounting with the front edge projecting from the front face of a standard 19-inch rack using the rack mounting brackets enclosed with the screws in the Accessory Kit (4 per bracket). The rack mounting brackets may be reversed, in order to install for flush or cabinet mounting if preferred. Depending on rack configuration, it may be necessary to remove the four adhesive backed rubber feet on the bottom of the unit.



The Lynx radio has internal fans which intake and exhaust on the left and right sides of the chassis. When rack mounting, it is important to leave a small gap between the outer edges of the radio and the inside edge of the rack.



The Lynx radio IDU may alternatively be placed on a table or shelf attached to a wall. Because of the low weight of the radio, any mounting option other than rack mounting will be less secure.

Even though the IDU can be mounted at any level within the rack, it is best to mount it as high as possible to minimize the routing of the thicker coaxial cable. By having the RF connection at the top of the rack, there is easier access to other rack mounted user equipment.

The ODU is mounted on a substantial mounting pole (minimum 2.5 inches O.D.) to accommodate the supplied mounting bracket. In the figure below, the top connector is cabled to the antenna feed.

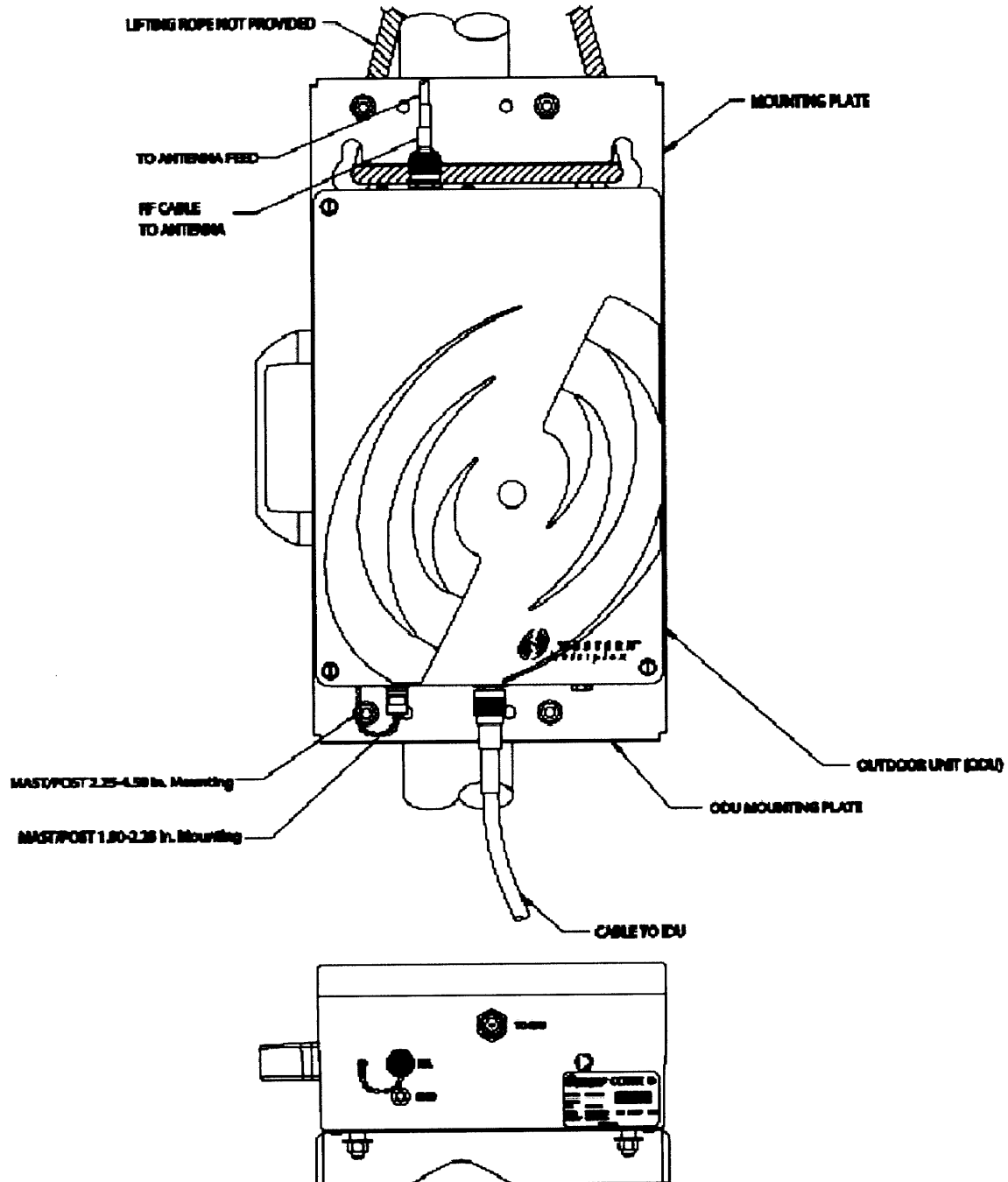


Figure 3-1: ODU Mounting Detail

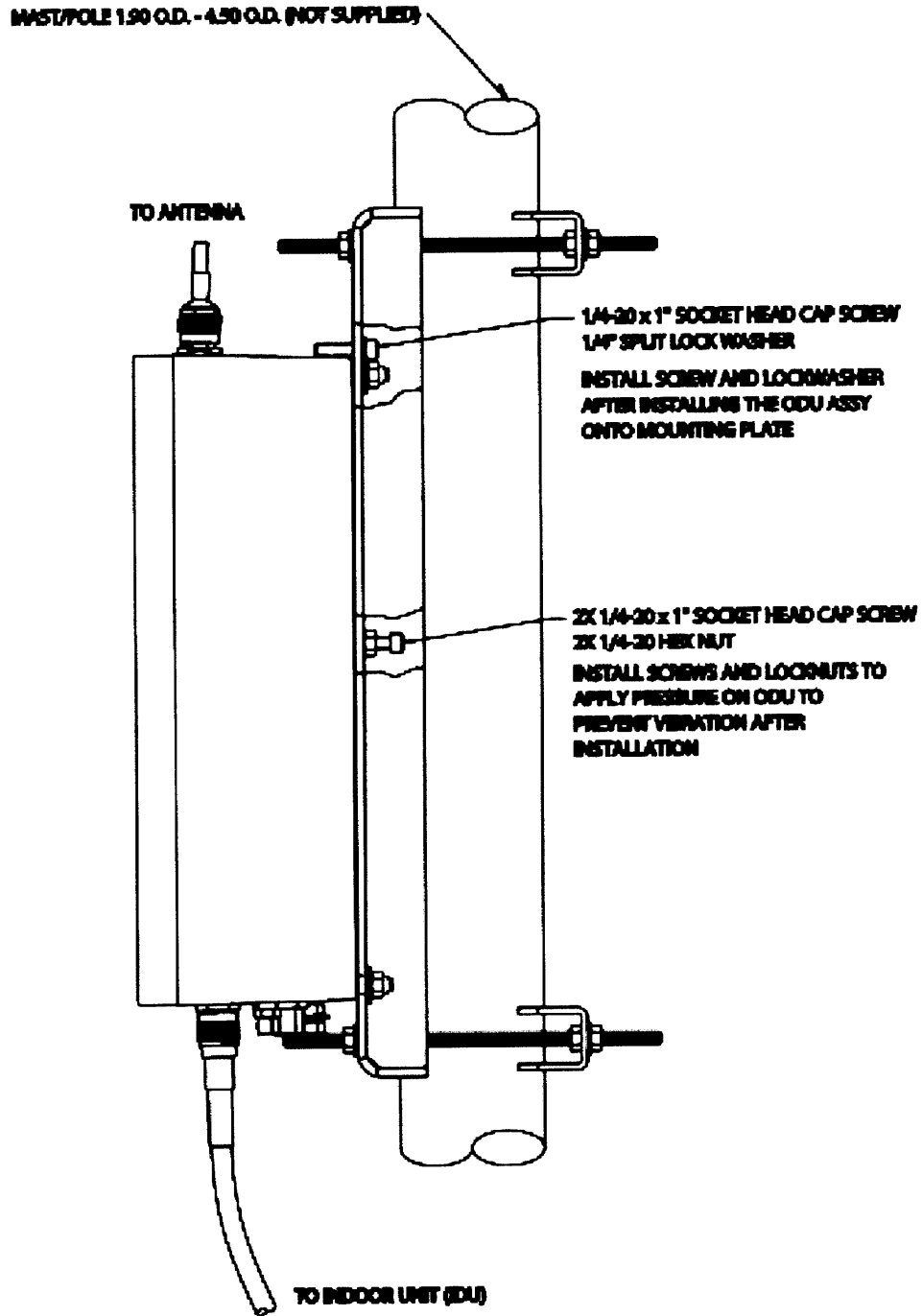


Figure 3-2: ODU Mount – Side Detail

3.6 Power Connection and Wiring



There is no ON/OFF switch on the radio bridge. As soon as power is applied, the equipment will be operational. This means that there can be up to 1W of RF power present at the antenna port. The antenna port should be terminated before power is applied.

