

Exhibit S

L5X-PMP-04-000



No. 68133 Revision A

January 1999

Tel-Link Point-To-Multipoint

Remote Terminal Installation Manual

PRELIMINARY

Every effort has been made to ensure that the information contained herein is complete and accurate. However, the information contained in this manual is subject to change without notice and P-COM reserves the right to change specifications of hardware and software without prior notice and assumes no responsibility for any damages resulting from any errors or omissions in this manual. P-COM's obligations regarding the use or application of its products shall be limited to those commitments to the purchaser set forth in its Standard Terms and Conditions of Sale for a delivered product.

© Copyright 1998, P-COM, Inc. All rights reserved. This document contains information Confidential and Proprietary to P-COM, Inc. No part of this publication may be reproduced or transmitted by any means and disclosure or distribution of its contents outside the company in any form without written consent from P-COM is strictly prohibited.

Issued by P-COM, Inc.

1801 Penn Street, Melbourne, Florida 32901

Printed in U.S.A.

This Page Intentionally Left Blank

Tel-Link Point-to-Multipoint Remote Terminal Installation Manual

Contents

1.0	General Information	1-1
1.1	Manual Organization	1-1
1.2	FCC Requirements Summary	1-2
1.3	Requesting Changes	1-2
1.4	Special Notations	1-2
1.5	General Safety Reminders	1-3
1.6	PMP Terminology	1-3
2.0	Remote Terminal Overview	2-1
2.1	Indoor Unit (IDU)	2-1
2.2	Outdoor Unit (ODU)	2-2
2.3	Antenna	2-3
2.4	IF Cable Run	2-3
3.0	Tools and Test Equipment Required	3-1
4.0	Site Preparation	4-1
4.1	ODU/Antenna Installation Preparation	4-1
4.2	IDU Installation Preparation	4-1
4.3	Power Preparation	4-2
4.4	IFL Installation Preparation	4-2
5.0	Equipment Receiving, Unpacking and Inspection	5-1
5.1	Equipment Receiving and Unpacking	5-1
5.2	Inspecting the Equipment	5-1
6.0	Remote Terminal ODU Installation	6-1
6.1	Introduction	6-1
6.2	Tools Required	6-1
6.3	Materials Required	6-1
6.4	Step by Step Remote Terminal ODU/Antenna Installation Procedure	6-1
7.0	Remote Terminal IDU Physical Installation	7-1
7.1	Introduction	7-1
7.2	Tools Required	7-1
7.3	Materials Required	7-1
7.4	Step by Step Remote IDU Installation Procedure	7-1
8.0	Installation of Remote Terminal Wire and Cabling	8-1
8.1	Introduction	8-1
8.2	Remote Terminal IDU Power Supply Wiring	8-3
8.2.1	AC Power Supply	8-3
8.2.2	DC Power Supply	8-4
8.3	Remote Terminal IDU Interfacility Coaxial Cable Installation	8-5
8.4	Remote Terminal IDU User Interface Module Cable Installation	8-5
9.0	Remote Terminal IDU Board Installation	9-1

10.0 Remote Terminal Initial Power Application	10-1
10.1 DC Power Application	10-1
10.2 AC Power Application.....	10-1
11.0 Initial Terminal Configuration and Testing	11-1
11.1 Terminal Configuration	11-1
11.2 Terminal (Local) Testing.....	11-2
11.2.1 T1 Loopback Test	11-2
11.2.2 Antenna Alignment.....	11-3
11.3 Terminal Commissioning.....	11-4
12.0 Technical Support	12-1
12.1 Warranty	12-1
12.2 Return Process.....	12-1
12.3 Spares Ordering Information	12-2
12.4 Recommended Spare Parts	12-2
APPENDIX A: PMP Installation Procedure Checklist	A-1
APPENDIX B: Site Survey Checklist	B-1
Glossary	G-1

List of Figures

Figure 2-1 – Remote Terminal Indoor Unit Chassis.....	2-2
Figure 2-2 – Remote Terminal Outdoor Unit with 30 cm Parabolic Antenna.....	2-3
Figure 6-1 – ODU Polarization Orientation	6-2
Figure 7-1 – Rack Elevation of a Remote Terminal IDU	7-2
Figure 8-1 – Remote Terminal IDU (AC Input) Rear View.....	8-1
Figure 8-2 – Remote Terminal IDU (AC Input) Rear View.....	8-2
Figure 8-3 – AC Plug.....	8-3
Figure 8-4 – DC Plug.....	8-4
Figure 8-5 – UIM Pinouts	8-6
Figure 9-1 – Remote Terminal IDU Board Placement	9-1
Figure 9-2 – Printed Circuit Board.....	9-2
Figure 9-3 – Printed Circuit Board Insertion.....	9-2
Figure 9-4 – Printed Circuit Board Insertion.....	9-3
Figure 11-1 – LSM Attached To NMS Controller of Remote IDU	11-2
Figure 11-2 – Bit Error Rate Test Configuration	11-3

List of Tables

Table 2-1 – IFL Signals	2-4
Table 3-1 – Required Tools and Equipment (Common)	3-1
Table 3-2 – Required Tools and Equipment (Installation).....	3-2
Table 3-2 – Required Tools and Equipment (Installation) (Continued).....	3-3
Table 3-2 – Required Tools and Equipment (Survey).....	3-3
Table 5-1 – PMP Remote Terminal Equipment Parts List	5-2
Table 11-1 – Board LED Indications	11-1
Table 12-1 – Recommended Spare Parts.....	12-2

1.0 General Information

Before installing and operating a Tel-Link Point to Multipoint (PMP) System, P-COM recommends that installation personnel read this section in its entirety, before installing. Once this is accomplished, the user can proceed directly to the section or subsection of interest.

This manual provides the installation procedures and guidelines for installing hardware associated with a Tel-Link Point to Multipoint (PMP) System. This manual is intended for personnel who are responsible for installing and testing the Tel-Link Point to Multipoint system. The user should keep this manual next to the system at all times.

P-Com highly recommends that the user utilize the P-COM PMP Installation Procedure Checklist located in Appendix A to ensure the correct procedures for installing P-COM PMP equipment are followed. For further assistance, contact P-COM the Technical Assistance Center at (407) 674-3699.

1.1 Manual Organization

This manual is part of a set of Tel-Link Point-to-Multipoint manuals that focus on specific aspects of the Point-to-Multipoint system. The set of manuals consist of the following:

- 68132 - Tel-Link Point-to-Multipoint Sector Terminal Installation Manual
- 68133 - Tel-Link Point-to-Multipoint Remote Terminal Installation Manual
- 68134 - Tel-Link Point-to-Multipoint Local Site Manager Manual
- 68135 - Tel-Link Point-to-Multipoint System Description Manual

The Manual is divided into 12 sections providing specific information needed to install and test the Tel-Link Point to Multipoint System. The sections are:

- **Section 1:** General Information – Contains discussions on the use of this manual, summary of the manual, special notations, and general safety reminders
- **Section 2:** Tools and Test Equipment Required
- **Section 3:** Site Preparation
- **Section 4:** Equipment Unpacking and Inspection
- **Section 5:** Remote Terminal Outdoor Unit Installation
- **Section 6:** Remote Terminal Indoor Unit Equipment Physical Installation
- **Section 7:** Installation of Base Station Wire and Cabling
- **Section 8:** Remote Terminal IDU Board Installation
- **Section 9:** Base Station Initial Power Application
- **Section 10:** Base Station Switch Settings
- **Section 11:** Initial Terminal Configuration and Testing
- **Section 12:** Technical Support

1.2 FCC Requirements Summary

Operators must be familiar with the requirements of the Federal Communications Commission (FCC) Parts 2 and 101 Regulations prior to operating any link using the equipment. For installations outside the United States, contact local authorities for applicable regulations.

1.3 Requesting Changes

We welcome your suggestions for improving this manual. A Reader Comments form is provided at the end of this manual on which you can record your comments and suggestions for improvements.

1.4 Special Notations

This manual uses four levels of special notation to alert you to important information concerning your safety, proper equipment handling, or useful tips for easier operation. These notations are shown below in descending order of importance

DANGER!

Indicates that personal injury can result if you do not comply with the given instruction. A **DANGER!** statement will describe the potential hazard, its possible consequences, and the steps you must take to avoid personal injury.

WARNING!

Indicates that serious damage to the equipment can result if you do not comply with the given instruction. A **WARNING!** statement will describe the potential hazard, its possible consequences, and the steps you must take to avoid serious equipment damage.

CAUTION!

Indicates that equipment damage and/or process failure can result if you do not comply with the given instruction. A **CAUTION!** statement will describe the potential hazard, its possible consequences, and the steps you must take to avoid equipment damage and/or process failure.

NOTE

Provides supplementary information to emphasize a point or procedure, or gives a tip for easier operation.

1.5 General Safety Reminders

To prevent possible personal injury or equipment damage, always observe the following rules:

- Installation and operations personnel should be familiar with the safety requirements before attempting installation or operation of the equipment covered by this manual. Failure to follow the requirements could result in death or injury to personnel and/or damage to the equipment.
- Always examine the general area for any potential hazards (such as wet floors or overhead powerlines) before beginning installation.
- Observe all DANGER! notations. Dangerously high voltages are present within this equipment, when in operation. Lethal line voltages may be present unless the main line power has been disconnected.
- Always remove any jewelry or other personal items that may conduct electricity before beginning installation.
- Keep away from live circuits. Whenever feasible in verifying circuits, check by continuity and resistance methods with all power off, rather than directly checking voltages.
- Observe grounding precautions. Verify that the unit under test or being installed and all measurement equipment are properly grounded.
- Do not test alone. Testing or adjusting the equipment should only be carried out in the presence of a person qualified to render aid.
- When lifting the equipment, use proper lifting techniques to prevent injury.
- It is the responsibility of the installer and the user to ensure that the public is not exposed to excessive RF levels. Such information must be posted near the antenna in the form of caution or warning notes and signs.

1.6 PMP Terminology

For the ease of the reader, a Glossary is provided at the end of the manual defining terminology used in P-COM Tel-Link Point-to-Multipoint manuals

This Page Intentionally Left Blank

2.0 Remote Terminal Overview

The Remote Terminal provides the interface to network services at the customer premise. The basic indoor unit (IDU) is provided with various interfaces and communicates with a Sector Terminal. The Remote Terminal consists of the following components:

- An IDU containing a modulator, demodulator, controller and User Interface Module (UIM)
- An outdoor unit (ODU) containing the RF electronics
- An Antenna and mounting hardware
- An IFL consisting of a single coaxial cable connecting the IDU to the ODU

2.1 Indoor Unit (IDU)

The IDU is located inside the customer's facility at a remote site and is connected to an ODU via a coaxial cable. The IDU is comprised of the following components:

- A software configurable QPSK, 16-QAM, or 64-QAM Modem that provides the physical layer wireless communication link between the Remote Terminal and the Hub/Sector Subsystem.
- A Controller card that is responsible for controlling and monitoring local functions, and processing Network Management messages from the Network Operation Center.
- User Interface Module(s) (UIM) which supports user interfaces, as well as signal monitoring and port statistics collection.

