Lucent Technologies
Bell Labs Innovations

AnyMedia® Access System

(24 Channel)
Optical Network Unit
Installation Manual for Indoor Applications

Issue 1
June 2002
363-211-521

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About This Manual

Introduction

Purpose

This Installation Manual (IM) provides installation instructions for Lucent Technologies' *AnyMedia* Optical Network Unit (ONU) for indoor applications. Another model of the ONU is available for outdoor applications, but is not discussed in this manual. If you are interested in obtaining more information on the ONU for outdoor applications, contact your Lucent Technologies representative.

Scope

The ONU IM is intended to enable installation personnel to install the *AnyMedia* ONU. In principal, the ONU will be delivered with all passive system components and with all internal cabling pre-installed, including the cabling from the APs of the ONU shelf to the feeder side of the internal main distributing frame (MDF). The installer will be required to perform the connections from and to the ONU (AC, fiber, and distribution side of the MDF). Installation of the application packs and turn-up are performed after the installation procedures described in this manual are complete.

Intended audience

This installation manual is for technical support personnel and for customers who maintain their own installation organizations.

Reason for issue

This is Issue 1 of the Installation Manual.

How to use this manual

This manual is organized as follows:

- How are we doing

  A comment form so readers can give feedback to improve the next revision of the document.

- *Table of contents, list of figures, list of tables*.

- About This Manual

  This chapter defines the purpose of the document and the intended audience. Also included are topics about the conventions used in the document, related documentation, how to order documents, and how to comment on this document.

- Safety

  This chapter defines the types of safety labels and precautions associated with the *AnyMedia* Access System. Also included are general circuit pack handling precautions and specific warnings relating to lightwave safety, ESD considerations, handling batteries, connecting to AC utility, and other built-in equipment.

- ONU Product Description

  This chapter describes principal components that comprise the indoor *AnyMedia* ONU.

- Overview of the Installation Process

  This chapter summarizes the ONU installation and cabling process and lists the tools and test instruments you will need to accomplish the installation.

- Mounting the ONU

  This chapter describes the procedures for mounting the cross-connects in the ONU termination compartment; for mounting/installing the ONU; and for connecting it to the site ground. These mounting procedures must be performed before you connect any external cables to the ONU or power-up the system.

- Installing and Grounding External Cables

  This section describes the procedures for installing and grounding the signal and power cables required by the ONU.

- Connecting the Signal Lines

  This chapter provides the procedures for installing the ONU copper and fiber signal cables.

- Connecting AC Power

  This chapter describes the requirements and procedures for connecting the ONU to the local electric utility.

- Installing the Batteries

  This section provides the procedures for unpacking, inspecting, and mounting the batteries in the ONU battery compartment.

- System Power Up

  This chapter provides the procedures for installing power-related modules, applying AC power and activating the batteries.

- Fan Unit and Battery Maintenance

  This chapter covers the recommended maintenance procedures for the *AnyMedia* ONU fan units and batteries.

- *Appendix A: Installation and Maintenance Record*

  This appendix contains a copy of the installation and maintenance record.

- List of Acronyms

  Lists the abbreviations and acronyms used to replace longer expressions.

- Glossary

  Defines terms that may be unfamiliar to the user.

- *Index*

  Lists in alphabetical order the specific subject information in the document.

Conventions Used in This Document

Terms used

The following terms used in this manual may have different meanings than the general or common usages of the term.