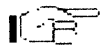
Power is connected using the DC power plug contained in the Accessory Kit. Use Table 3-C or 3-D along with the associated diagram of Figure 3-3 or 3-4 to connect the DC power cables. For example, for a negative DC power input, use Table 3-C and Figure 3-3. Use 14 gauge wire as the minimum size.

| NEGATIVE DC POWER INPUT (-37 TO -63 VDC) | |
|---|--------------|
| PIN | FUNCTION |
| 1 | Power (-DC) |
| 2 | Power (-DC) |
| 3 | Ground |
| 4 | Ground |
| 5 | Return (+DC) |
| 6 | Return (+DC) |

Table 3-C: DC Power Connection for Negative Supply

| POSITIVE DC POWER INPUT (+37 TO +63 VDC) | |
|---|--------------|
| PIN | FUNCTION |
| 1 | Return (-DC) |
| 2 | Return (-DC) |
| 3 | Ground |
| 4 | Ground |
| 5 | Power (+DC) |
| 6 | Power (+DC) |

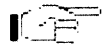
Table 3-D: DC Power Connection for Positive Supply



Pins 1 and 2 are connected together on the motherboard. Either pin may be used to apply (+DC) DC power input. Similarly, pins 5 and 6 are connected together on the motherboard and may be used to apply (-DC) DC power input.

3.6.1 DC Power Wiring

Connect the power cable with adequate current rating (minimum of 18 AWG, recommend 16 AWG) to the terminals shown on the removed (not plugged into the radio) DC power plug using the screw connections. The recommended minimum current rating of external fuses and cables is 5 Amps. The Lynx radios consume less than 3.1 Amps at $\pm 48V$. Be sure the DC power cable is less than 3 meters (9.75 feet) in length and not less than stranded 14 gauge in size.



Each Lynx terminal should be externally fused separately with a 8 Amp maximum fuse. The DC power cable must be less than three (3) meters in length. Use 14 gauge wire as the minimum size.

If using **negative** power, connect the negative voltage to pins 5 or 6. Connect the ground return connection to pin 1 and use an optional jumper - 2 to 3 for ground reference. See Figure 3-3.

If using **positive** power, connect the positive voltage to pins 1 or 2. Connect the ground return connection to pin 6 and use an optional jumper - 4 to 5 for ground reference. See Figure 3-4.

The **ground** connection is available at pins 3 and 4. Either pin may be used to ground the return side of the power supply. Do not ground both sides of the power supply.



Proper grounding, either through the chassis and/or the power supply, can be very important for protection from lightning. A grounding screw and nut (#4x40) is provided on the left front panel.

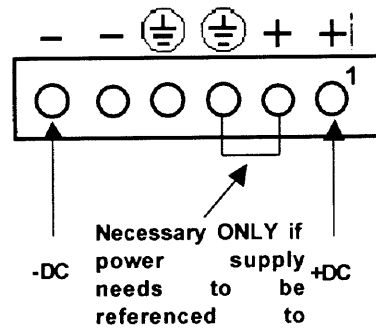


The ground connection may be left floating if the power supply is referenced to ground externally and to avoid ground loops in some configurations. However, this may not provide adequate grounding for lightning protection. Be sure to use the local electrical code to determine wire size and proper connection to the grounding screw.

Use a DVM (digital voltmeter) to verify voltage and polarity on the DC power plug.



Do not connect the DC power plug to the front of the Lynx IDU until the ODU is connected via coax).



Ground Return

Figure 3-3: Negative Voltage DC Connection

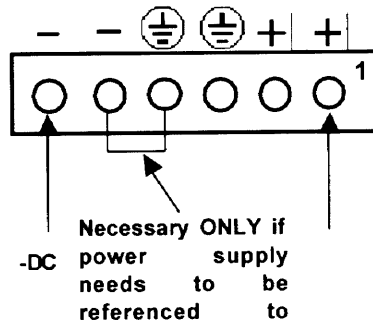


Figure 3-4: Positive Voltage DC Connection



Make sure that when connecting the mating plug that it is properly oriented (terminal screws pointing up) and securely fastened.

Use 14 gauge wire for jumper if used.