The IDU chassis allocated slots for a modulator, demodulator, controller, power supplies and UIMs. The chassis can be desktop or rack mounted (refer to Figure 2-1).

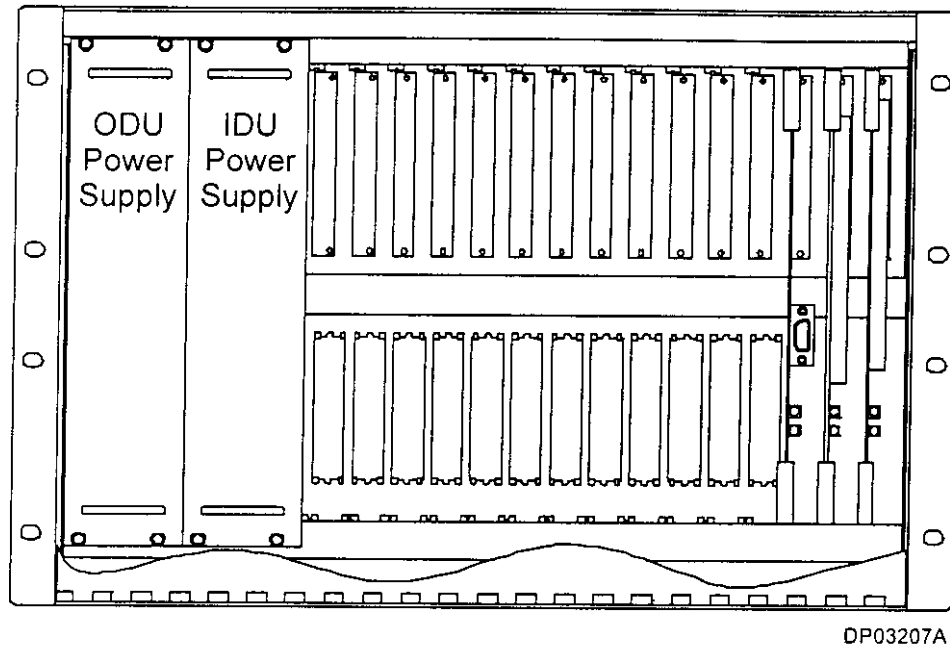


Figure 2-1 – Remote Terminal Indoor Unit Chassis

A single power source (AC or DC) is required to provide power to the Remote Terminal. An optional external battery back-up unit can provide from 4 to 8 hours of operation in the presence of a primary power failure.

2.2 Outdoor Unit (ODU)

Figure 2-2 illustrates the RF/Antenna configuration for the Remote Terminal Outdoor Unit. The packaging includes the following components:

- ODU Enclosure
- RF Electronics
- ODU Controller Card responsible for controlling and monitoring ODU functions and for interfacing with the IDU

The ODU is frequency agile so that the same ODU can typically be used throughout the entire allocated frequency band. Subsequently, this reduces sparing levels.

The ODU meets all National Electrical Code requirements pertaining to lightning and power transients and meets or exceeds FCC and ETSI regulations pertaining to conducted and radiated Electromagnetic Emissions.

The ODU is sealed against the environment and is capable of functioning in ambient temperatures ranging from -40°C to +60°C, with up to 100% relative humidity. The ODU can survive steady state winds of 40 m/s with gusts to 55 m/s (89 mph/123 mph).

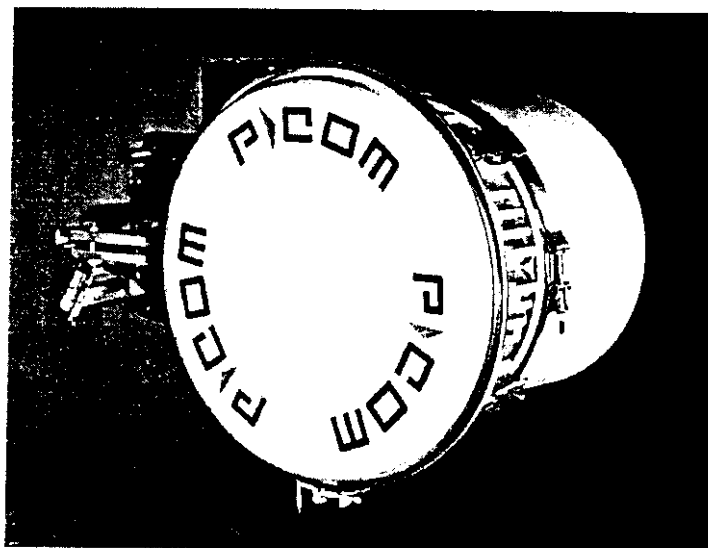


Figure 2-2 – Remote Terminal Outdoor Unit with 30 cm Parabolic Antenna

2.3 Antenna

The Antenna is typically a 30-cm parabolic and can be directly mounted to an 8.85 cm – 11.385 cm pipe. The mount will support a minimum of ± 25 degrees of elevation and 360 degrees of azimuth adjustment. The packaging includes the following components:

- Reflector
- Feed
- Radome
- Mount

2.4 IF Cable Run

A single coaxial cable is used to connect the ODU to the Remote Terminal IDU. The cable carries transmit IF signal, receive IF signal, telemetry 10 MHz reference signal and DC power between the IDU and ODU. The IDU and ODU contain “N” type female connectors for interconnection of the coaxial cable.

The signals that are carried between the IDU and the ODU on the coaxial IFL cable are provided in Table 2-1.

Table 2-1 – IFL Signals

IFL Signal	Frequency	Variation
IDU Transmit	205 MHz	±25 MHz
IDU Receive	490 MHz	±25 MHz
Telemetry	500-800 kHz	300 kHz
Reference Signal	10 MHz	1 ppm
IFL Power	Voltage	Variation
ODU Power	+48 Vdc	+40 to +57Vdc
IFL Connector	Termination 1	Termination 2
Type N male	Remote Terminal IDU	ODU

3.0 Tools and Test Equipment Required

Tables 3-1, 3-2 and 3-3 are the recommended list of tools and test equipment necessary for the installation of a P-COM Point-to-Multipoint radio subsystem:

NOTE:

This is a Typical Installers tool Kit , on some installations additional tools may be necessary.

Table 3-1 – Required Tools and Equipment (Commissioning)

DESCRIPTION	QNTY	BRAND	PART NO
Antenna Alignment Tool	1	P-COM	
Binoculars	1		
Bit Error Rate Test Set, (with correct UIM interface module) FireBird Portable T1	1		
Circuit Tester	1	Ideal	6-035
Compass			
Computer, Laptop (with LSM Software)	1		
Flashlight	1	Mallory	ML901-F
Global Positioning System	1		
Printer, Color	1		
Multimeter, Handheld	1		
Radio, 2-Way or Cell Phone	2		
Safety Belt	1		
Screwdriver, Jewelers Set	1		
Static Material Kit	1	Charleswater	16430
Wood Stick	1	Desco	517F
Wrench, 8" Adjustable	1	Diamalloy	D78
Wrench, SAE ¼ - ¾ Set	1		
Wrench, Socket Set (Deep)	1		
Wrench, Torque (20 in lbs. – 55 ft lbs.)	1		

Table 3-2 – Required Tools and Equipment (Installation)

DESCRIPTION	QNTY	BRAND	PART NO
Binoculars	1		
Bit Error Rate Test Set, (with correct UIM interface module) FireBird Portable T1	1		
Cable Cutter	1	Klein	63050
Circuit Tester	1	Ideal	6-035
Compass			
Computer, Laptop (with LSM Software)	1		
Crimp Tool (Solderless Connectors)	1		
Crimp Tool, RJ-x Connectors (RJ-11, RJ-45)	1		
De-soldering Tool	1	Edsyn	AS196
Diagonal Cutters, Flush Cut	1	Diamalloy	S55KS
Flashlight	1	Mallory	ML901-F
Glasses, Safety	2	Eastern Safety	410
Global Positioning System	1		
Heat Gun	1		
Inclinometer	1		
Knife, Utility	1	Klein	44100
Knife/Scissors/Pouch	1	Klein	46037
Multimeter, Handheld	1		
N-Connector, w/Padded Jaws	1	Cresant	529-10
Pliers, Needle Nose 4" Insulated	1	Diamalloy	LN54
Pliers, Slip Joint 6" Insulated	1	Diamalloy	K16
Printer, Color	1		
Radio, 2-Way or Cell Phone	2		
Rope, Nylon 100 feet	1		
Rope, Nylon 50 feet	1		
Safety Belt	1		
Screwdriver, #0 Phillips	1	Xcelite	X100
Screwdriver, #1 Phillips	1	Xcelite	X101
Screwdriver, #2 Phillips	1	Xcelite	X102
Screwdriver, #2 Phillips Stubby	1	Xcelite	SX102
Screwdriver, #3 Phillips	1	Xcelite	
Screwdriver, ¼ x 1" Slotted	1	Xcelite	S141
Screwdriver, ¼ x 4" Slotted	1	Xcelite	R144
Screwdriver, 1/8 x 2" Slotted	1	Xcelite	R182
Screwdriver, 1/8 x 8" Slotted	1	Xcelite	R188
Screwdriver, 3/16 x 3" Slotted	1	Xcelite	R3163
Shrink-tube, 3/4" Epoxy Lined	1		
Shrink-tube, Variety Pack	1		
Soldering Iron, 25 watt	1	Kester	83-4000-000

Table 3-2 – Required Tools and Equipment (Installation) (Continued)

DESCRIPTION	QNTY	BRAND	PART NO
Soldering Iron, Solder	1	Weller	SP23
Speed Square	1		
Static Material Kit	1	Charleswater	16430
Tape Measure	1		
Tie Wraps	1		
Wire Brush, Stiff	1		
Wire Stripper, 10-18 AWG	1	Ideal	45-120
Wire Wrap Tool, 24 & 26 Gauge, Manual	1		
Wire Wrap Tool, 24 & 26 Gauge, Power	1		
Wrench, 8" Adjustable	1	Diamalloy	D78
Wrench, SAE ¼ - ¾ Set	1		
Wrench, Socket Set (Deep)	1		
Wrench, Torque (20 in lbs. – 55 ft lbs.)	1		

Table 3-3 – Required Tools and Equipment (Survey)

DESCRIPTION	QNTY	BRAND	PART NO
Flashlight	1	Mallory	ML901-F
Safety Belt	1		
Radio, 2-Way or Cell Phone	2		
Wood Stick	1	Desco	517F
Compass			
Computer, Laptop (with LSM Software)	1		
Flashlight	1	Mallory	ML901-F
Global Positioning System	1		
Printer, Color	1		
Multimeter, Handheld	1		
Camera, (Digital Preferred)	1		
Soldering Iron, 25 Watt	1	Weller	SP23

This Page Intentionally Left Blank

4.0 Site Preparation

Prior to beginning physical installation of the Tel-Link Point to Multipoint (PMP) equipment, the Site preparation work should be complete. Site preparation includes but is not limited to the following:

- Completed Site Survey Checklist (P-COM highly recommends the use and completion of the Site Survey Checklist located in Appendix B)
- System Configuration Document Specification
- Commissioning Test Procedure for each site

The criteria below should be evaluated prior to designating Remote to Sector terminal RF paths with the use of Site Surveys and Link Budgets:

- An unobstructed line-of-sight
- Be within range (distance separation) with respect to the modulation type used
- Be within the antenna beamwidth

4.1 ODU/Antenna Installation Preparation

Verify the location selected has the following characteristics:

- Space on pole is adequate for mounting the antenna and ODU.
- Verify pole that the ODU/Antenna assembly is to be mounted on has been installed in the designated location identified on the Site Survey Checklist.
- Verify pole has been securely installed and a 10-12 AWG copper wire connects the pole to earth ground.
- Perform a continuity test between the pole and earth ground. Continuity should measure <1 Ohm.