- The term *AnyMedia* Access System is used here for both the *AnyMedia FAST* shelf and for the *AnyMedia* ONU subshelf.
- The term *system configuration* when used here refers to an *AnyMedia* Access System system equipped with certain packs or units for a certain application.
- *Mixed configuration* means a configuration of the *AnyMedia* Access System that includes packs for narrowband and ATM xDSL services.
- The term *AnyMedia FAST* shelf is used when the text refers to the shelf which houses the COMDAC, CTU, OAP, and AFM pack.
- The term ONU shelf is used when the text refers to the shelf in the ONU (housing the OCP) that provides the interface for the optical link to the *AnyMedia FAST* shelf.
- The term *AnyMedia* shelves is used whenever the text does not need to distinguish between both types of shelves.
- Narrowband services typically include POTS services, coin, special services such as foreign exchange and PBX support. In the current release of the *AnyMedia* Access System, narrowband services comprise POTS, COIN, PBX support, and ISDN services.
- ATM xDSL services are supported in the *AnyMedia* Access System using ATM cell transfer. In the current release of the *AnyMedia* Access System, ATM xDSL services include ADSL, SDSL, and SHDSL.
- The term *pack* is generally used for circuit packs in the *AnyMedia FAST* shelf (COMDAC, OAP, and AFM) or in the ONU shelf (OCP, RGU, PRU, PFU and LVD), and also for all application packs.
- The term *application pack* is generally used for the packs in the *AnyMedia FAST* shelf and also in the ONU shelf that are located in any of the AP slots of the *AnyMedia* Access System (APs for POTS, ISDN, and ATM xDSL).
- In this manual the subscriber interface for analog POTS is tip/ring (T/R) interface.
- DS1 interface refers to the 1.544-kbps digital feeder interfaces of the narrowband system on the network side of the *AnyMedia FAST* shelf.
- DS3 interface refers to the digital feeder interface of the broadband system that carries the ATM payload cells. The DS3 interface is provided by the ATM feeder multiplexer AFMDS3.
- DS3 interface refers to a bit rate of 44.736 MBps and a framing according to ITU-T recommendations G.804, I.432 and ANSI T1.107, without specifying the physical interface.

- The term DSX-3 interface refers in the *AnyMedia FAST* shelf only to everything that DS3 refers to with the addition of a specific physical interface according to Telcordia standard GR-499.
- ADSL line refers to the twisted copper pair carrying ATM xDSL services.
- *xDSL service* means any broadband service transmitted over twisted pairs. Examples are ADSL, SDSL, and SHDSL.
- ADSL modem means the ADSL data circuit-terminating equipment at the customer's site.
- The *AnyMedia* graphical system interface software (GSI) provides one graphical user interface for narrowband and ATM xDSL services to one *AnyMedia* Access System.
- TL1 system interface (TL1SI) means any interface for operations using TL1 commands.
- A trademark is not treated as an acronym (it is not spelled out or expanded).

Acronyms and abbreviations

In the text, acronyms are expanded the first time they are used in the main text of a chapter (e.g., permanent leased line [PLL]). (See *List of Acronyms* at the end of this document.) Trademarked acronyms are not spelled out.

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Document list, packaging, and formats

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Available on the Web

- *AnyMedia* Access System Documents
  - 363-211-125, AnyMedia® Access System, *Ordering Guide* http://www.lucent8.com/library/AnyMediaOrderingGuide.pdf.
  - Other *AnyMedia* Access System documents, including System Release Descriptions (SRDs) and the Navis™ *AnyMedia* Element Management System (EMS), can be found by going to http://www.lucent8.com, selecting “Documents”, then selecting “Product Line: AnyMedia” (under “Enter 1 or more search items below”) and “Search Now”.

    An SRD is issued per release and describes the functionality of the system at the time of release.