4.2 IDU Installation Preparation

Verify the location selected has the following characteristics:

- Each site should be identified if the Indoor Unit (IDU) is to be rack mounted or placed on a tabletop. This information should be annotated in a completed Site Survey Checklist.
- Verify the required rack or table is installed, secured to the floor, and ready to accept the IDU.

The IDU Equipment should be installed in a location that is:

- Dry and clean
- Well ventilated
- Easily accessible
- Within 1000 feet of subsequent T1 equipment
- Within 1000 feet of the ODU when using LMR-400 or equivalent Coaxial cable
- Complies with all environmental specifications

NOTE:

P-COM highly recommends that a blower or fan be used with an enclosed rack containing three or more IDU's.

The IDU is designed to be installed in a 19-inch equipment rack or enclosed cabinet. However, the IDU may be mounted on a tabletop if necessary

4.3 Power Preparation

Verify the location selected has the following characteristics:

- Verify the correct power source has been provided within close proximity to the location where the IDU is to be installed.
- Verify the power source is controlled through an appropriately sized circuit breaker or fuse
- Verify power to the IDU is in the OFF position.

4.4 IFL Installation Preparation

Planning of the IFL coaxial cable run is critical to maintain minimal signal loss between the IDU and ODU. The IFL coaxial cable type P-COM recommends is the Times-Microwave LMR-400 coaxial cable which allows lengths of up to 1000 feet. Other coaxial cable types with similar performance characteristics or tradeoffs in cable lengths may be considered.

- Verify the Inter Facility Link (IFL), between the ODU and IDU locations, is present.

NOTE:

Maximum signal attenuation between the IDU and ODU is approximately 25 dB at 490 MHz.

- Verify a sufficient length of IFL is present at both ends to provide a service loop prior to being terminated to the equipment.
- Verify each end of the IFL is terminated with a Type-N male connector.

5.0 Equipment Receiving, Unpacking and Inspection

This procedure provides information for unpacking and inspecting the Tel-Link Point to Multipoint equipment prior to physical installation.

5.1 Equipment Receiving and Unpacking

At a minimum, check for the following

- Step 1** Check the outside of the shipping crates for visible signs of damage. Crushed corners or tears in cardboard may indicate rough handling which may result in hidden damage to equipment.
- Step 2** Inventory shipping crates and other packages received in the shipment. Verify that all items listed on the Electronic Goods Descriptive Inventory or applicable shipping document were received. Identify all missing items on the inventory sheet.
- Step 3** Record any noted damage to the outside of the packaging material on the carrier's Bill of Lading and have the transportation company initial the sheet. All notations should indicate location and condition.

Example: 1" x 2" scratch on left front (LF) metal panel; not LF panel scratched. Another example would be 4" x 6" dent in center panel; (not dent in panel).

WARNING!

The warranty will be violated if you do not take anti-static precautions when unpacking or assembling the PMP boards in the PMP shelf. Circuit modules can be damaged by electrostatic discharge. Ensure that an approved anti-static wrist strap is connected between the wrist of the person and an electrical ground before handling any of the circuit modules.

CAUTION!

Covering the floor with 1/8" pressed board, or equivalent, will prevent damage to the floor covering.

- Step 4** Carefully open the equipment packaging.

5.2 Inspecting the Equipment

- Step 1** For each of the PMP subsystems received, verify the equipment received matches the shipping list by Part Number and Serial Number. Report and discrepancies immediately using the field return procedure outlined in Section 12.0 of this manual.

The Tel-Link Point-to-Multipoint (PMP) system may be ordered in different configurations. Table 5-1 shows the Part Number for all system parts. In addition, the quantity of boards for redundant and non-redundant configurations is identified. The Equipment Parts List may contain more than the users specific requirements.

CAUTION!

Tampering with seals will void the warranty.

Table 5-1 – PMP Remote Terminal Equipment Parts List

REMOTE INDOOR UNIT (IDU)			
		Quantity (Per Configuration)	
Description	Part Number	Redundant	Non-Redundant
Remote IDU Chassis	48068	N/A	1
Remote Controller	28070	N/A	1
Modulator	28020	N/A	1
Demodulator	28023	N/A	1
User Interface Module			
6 x T1 UIM	28530	N/A	As Required
Power Supplies			
48 Vdc Module	48004-2 (AC input) 48008-4 (DC input)	N/A	1
+5, ±15 Vdc Module	48004-1 (AC input) 48008-3 (DC input)	N/A	1
Filler Panels	58512		As Required
REMOTE OUTDOOR UNIT (ODU)			
		Quantity (Per Configuration)	
Description	Part Number	Redundant	Non-Redundant
Remote ODU Module	Frequency dependent	N/A	1
12" Parabolic Antenna	Frequency dependent	N/A	1
24" Parabolic Antenna	Frequency dependent	N/A	Optional

Step 2

After unpacking the equipment, visually inspect the equipment for damage and ensure that:

- All components mounted on the individual boards are secure.
- The circuit boards are not cracked.
- There are no loose leads.
- The shelf unit has not been dented or damaged in any way.

- Step 3** Dispose of as much packing material as possible. P-COM suggests that the user retain at least one of each box with all packing materials. In the unlikely event that it is necessary to return a unit, the user will possess the required packing material for safe shipment of the unit.
- Step 4** Make claims for any damages incurred during shipment to the transportation company involved in accordance with company procedures.

This Page Intentionally Left Blank

6.0 Remote Terminal ODU Installation

6.1 Introduction

This procedure provides instruction for installing a P-COM Tel-Link Point to Multipoint Remote Terminal ODU/Antenna assembly.

6.2 Tools Required

Multiple vendors of antenna and mounting assemblies may be used to operate with the P-COM PMP ODU. A listing of tools necessary to install an antenna/mounting assembly, can be found in Vendor's Antenna Installation Manual.

6.3 Materials Required

- Antenna/mounting assembly. This assembly typically includes all hardware needed to install the antenna to the mount, and the mount to a pole.
- Outdoor Unit (ODU)

6.4 Step by Step Remote Terminal ODU/Antenna Installation Procedure

WARNING!

Failure to follow installation procedures may result in damage to the ODU/Antenna and render the radio unusable. Read through the entire procedure before attempting installation. Contact P-COM Technical Assistance Center (TAC) with any questions.

- Step 1** Refer to the appropriate vendor's installation manual to assemble the mount and antenna.
- Step 2** Install the ODU to the rear of the antenna. Align the waveguide port of the ODU to the waveguide port of the antenna. Ensure the correct polarization is used for the polarization sense of the ODU. The polarization orientation shown in Figure 6-1 is Transmit: Vertical, Receive: Horizontal. Secure the four retaining clips on the ODU to the antenna mount.

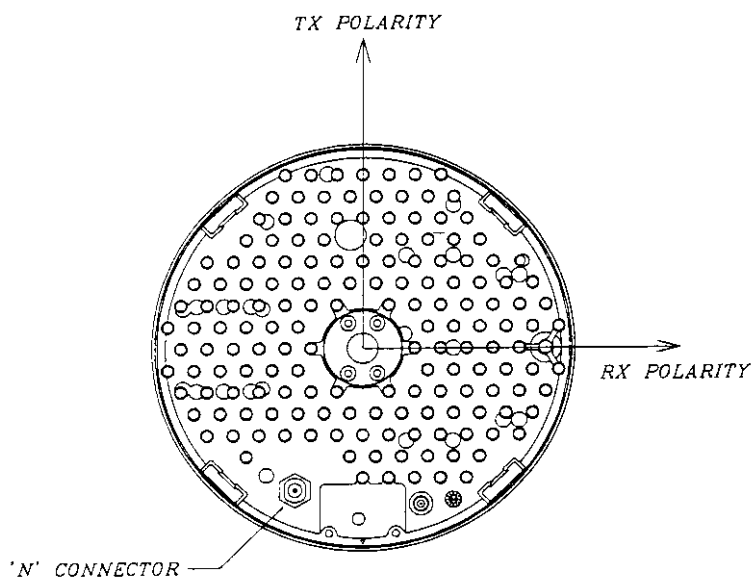


Figure 6-1 – ODU Polarization Orientation

- Step 3** Install the antenna assembly with the ODU to the pole or antenna mount. Tighten the nuts sufficiently to prevent the mount from sliding, but allows movement in the azimuth direction.

- Step 4** Prior to securely tightening the bracket bolts, point the antenna to the desired azimuth angle as defined in the Configuration Document. A compass should be sufficient to aim the antenna in the desired general direction within $\pm 3^\circ$, taking Magnetic Deviation into consideration when comparing the angle read on the compass to the desired azimuth angle. Set the elevation angle of the antenna to zero degrees using a level.

- Step 5** Tighten the mounting bolts to secure the antenna assembly to the mount.

- Step 6** The mounting system includes elevation and azimuth fine adjustments. Refer to the vendor's installation manuals for procedures of how to make these fine adjustments.

- Step 7** Final adjustments of the antenna will be accomplished during initial terminal configuration and testing.

7.0 Remote Terminal IDU Physical Installation

7.1 Introduction

This procedure provides instructions for installing the IDU Chassis in a standard 19 inch common equipment rack or cabinet. A typical installation of a Remote Terminal IDU in a rack is shown in Figure 7.1.

7.2 Tools Required

- Screwdrivers, Flat and Phillips
- Wire Stripper
- Solderless Crimp Tool

7.3 Materials Required

- Eight (8) equipment mounting screws with washers. (Consult rack manufacturer's documentation for required size.)
- Eight (8) cage nuts. (May not be required, consult rack manufacturer's documentation.)
- 12 AWG Green Stranded Wire.
- 12 AWG Compression Ring Lug

7.4 Step by Step Remote IDU Installation Procedure

Step 1 Install the IDU using screws in the eight mounting holes.

NOTE:

Ground all chassis through the Earth Ground Lug located on the back of the chassis.

Step 2 Ground the IDU chassis by installing compression type lugs and connecting the lugs to the rack frame vertical channel by using 12 AWG (or larger) copper wire. Remove any paint or oxidation from the surface of the equipment rack and apply an anti-oxidant compound to assure electrical contact to the rack channel. (Refer to Figure 7-1.)

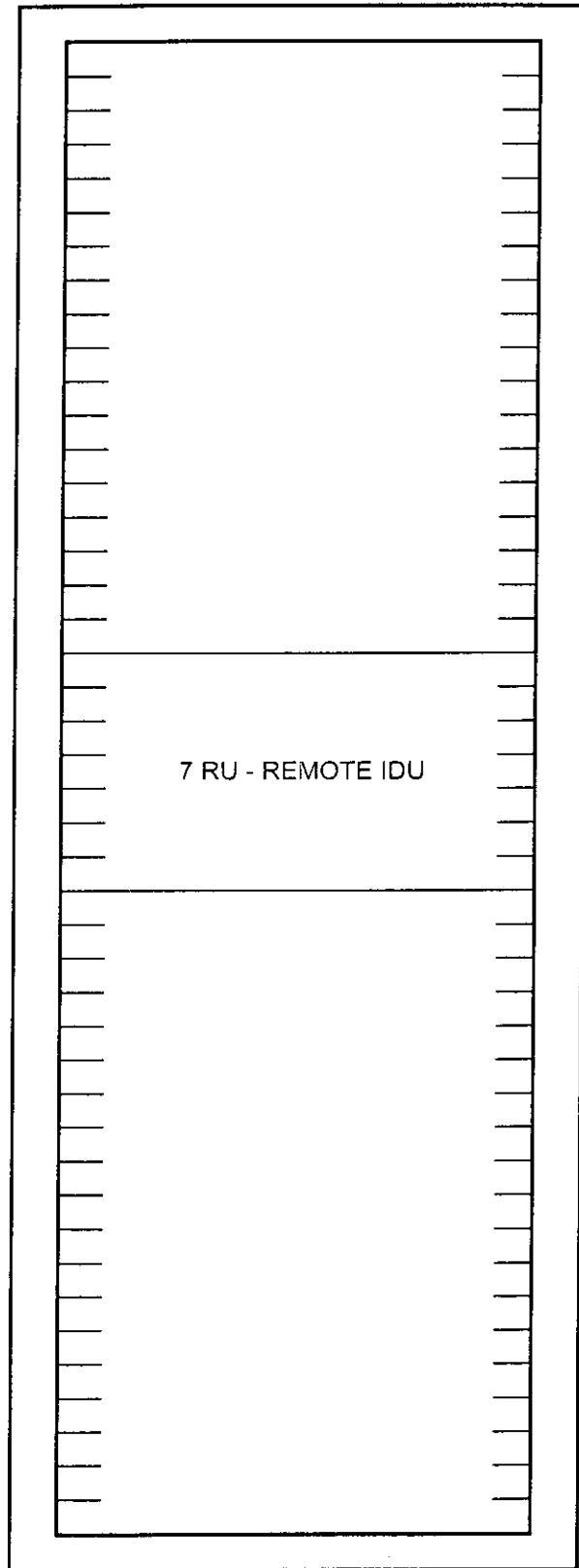


Figure 7-1 – Rack Elevation of a Remote Terminal IDU

8.0 Installation of Remote Terminal Wire and Cabling

8.1 Introduction

The following shelf wiring is required for full system operations:

- Power Supply Cabling
- IFL Cabling interconnect
- User Interface Module (UIM) Cables

The cabling requirements for the Power Supply and IF Coaxial Cable are provided in this section. Figures 8-1 and 8-2 displays a rear view of the Remote Terminal IDU, AC input and DC input, respectively. All interconnects to these IDU are shown in this figures.

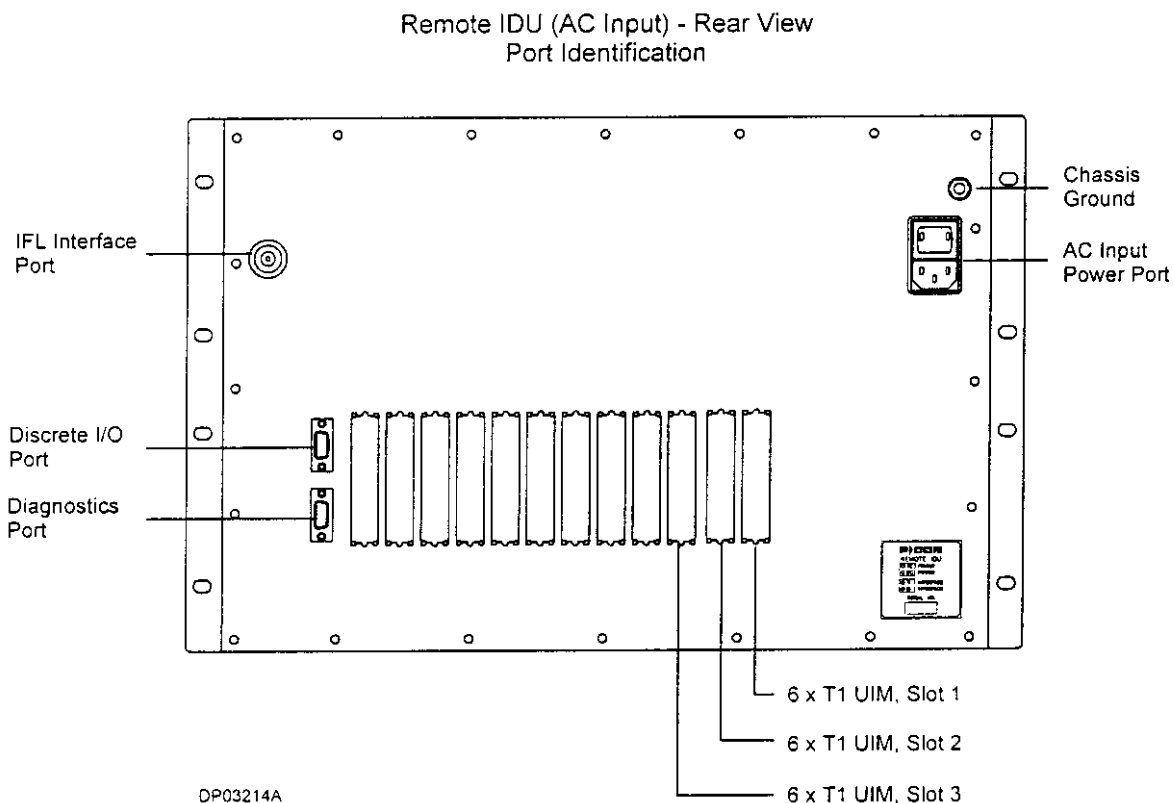


Figure 8-1 – Remote Terminal IDU (AC Input) Rear View

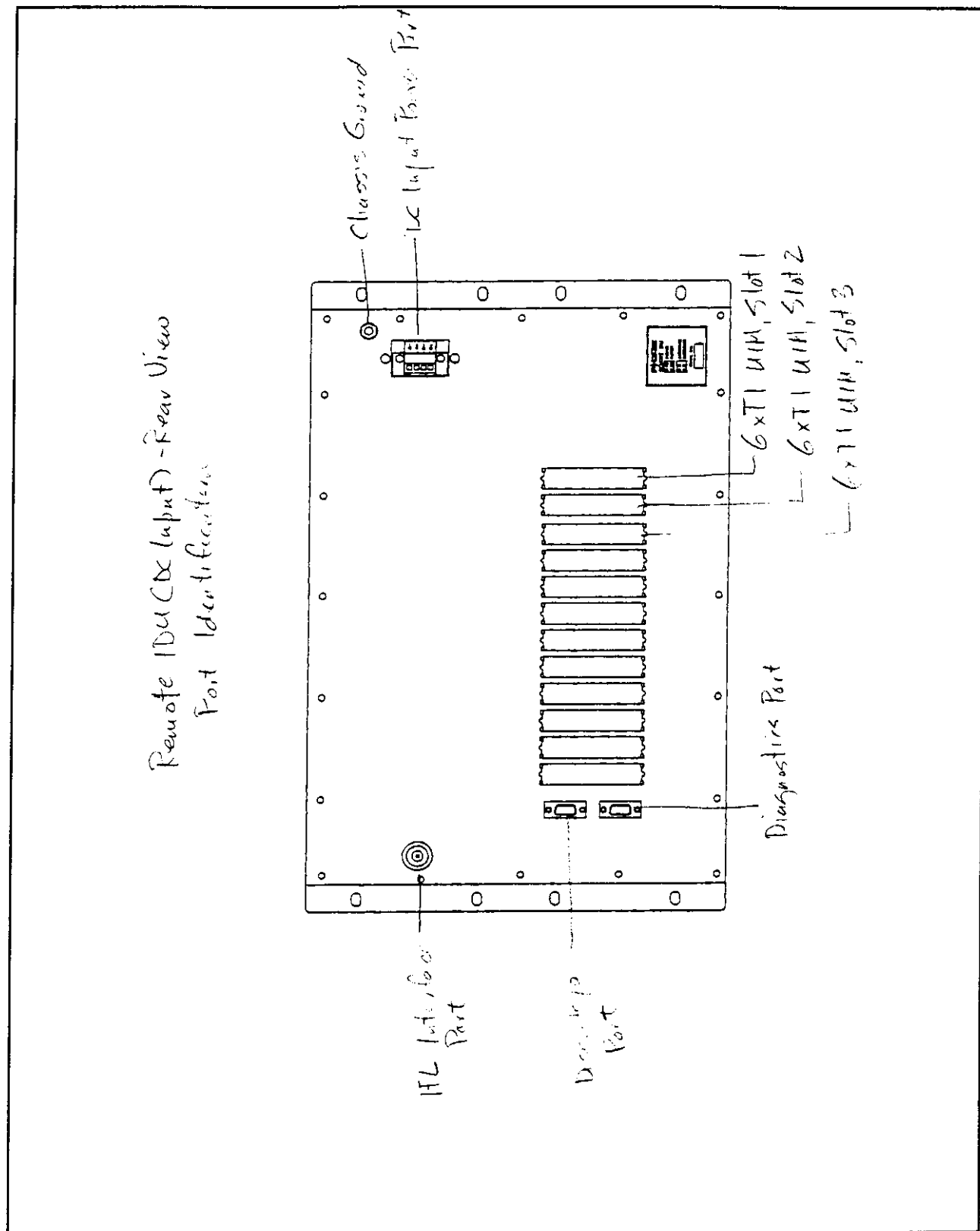


Figure 8-2 -- Remote Terminal IDU (DC Input) Rear View

8.2 Remote Terminal IDU Power Supply Wiring

8.2.1 AC Power Supply

For AC operations, a standard computer AC power cable rated for 10 Amp capacity is supplied with each Remote IDU chassis. The AC receptacle is found on the rear of the Remote IDU chassis (refer to Figure 8-3). One power cable is supplied with the Remote IDU.

DANGER!

Before connecting the AC cord to the IDU, ensure that the power switch is turned off.