Available on CD-ROM

363-211-103, AnyMedia® Access System, *Documentation*. This is a CD-ROM that contains the following documents in various formats:

- *AnyMedia* Access System Documents
  - 363-211-101, AnyMedia® Access System, *Applications, Planning, and Ordering Guide* (APOG) (in PDF format)
  - 363-211-125, AnyMedia® Access System, *Ordering Guide* (in PDF format)
  - 363-211-106, AnyMedia® Access System, *Feature Supplement—MDS2 Shelf Configurations* (in PDF format)
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  - 363-211-128, AnyMedia® Access System, *Feature Supplement—Central Office Terminal* (in PDF format)
  - 363-211-102, AnyMedia® Access System, *Installation Manual* (in PDF format)
  - 363-211-100, AnyMedia® Access System, *Commands and Procedures (*in HTML format, also includes PDFs of selected procedures)
  - 363-211-129, AnyMedia® Access System, *ConnectReach™ Terminal User’s Guide* (in PDF format)
  - 363-211-130, AnyMedia® Access System, *ConnectReach Plus™ Terminal User’s Guide* (in PDF format)
  - 363-211-521, AnyMedia® Access System, *Optical Network Unit Installation Manual for Indoor Application* (in PDF format)
  - 363-211-520, AnyMedia® Access System, *Optical Network Unit Installation Manual for Outdoor Application* (in PDF format)

- SLC® Documents
  - — 363-205-121, *SLC* Series 5 Carrier System J1C182BC-1 Remote Terminal Ring Shelf, *User Manual* (in PDF format)

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The *AnyMedia* Access System Management Interface, which includes the graphical system interface (GSI) and the Network Maintenance Manager, is available on CD-ROM. To order, see the *AnyMedia* Access System *Ordering Guide,* 363-211-125.

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Safety

1

Overview

The *AnyMedia*® Optical Network Unit (ONU) for indoor applications is based on state of the art technology and fulfills current national and international safety requirements. It supports a high degree of operational safety resulting from many years of development experience and continuous stringent quality control.

This chapter lists the safety information applicable to the installation and cabling of the ONU for indoor applications.

Contents

Electrostatic Discharge

Electrostatic Discharge (ESD) Consequences

Semiconductor devices, and circuit packs in general, are sensitive to static charges. Most circuit pack integrated circuit (IC) damage can be attributed to a discharge of static electricity. Tests have shown that ICs can be damaged by electrostatic discharges of less than 100 volts. For a person to feel the discharge of static electricity, a minimum level of 3500 volts must exist. A person walking across a floor can generate electrostatic voltages in excess of 5000 volts.

NOTE:
Since ESDs contain little or no current, there is no employee safety hazard.

In addition to ESD resulting from an ungrounded person touching a circuit pack, static discharges may result from other sources. If a piece of plastic is placed near one end of a circuit pack lying on an insulated table top, the plastic can direct its charge into the circuit pack.

Identifying ESD damage can be difficult because in most cases, physical damage cannot be seen. A circuit pack which has been exposed to an ESD may:

- Not be affected, i.e., work perfectly with normal life expectancy
- Function normally, but with reduced life expectancy
- Function erratically at times
- Stop functioning altogether.

Electrostatic Discharge Protection Requirements

To reduce the possibility of ESD damage, use the following guidelines. Assemblies are usually equipped with grounding jacks to enable personnel to ground themselves using wrist straps while handling circuit packs or working on an assembly. The jacks for connection of wrist straps are located at each assembly and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

- Inspect the antistatic wrist strap once a day for damage or when it is suspected that the wrist strap has been stressed. See Figure 1-1 on page 1-4 for a typical antistatic wrist strap.
- Before using the antistatic wrist strap, verify with a volt-ohmmeter that approximately 1 megohm resistance is present between the wrist strap frame connector and the wrist harness.
- The clip or plug connector of the wrist strap must be connected to a ground which is common with the circuit pack ground. Use the equipment bay or shelf ESD ground jack.

In an emergency, when a properly functioning wrist strap is not available at the job site, use the following “touch-ground” procedure for handling circuit packs containing electronic components.

- Always touch ground (exposed or bare) metal before handling a circuit pack in any way (i.e., inserting, removing, or storing). This must be done just prior to touching the circuit pack. Moving around will necessitate repeating this procedure. Note that painted surfaces are not good ground points.
- Handle circuit packs only by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, leads, or connector pins.
- Put the circuit pack into an antistatic bag or carton immediately upon removing it from a frame.