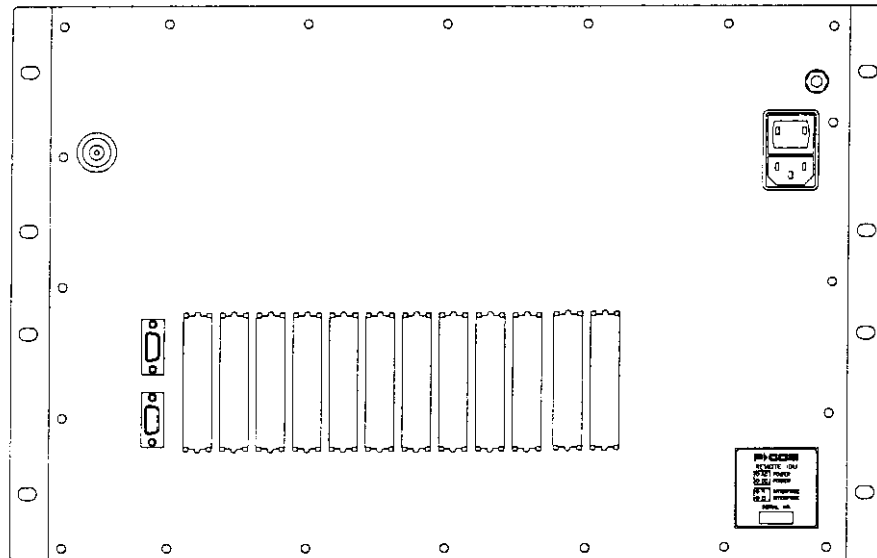


Figure 8-3 – AC Plug

The AC power to the Remote Terminal should be protected with a 1.0 Amp fuse or circuit breaker.

8.2.2 DC Power Supply

For DC operations, 12 AWG, 2-conductor cable is supplied. The cables for carrying DC power to the Remote IDU should be routed to a DC distribution panel preferably installed in the same rack (refer to Figure 8-4). The DC distribution panel should provide individual fuse protection to each chassis. The DC receptacle is found on the rear of the IDU.

DANGER!

Before connecting the DC cable to the IDU, ensure that the protection fuse is removed to prevent the application of power at this time.

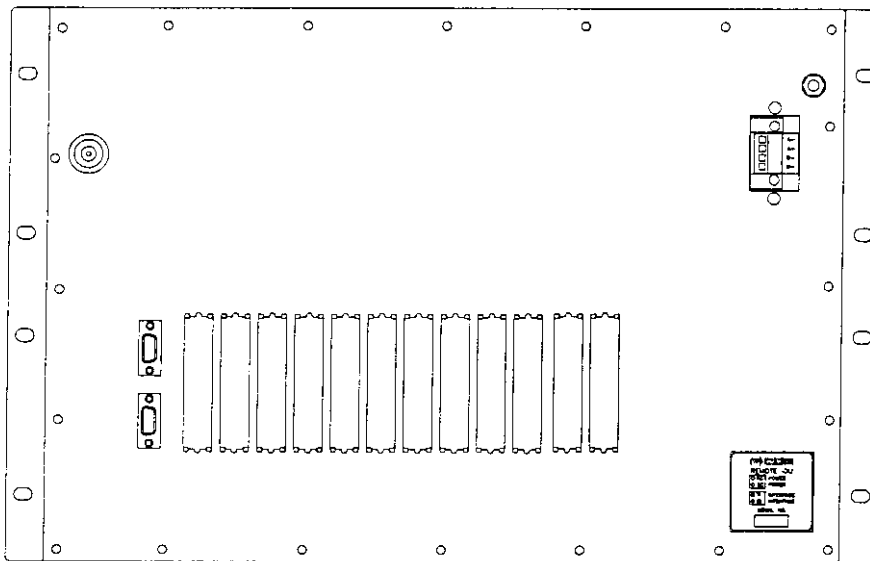


Figure 8-4 – DC Plug

The DC power to the Remote Terminal should be protected with a 2.5 Amp fuse.

8.3 Remote Terminal IDU Interfacility Coaxial Cable Installation

WARNING!

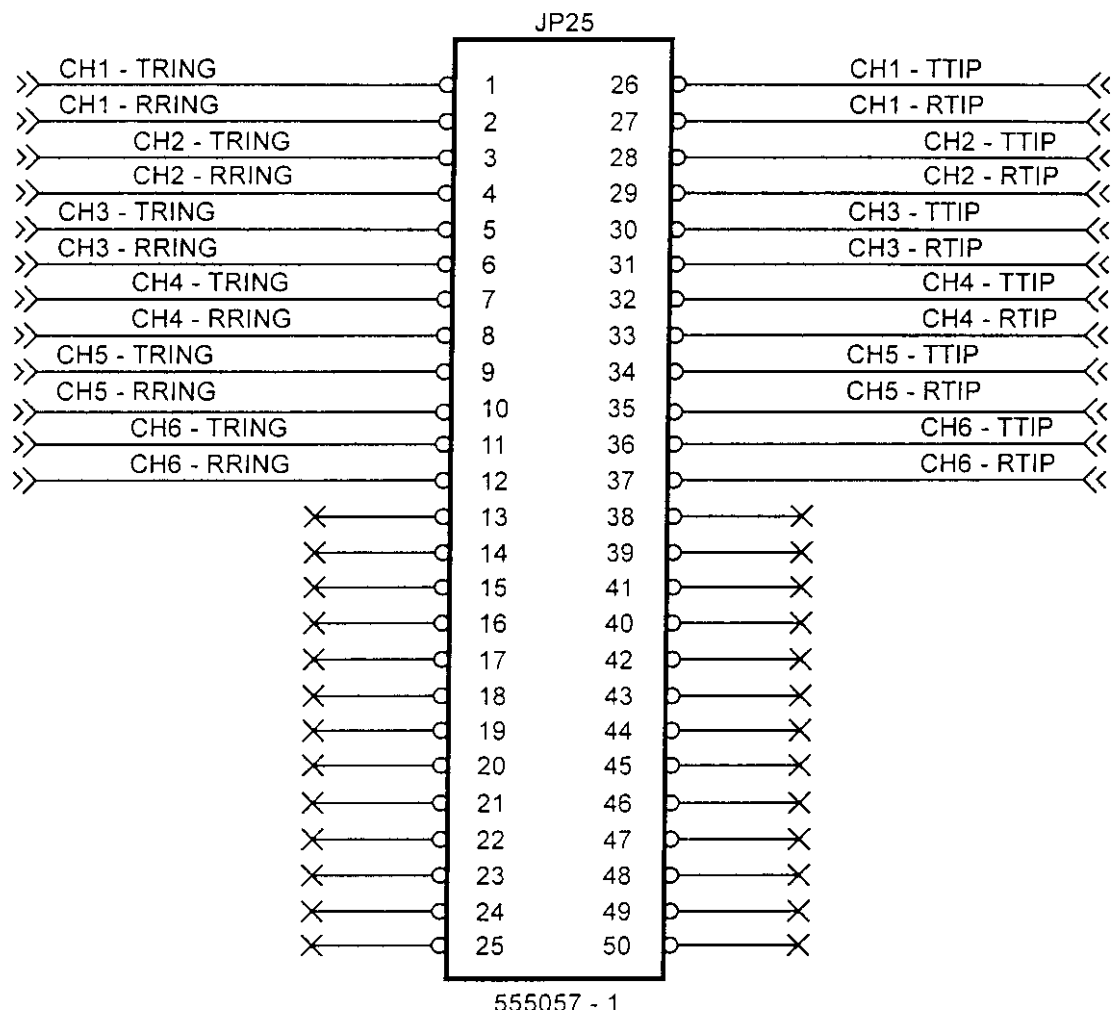
Do not plug the IDU into the AC outlet or DC power source until the cable to the ODU is connected. If power is on, a DC voltage (43V DC) will be present on the N connector of the IDU and could be shorted when installing the coaxial cable to the ODU.

Sufficient length of cable should be used to allow routing along the side of the rack. And Service loop. Connect the Type-N male connector on the IFL coaxial cable to the IFL Interface Port of the IDU, refer to Figure 8-1.

8.4 Remote Terminal IDU User Interface Module Cable Installation

The interface to the 6xT1 User Interface Module (UIM) is a 50-pin Amp Champ, female, connector. Access to this port is from the rear of the Remote Terminal IDU chassis. Figure 8-1 identifies the slot number of the boards when installed.

The pin-outs of the connector on the 6xT1 UIM board are shown in Figure 8-5.



555057 - 1

AMP, 50 - PIN CHAMP CONNECTOR
T1 INTERFACE I/O COONNECTOR

DP03208A

Figure 8-5 – UIM Pinouts

It is preferable to use a 50-pin Amp Champ, male, connector, part number _____. Secure the connector to the UIM board with the two captive retaining screws on the male connector.

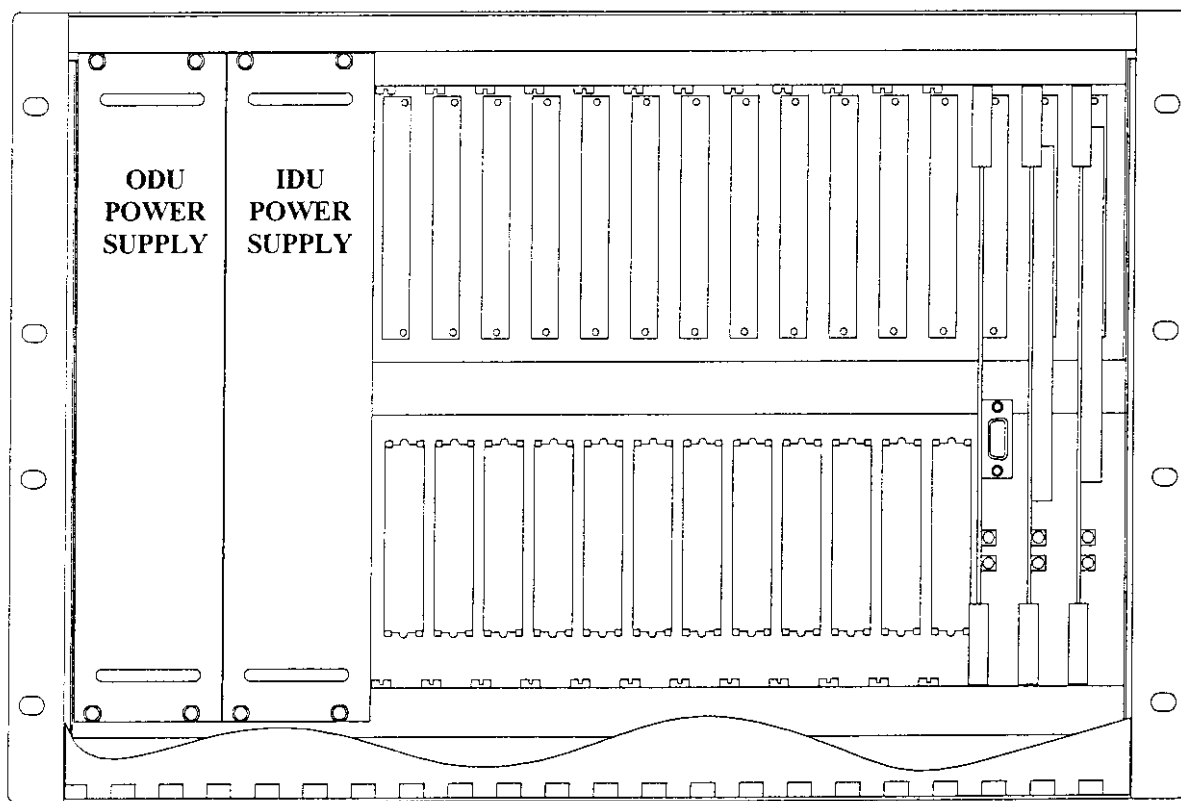
9.0 Remote Terminal IDU Board Installation

Warning!

Precautions for anti-static protection should be taken whenever handling printed circuit boards. Circuit modules can be damaged by electrostatic discharge. Ensure that an approved anti-static wrist strap is connected between the wrist of the person and an electrical ground before handling any of the circuit modules.

The common equipment boards consist of the Power Supply, Controller, User Interface Module (UIM), Modulator, and Demodulator. Up to three on-line UIM boards may be placed in a Remote Terminal IDU.

Placement of the common equipment boards within the IDU chassis is critical, and should follow the appropriate illustrations in Figures 9-1. Insert the boards from left to right for each board type.



Figure

9-1 – Remote Terminal IDU Board Placement

The printed circuit board has a high-density connector on one edge of the board and two black ears on the opposite edge of the board. A diagram of the XXXX board is shown in Figure 9-2, identifying the high-density connector and the two black ears. Within the chassis, a board slot consists of nylon guides located at the top and bottom of a board slot, and a high density mating connector located on the motherboard within the chassis.

<< Insert diagram of a printed circuit board identifying the motherboard connector and insertion ears >>

Figure 9-2 – Printed Circuit Board

To insert a printed circuit board, vertically align the printed circuit board with the board slot of the chassis. The majority of the components on the printed circuit board should be facing towards the right of the chassis. The high-density connector located on the printed circuit board is inserted into the chassis first, orientated to allow mating with the corresponding high-density receptacle on the motherboard within the chassis (refer to Figure 9-3).

<< Insert diagram showing the printed circuit board being inserted into the chassis showing the ears extended >>

Figure 9-3 – Printed Circuit Board Insertion

The two black ears on the front edge of the board are to be held in an extended orientation. Slide the board into the chassis, along the guides, until the two high-density connectors are close to mating. Use the grips of the black ears to attach to the chassis frame, pressing the ears towards the printed circuit board edge, making a secure connection with the two high-density connectors (refer to Figure 9-4).

<< Insert diagram showing close-up of ears attaching to chassis frame during insertion >>

Figure 9-4 – Printed Circuit Board Insertion

To remove a printed circuit board, grab the two black ears on the edge of the printed circuit board. Extending these ears will separate the printed circuit board high-density connector from its mate within the chassis. Slide the printed circuit board out of the chassis to complete the removal.

This Page Intentionally Left Blank

10.0 Remote Terminal Initial Power Application

10.1 DC Power Application

- | | |
|---------------|---|
| Step 1 | Remove the DC connector from the Remote Terminal IDU. |
| Step 2 | Insert the appropriately sized fuse in the fuse holder assigned to the chassis. |
| Step 3 | Plug in the DC connector into the DC Power Port of the Remote Terminal IDU. |
| Step 4 | Verify power is applied to the chassis by viewing the LEDs on the boards within the IDU chassis. |
| Step 5 | If the LEDs on the boards do not illuminate, remove the DC connector from the IDU and verify wiring and voltage polarity. |

10.2 AC Power Application

- | | |
|---------------|---|
| Step 1 | Insert the appropriately sized fuse, or switch the circuit breaker to the ON position. |
| Step 2 | Place the AC power switch on the Remote Terminal in the ON position. |
| Step 3 | Verify power is applied to the chassis by viewing the LEDs on the boards within the IDU chassis. |
| Step 4 | If the LEDs on the boards do not illuminate, remove the DC connector from the IDU and verify wiring and voltage polarity. |

This Page Intentionally Left Blank

11.0 Initial Terminal Configuration and Testing

Proper functioning of this command and response exchange verifies that the IDU's Local Site Manager (LSM) agent and other critical software components are present and operational. From the PC, the installer can use the **Get** and **Set** commands to communicate with the LSM agent in the IDU to set and interrogate the IDU configuration. Completion of the test will ensure configuration items are properly loaded.

11.1 Terminal Configuration

- Step 1** After applying power to the Remote Terminal. Allow the terminal to warm up for five minutes.
- Step 2** Verify that each card has completed its self-test process and the LEDs on the front of each card are in an operational state. (Refer to Table 11-1).

Table 11-1 – Board LED Indications

BOARD	LED COLOR	INDICATION	DESCRIPTION
Modulator	Green	On	OK
		Off	Fault
	Red	On	Fault
		Off	OK
Demodulator	Green	On	OK
		Off	Fault
	Red	Fast Blink	Demodulator configured, not locked
		Slow Blink	Demodulator not configured
		On	Fault
Hub/Sector Controller	Green	Blinks	OK
		Off or Solid On	Backplane or Cell I/F in Fault
	Red	On	Fault
		Off	OK
T1	Green	Blinks	Operational
		Off	Fault
	Red	Blinks	Fault

- Step 3** Connect the PC equipped with the Local Site Manager (LSM) software to the diagnostics port on front of the Controller board in the IDU. Connection is via a 10" cable with DB-9 connectors on each end, refer to Figure 11-1. The LSM should be running the P-COM WaveLiew Lite software.

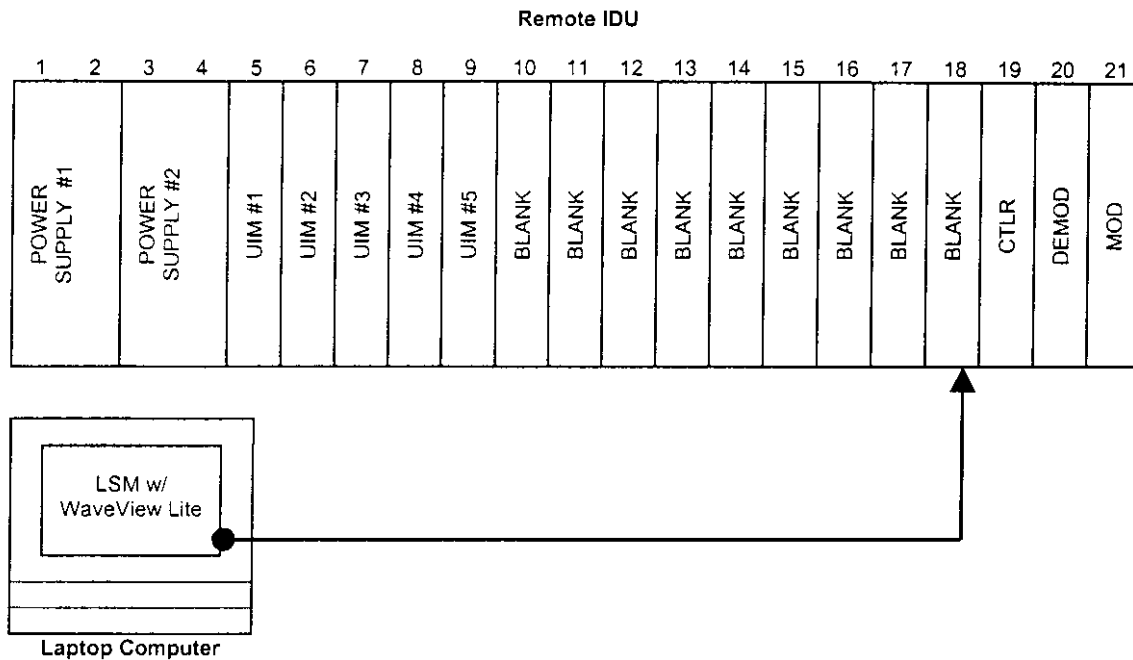


Figure 11-1 – LSM Attached To NMS Controller of Remote IDU

- Step 4** Load appropriate software in the Controller and each UIM card.
- Step 5** Verify that the transmitter is disabled.
- Remote Terminal SET the **sc_Commissioning_Complete** register to "No"
- Step 6** Load (SET) appropriate registers in the IDU. Refer to the System Configuration Document for appropriate frequencies, data rates, modulations, T1 mapping, etc. The icon to the left of each of the configuration item's name should have a green plus symbol to indicate successful loading of each configuration parameter.

11.2 Terminal (Local) Testing

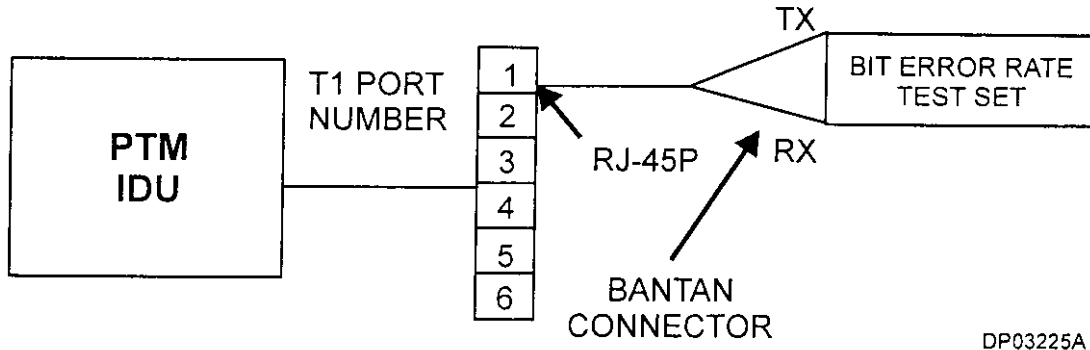
11.2.1 T1 Loopback Test

Perform a "Remote Loopback" BER test on each T1 port.

NOTE:

For this test, a Bit Error Rate test set is substituted for the actual CPE. P-COM recommends the TTC Fireberd test set, model 4000 or 6000, with the DS1/T1/D4ESF/SLC-96 data interface module. A self-loop test should be conducted on the test set prior to performing this procedure. A test is to be conducted for each of the T1 ports the IDU is configured with.

- Step 1** Using the LSM, SET the **Remote_Loopback** register of the T1 port under test to **Loopback_To_Ext_Device**.
- Step 2** Connect the Bit Error Rate (BER) test set to the T1 port under test with the BER test cable. (Refer to Figure 11-2).



DP03225A

PINOUTS		
RJ45P	CIRCUIT DESC	BANTAM PLUG
1	Chn Rx Ring	Tx Ring
2	Chn Rx Tip	Tx Tip
3	NC	
4	Chn Tx Ring	Rx Ring
5	Chn Tx Tip	Rx Tip
6	NC	
7	NC	
8	NC	

Figure 11-2 – Bit Error Rate Test Configuration

- Step 3** Allow the test to run for 20 minutes. Record results of each T1 port.
- Step 4** Upon completion of each test SET the **Remote_Loopback** register to **Disabled**.

11.2.2 Antenna Alignment

Step 1 Enable the transmitter

- Remote Terminal Set the **sc_Commissioning_Complete** register to "Yes"

Step 2 Verify proper transmit level. SET the following registers:

- TxLevCtrlDBM** 20
- TX_Enable** Enabled
- Antenna_Align** Enable

- Step 3** Attach the P-COM Antenna Alignment Meter to the Test (BNC) port of the ODU.
- Step 4** Loosen the appropriate bolts to allow the fine adjustment tuning of the antenna.
- Step 5** Adjust the antenna in elevation and azimuth (elevation only for the Sector Antenna) to achieve maximum signal level.
- Step 6** Securely fasten all bolts.

11.3 Terminal Commissioning

The Commissioning Test Procedure outlines the steps to commission a Remote Terminal into a new or existing Sector Network. Follow the steps in this document to bring a new Remote Terminal on line.

12.0 Technical Support

12.1 Warranty

P-COM warrants Point-To-Multipoint products to be free from defects in materials and workmanship for a period of twelve (12) months from the date of shipment from the factory. Extended warranty options are available.

12.2 Return Process

The boards of the PMP product requiring service may be sent to P-COM Florida at any time whether the unit is under warranty or not. There is a charge for repairs after the twelve-month warranty period.

A product requiring service should be returned with a detailed description of the problem and proof of purchase date if the twelve-month warranty has not expired. The product should be returned in its original shipping carton to ensure that in-transit damage does not occur.

The following process should be used whenever returning equipment to P-COM:

- Step 1** Contact P-COM at the telephone number below to obtain a Return Material Authorization (RMA) number and return shipping address:

P-COM Technical Assistance Center

Phone Number: (407) 674-3699.

FAX Number: (407) 674-3799

Hours of Operation

8:00 AM to 5:00 PM EST

NOTE:

All equipment received without an RMA will be returned to the sender.

- Step 2** Pack the equipment in the original shipping containers, if possible. If original shipping containers have been discarded, pack the failed unit so as to protect it from shipping damage.
- Step 3** Obtain insurance from the shipper that will cover the entire value of the equipment being returned.
- Step 4** Send the equipment (pre-paid shipping) to the address received from the Technical Assistance Center.
- Step 5** P-COM will notify the sender, upon receipt of the equipment, of an estimated time to repair and for return shipping instructions. An estimate of the repair cost will be given for all non-warranty repairs

All repairs covered under warranty will be completed at no cost and the return shipping (surface) will be paid for by P-COM. Repairs not covered by the warranty will be performed at current P-

COM labor rates and material costs and billed to the customer. In addition, shipping will be billed for non-warranty repairs.

12.3 Spares Ordering Information

Spare parts may be ordered at any time. Please submit requests consisting of part description, part number and quantity to the following address:

P-COM Florida
Spares Ordering Department
1801 Penn Court
Melbourne, Florida 32901

Spare parts pricing may be obtained by calling or faxing P-COM's Spares Ordering Department at:

Phone Number: (407) 674-3699
FAX Number: (407) 674-3799

12.4 Recommended Spare Parts

The following table is a list of recommend spare parts:

Table 12-1 – Recommended Spare Parts

DESCRIPTION	PART NUMBER	QUANTITY
Hub/Sector IDU		
Sector Controller	28520	1
Modulator	28020	1
Demodulator	28023	1
Network Interface Modulator	28530	1
Power Supply	XXXXX	1
Hub/Sector ODU		
Hub/Sector ODU Module	XXXXX	1
Hub IF Combiner		
Hub IF Combiner Module	XXXXX	1
Remote IDU		
Remote Controller	28070	1
Modulator	28020	1
Demodulator	28023	1
User Interface Module	As Required	1
Power Supply #1 (+48 Vdc)	XXXXX	1
Power Supply #2 (+5, ± 15 Vdc)	XXXXX	1
Remote ODU		
Remote ODU Module	XXXXX	1



January 1999

APPENDIX A:

PMP Installation Procedure Checklist

PMP INSTALLATION PROCEDURE CHECKLIST

(To Be Completed For Each Site)

Technicians Name:		Date:	
----------------------	--	-------	--

INTRODUCTION

This Installation Procedure Checklist is provided to ensure the correct procedures for installing P-COM PMP equipment are followed. The Checklist is to be completed for each site installed and the installer is to check-off each box upon completion of each step. Upon installation completion, the installer will sign and date the Checklist.

Site Name:	
------------	--

Site Designation:	
	Sector Terminal Remote Terminal

FORMS:

- ☐ Verify possession of completed Site Survey form for the designated site
- ☐ Verify possession of System Configuration Document for designated site
- ☐ Verify possession of Commissioning Test Form for testing of a terminal

TOOLS:

- ☐ Verify all required tools listed in P-COM PMP Installation and Operation Manual are in good working order

INVENTORY: The shipping list should contain all equipment ordered by the customer for the total number of Sector and Remote Terminals

- ☐ Verify equipment received matches the shipping list by Part Number and Serial Number
- ☐ Verify equipment has arrived without any visible damage

NOTE:

Any visible damage should be reported immediately to the customer and to the P-COM TAC at: (407) 674-3699.

PMP INSTALLATION PROCEDURE CHECKLIST			
Site Name:		Date:	
OUTDOOR UNIT (ODU) INSTALLATION SEQUENCE			
ODU/ANTENNA INSTALLATION PREPARATION			
☐ Verify pole the ODU/Antenna assembly is to be mounted on has been installed in the designated location identified in the Site Survey Form ☐ Verify the pole has been securely mounted and that a 10-12 AWG copper wire connects the pole to earth ground ☐ Perform a continuity test between the pole and earth ground. Continuity should measure ≤ 1 Ohm			
ODU/ANTENNA INSTALLATION:			
☐ Properly install the ODU/Antenna assembly in accordance with the P-COM Installation and Operation Manual ☐ Sector ODU/Antenna: Align the antenna in the direction for operations as specified in the P-COM System Configuration Document ☐ Remote ODU/Antenna: Align the antenna in the general direction of the designated Sector Terminal. Fine-tuning will be performed during the "Initial Power-up and test Sequence."			
ODU INTERCONNECT:			
☐ Remote Terminal: Connect the IFL cable to the ODU RF Port (Type-N Connector) ☐ Sector Terminal: Connect the IFL cable between the appropriate ODU and Hub IF Combiner chassis. ODU #1 should be connected to Hub IF Combiner #1. ODU #2 should be connected to Hub IF Combiner #2			
INTERFACILITY LINK (IFL) INSTALLATION SEQUENCE			
IFL INSTALLATION PREPARATION:			
☐ Verify presence of an appropriate Interfacility Link (IFL) between ODU and IDU locations ☐ Verify sufficient length of IFL exists at both ends to provide a service loop prior to being terminated to the equipment ☐ Terminate each end of the IFL with Type-N male connector The IFL should be Times-Microwave LMR-400 coaxial cable, or equivalent, unless otherwise stated in the P-COM Site Survey Form			
Page 2 of 5			

PMP INSTALLATION PROCEDURE CHECKLIST

Site Name:

Date:

INDOOR UNIT (IDU) INSTALLATION SEQUENCE

IDU INSTALLATION PREPARATION: Each site should be identified if the Indoor Unit (IDU) should be rack mounted or placed on a tabletop. This information is found in the P-COM Site Survey Form.

- ☐ Verify possession of IDU chassis and all appropriate cards intended to populate the IDU
- ☐ Verify presence of customer's interface demarcation
- ☐ Verify required rack/table is installed, secured to the floor, and ready to accept the IDU
- ☐ Verify correct power source has been provided within close proximity to the location where the IDU is to be installed
- ☐ Verify power source is controlled through an appropriately sized circuit breaker or fuse
- ☐ Verify power to the IDU is in the **OFF** position

IDU INSTALLATION:

- ☐ Properly install the IDU in accordance with the P-COM Installation and Operation Manual

IDU INTERCONNECT: There are four cables to be connected to the rear of the IDU

- ☐ Remote Terminal: Connect the IFL cable to the RF Port of the IDU
- ☐ Sector Terminal: For a Sector with one or more IDU's, connect Sector #1-Port #1 to Hub IF Combiner #1-Port #1. Connect IDU #1-IF Port #2 to Hub IF Combiner #2-Port #1. This same sequence should be followed if multiple IDUs are used in a Sector. A BNC (F) to Type-N (M) adapter may be required on each IF port on the IDU
- ☐ Sector and Remote Terminals: Connect the power leads/cord to the IDU Input Power port. Terminate the power leads/cord to the appropriate AC or DC power source. Two power leads/cables are to be terminated for a Sector Terminal
- ☐ Sector and Remote Terminals: Connect a ground wire from the chassis to a local earthgrounds

CUSTOMER PREMISE EQUIPMENT PREPARATION:

- ☐ Verify Customer Premise Equipment (CPE) has been installed within close proximity to the IDU equipment
- ☐ Verify sufficient length of CPE cable is present to provide a service loop prior to being terminated to the equipment
- ☐ Sector and Remote Terminals: After completion of the Commissioning Test Plan connect the CPE cable to the appropriate port on the User Interface Module (UIM) or Network Interface Card (NIC)

PMP INSTALLATION PROCEDURE CHECKLIST

Site Name:

Date:

HUB IF COMBINER INSTALLATION:

The Hub IF Combiner should be installed at least 1 rack unit above each Sector bank of IDUs to prevent air flow restriction

- ☐ Properly install the Hub IF Combiner in accordance with the P-COM Installation and Operation Manual

HUB IF COMBINER INTERCONNECT:

- ☐ For a Sector with one or more IDUs, connect IDU #1-IF Port #1 to Hub IF Combiner #1-Port #1. Connector IDU #1-IF Port #2 to Hub IF Combiner #2-Port #1. This same sequence should be followed if multiple IDUs are used in a Sector.
- ☐ Connect the power cord/leads to the Input Power port. Terminate the power cord/leads to the appropriate AC or DC power source
- ☐ Connect a ground wire from the chassis to a local earth ground

Initial Power-on and Test Sequence

- ☐ When prepared to apply power to the IDU, turn the circuit breaker assigned to the IDU to the ON position

SECTOR TERMINAL:

- ☐ Apply power to the Sector IDU Terminal. Allow the terminal to warm up for five minutes
- ☐ Verify each card has completed its self-test process and the LEDs on the front of each card are in an operational Green condition. Interpretation of LED conditions may be found in Table 4-1, Board LED Indications of the P-COM Installation and Operations Manual.
- ☐ Connect the LSM to the Controller
- ☐ Load appropriate software in the IDU
- ☐ Load (Set/Get) appropriate registers in the IDU
- ☐ Verify configuration loaded successfully
- ☐ Verify transmitter is disabled. The sc_Commissioning_Complete register should indicate "uncommissioned."
- ☐ Perform the "Remote Loopback" BER tests on all T1 ports in accordance with P-COM PMP Installation and Operation Manual
- ☐ Place T1 looping plugs in all T1 ports
- ☐ Enable the transmitter. Set the sc_Commissioning_Complete register to "commissioned."
- ☐ Verify proper transmit level

PMP INSTALLATION PROCEDURE CHECKLIST

Site Name:

Date:

REMOTE TERMINAL:

- ☐ Apply power to the Remote IDU Terminal. Allow the terminal to warm up for five minutes
- ☐ Verify each card has completed its self-test process and the LEDs on the front of each card are in an operational Green condition. Interpretation of LED conditions may be found in Table 4-1, Board LED Indications of the P-COM Installation and Operations Manual.
- ☐ Connect the LSM to the Controller
- ☐ Load appropriate software in the IDU
- ☐ Load (Set/Get) appropriate registers in the IDU
- ☐ Verify configuration loaded successfully
- ☐ Verify transmitter is disabled. The sc_Commissioning_Complete register should indicate "uncommissioned."
- ☐ Perform the "Remote Loopback" BER tests on all T1 ports in accordance with P-COM PMP Installation and Operation Manual
- ☐ Align the Remote Terminal antenna. Connect a DVM to the test port of the ODU. Adjust the antenna in elevation, then in azimuth to obtain a peak voltage measurement. Typical measurements should indicated ____Vdc. Tighten down all mounting bolts
- ☐ Verify proper receive level is registered at the IDU
- ☐ Enable the transmitter. Set the rc_Commissioning_Complete register to "commissioned."
- ☐ Perform BER tests with the Sector Terminal for each T1 port for at least 30 minutes. Record performance on the data sheets provided for commissioning each terminal

Installation Completed

This concludes the P-COM PMP equipment installation sequence. Sign and date in the spaces provided below and proceed to the P-COM PMP Commissioning Test Plan.

Signature:

Date:

Page 5 of 5

APPENDIX B: Site Survey Checklist

SITE SURVEY CHECKLIST (To Be Completed For Each Site)					
ENGINEER:				DATE:	
CUSTOMER:				ADDRESS:	
CONTACT NAMES(S):					
TELEPHONE NUMBERS:					
SITE CHARACTERISTICS					
NOTE: Prior to site installation planning visit, complete line-of-sight, transmission engineering and preliminary frequency coordination work to establish viability of path selected.					
Site Name:					
Site Designation:					
Sector Terminal			Remote Terminal		
Coordinates:	GPS EPE:		Degrees	Minutes	Seconds
Latitude					
Longitude					
Ground Elevation AMSL (Above Mean Sea Level):					
Distance Between Hub And Remote Terminals					
Kilometers:					
Azimuth (True) From Sector:					
Hub/Sector Terminal:			Remote Terminal:		
Transmit Frequency (High/Low Band; Polarization)					
Transmit:			Receive:		
Available Conduit:					

SITE SURVEY CHECKLIST					
CUSTOMER:				DATE:	
SITE NAME:					
OUTDOOR EQUIPMENT					
Roof Access (Describe):					
Site Access					
	Yes	No		Yes	No
Roof Access Door			Ladder Required		
Permit Required			Access Keys Required		
Roof Penetration			Wall Penetration		
Special Tools Required			On-site Escort Required		
If Yes, What Special Tools:			If Yes, Who Is Needed As The Escort:		
Sketch/Photos Of Equipment And Site (on pages 5 and 6) – Include Site Layout (Topographical Map And Building Blueprints If Available), Location Of Antenna/ODU, And Briefly Explain How The Antenna/ODU Will Be Installed Below.					
Tripod:					
Wall Mount:					
Parapet:					
Tower:					
Other:					
Pole Diameter:					
Show details in sketch of proposed mounting and hardware (pole) location. Show relationship to coaxial cable access and building ground. Show lightning rod ground connect point if applicable					
Terrain Considerations:					
Obstructions:					
Other Considerations:					

SITE SURVEY CHECKLIST

CUSTOMER:		DATE:	
------------------	--	--------------	--

SITE NAME:	
-------------------	--

INTERFACILITY POWER AVAILABILITY

Available Power (Voltage and Current)

NOTE:

Do not mount radio equipment in the proximity of machinery that can either generate large electromagnetic fields or large voltage spikes as they cycle on/off (i.e., air conditioners, elevator motors, etc.).

	Yes	No		Yes	No
AC Power On Roof			AC Power At Rack		

Identify Location/Distance to Available AC Power:	
---	--

Distance Between ODU and IDU:	
--------------------------------------	--

NOTE:

Maximum distance of LMR-400 Cable is 1000 Feet

Has Cable Been Ordered?	Yes	No
IFL Cable Supplied By		
P-COM	☐	Customer

Distance Between IDU and Customer Premise:	
---	--

NOTE:

Maximum distance for T1 is 1000 Feet

Sketch/Photos Of Equipment – Cable Run From ODU To IDU

Show Access Points (i.e., Floors) (Sketch) (Space available on Pages 5 and 6)

	Yes	No
IFL Exists In-place		
Is Plenum Rated Cable Required?		

Length:		Type #	
---------	--	--------	--

	Yes	No
Is Pull Rope Installed In Conduit		
Is New Pull Rope Required		

SITE SURVEY CHECKLIST					
CUSTOMER:			DATE:		
SITE NAME:					
INDOOR EQUIPMENT					
What Type of Terminating Equipment Will Be Used (Customer Premise Equipment)					
Check Site For:					
	Yes	No		Yes	No
Phone Jack Available			AC/DC Power Provided		
Fuse Panel Available			Battery Back-up Required		
Is Equipment Redundancy A Requirement?					
Number of IDU's Required:					
IDU Mounting:	Rack Mounted			Tabletop Mounted	
Rack/Table Supplied By:	P-COM			Customer	
Rack or Table Ordered?				Yes	No
Limitations on Rack or Table Floor Space:					
				Yes	No
Temperature/Humidity Controlled Room					
Air Flow Restrictions					
Fans Needed					
Other Rack Installation considerations:					
Sketch/Photos Of Equipment Including (on pages 5 and 6) – Site layout (Include extracts from topographical map and building blueprints if available) and location of radio equipment					
TOOLS REQUIRED					
	Yes	No		Yes	No
Binoculars			Camera		
Cellular Phone (2 each)			Compass		
Flashlight/Strobe			GPS Receiver		
Tape Measure			Other		

SITE SURVEY CHECKLIST

CUSTOMER:

DATE:

SITE NAME:

SKETCH OF EQUIPMENT AND SITE

Page 5 of 6



CUSTOMER:

DATE:

SITE NAME:

SKETCH OF EQUIPMENT AND SITE

Page 6 of 6

This Page Intentionally Left Blank

Glossary

AAU	Antenna Alignment Unit
AGC	Automatic Gain Control
AIS	Alarm Indicator Status
AMI	Alternate Mark Inversion
AMSL	Above Mean Sea Level
ASIC	Application Specific Integrated Circuit
B8ZS	Bipolar with Eight Zero Substitution
Base Station	The center of a cell where Sector Terminal(s) are installed.
BER	Bit Error Rate
BNC	Bayonet Nut Connector
BPV	Bipolar Violation
CAS	Channel Associated Signaling
CCS	Common Associated Signaling
CHAMP	Connector
CLAV	Cell Available
CPE	Customer Premise Equipment - Customer provided equipment that connects to the interface port(s) of the IDU.
CRC	Cyclic Redundancy Check
CSA	
DBPSK	Differential Bi-Phase Shift Keyed
DFM	Drive Fault Monitor
DLL	Dynamic Link Library
Down Link	The RF communications path from a Base Station to the Remote Terminal
DQPSK	Differential Quadrature-Phase Shift Keyed
DSP	Digital Signal Processor
EIA	Electronics Industry Association
EIRP	Effective Isotropic Radiated Power
EMC	
EPLD	Electronically Programmable Logic Device
ESF	Extended Super Frame Format
ETSI	
FCC	Federal Communications Commission
FDMA	Frequency Decision Multiple Access
FEC	Forward Error Correction
FPGA	Field Programmable Gate Array
FSK	Field Shift Keyed
FWA	Fixed Wireless Access

HDB3	High Density Bipolar Order 3
IDU	Indoor Unit
IF	Intermediate Frequency
IFL	Interfacility Link
ISDN	
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LIU	Line Interface unit
LMCS	Local Multi-Point Communications Services
LMDS	Local Multi-Point Distribution Services
LNA	Low Noise Amplifier
LOS	Loss of Signal
LSM	Local Site Manager -Laptop or desktop PC using the P-COM's WaveView Lite Windows application
MC	Modem Controller
MCF	Motorola Cold-Fire Processor
MIB	Management Information Base
NCO	Numerical Control Oscillator
NIC	Network Interface Card - Supports user interfaces, as well as signal monitoring and port statistics collection.
NMA	Network Management Agent
NMS	Network Management System
ODU	Outdoor Unit
OTA	Over the Air
PA	Power Amplifier
PA	Power Amplifier
PCB	Printed Circuit Board
PD	Pattern Detect
PMP	Point-to-Multipoint
POST	Power Up Self Test
POTS	
PSN	Public Switched Network
PTN	Public Telephone Network
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keyed
RAM	Random Access Memory
RCS	Redundancy Control Switch
Remote IDU	Remote Terminal Indoor Unit chassis located at the remote location
Remote ODU	Remote Terminal Outdoor Unit located at the remote location,

	connected to a directional antenna pointed towards the Sector Terminal.
Remote Terminal	Consists of a Remote IDU, Remote ODU and Interfacility Link
RF	Radio Frequency
RMA	Return Material Authorization
ROC	
ROM	Read Only Memory
RSSI	Receive Signal Strength Indicator
RU	Rack Unit
RX	Receive Signal
SAW	Surface Acoustic Wave
SCC	Serial Communication Controller
Sector	A geographic area radiating out from a Base Station. Typically referred to as the area covered by a Sector Antenna
Sector IDU	Sector Terminal Indoor Unit chassis located at the Base Station
Sector ODU	Sector Terminal Outdoor Unit chassis located at the Base Station location, connected to an antenna providing coverage over a sector.
Sector Terminal	Consists of one or more Sector IDUs connected to a common, or redundant, set of Hub IF Combiners and Sector ODU/Antenna assemblies
SF	Super Frame Format
SNMP	Simple Network Management Protocol
SPI	
TAC	Technical Assistance Center
TDMA	Time Division Multiple Access
Tel-Link	Brand Name for P-COM Point to Multipoint equipment
TX	Transmit Signal
UIM	User Interface Module
UL	
Uplink	The RF Communications path from the Remote Terminals to the Base Station
VOM	Volt-Ohm-Meter
WLL	Wireless Local Loop

This Page Intentionally Left Blank

Reader Comment Form

We welcome your comments and suggestions for improving our manuals. Please record your suggestions below and FAX the completed form with your comments to (407) 674-3697.

NOTE

This form is for documentation comments only. Problems with hardware or software should be reported separately to the Technical Assistance Center at (407) 674-3699.

1. Did you find any omissions or inaccuracies in the manual? If so, please specify the page and the problem. (It may help to include a marked up copy of the page along with this form.)

2. Did you find this manual understandable, usable, and well organized? Please make suggestions for improvement.

3. Is there sufficient documentation on the associated hardware or software required for your use of the Point to Multipoint System, as described in this manual? If not, specify the type of information you feel is missing.

4. Please indicate the type of user/reader that you most nearly represent:

____ System programmer/System Manager

____ Maintenance Technician

____ Process Engineer

____ Other _____

5. Please indicate the way(s) in which you use this manual:

____ Instructional Tool

____ Other _____

____ Reference Tool

Name _____

Title _____

Company _____

Division _____

Address _____

City _____

Telephone _____

State, Zip/Country _____

Date _____