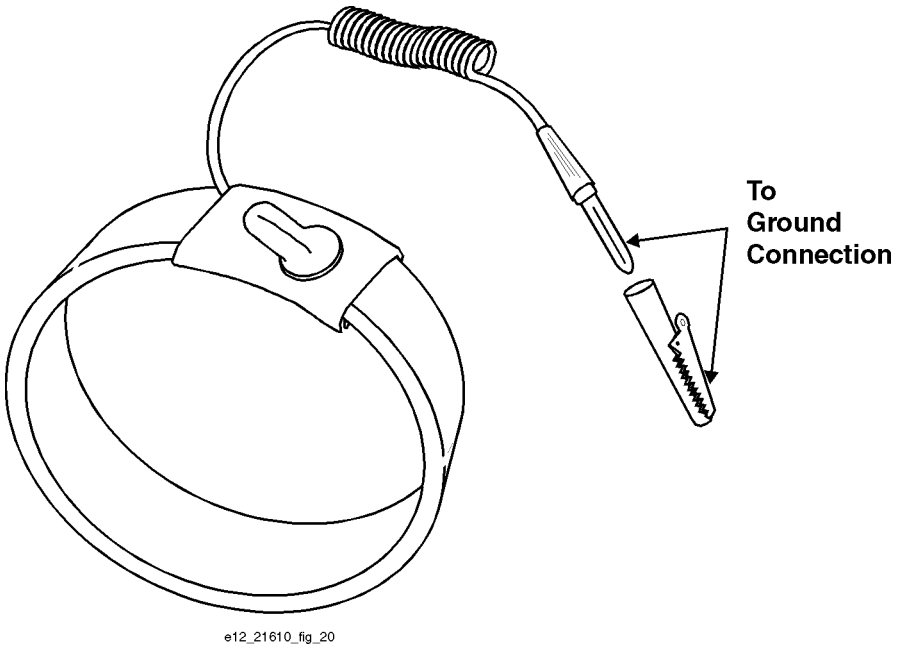


Figure 1-1 ESD Strap

CAUTION:
A grounded person must never hand an unprotected circuit pack to a person who is ungrounded. A static discharge from the ungrounded person through the circuit pack to the grounded person could cause an ESD induced failure. All persons and equipment at a work location must be at common ground potential to be static-safe.

Do not rub or wipe circuit packs containing ICs to clean them or their gold fingers unless both the individual and the circuit pack are the same ground potential.

Work areas must be kept clear of common plastics, a major source of static electricity. When rubbed or handled, these plastics produce a static charge that will not readily dissipate when grounded. These plastics must not make direct contact with ICs or circuit packs. Common plastic materials in this classification include polystyrene packing containers, clear plastic bags, plastic drinking cups, food wrappers, notebooks, and nonconductive plastic solder suckers. (The plastic insulation on small hand tools does not represent a static hazard.)

All circuit packs should be stored and transported in original factory packing materials whenever possible. Storage in frames or approved antistatic packaging is acceptable when factory packaging is unavailable.

An antistatic wrist strap must be used whenever a circuit pack with ICs is removed from, or inserted into, the frame or from its container.

Put the circuit pack into an antistatic bag or carton immediately after removing it from a frame. Keep adhesive tape (i.e., transparent or masking) away from the circuit packs.

Never place circuit packs on ungrounded metal shelving or on ungrounded portable carts without insulated surfaces.

Battery Safety

General precautions

Use the following basic precautions when handling batteries:

- Use only properly insulated tools and test equipment.
- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses, acid-resistant gloves, rubber overshoes and apron.
- Test circuits before touching.
- Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn-on. For the ONU these are the battery circuit breaker, the GMT-type fuse and the battery string cable connector on the low voltage disconnect unit (LVD) inside the rectifier shelf.
- Be aware of potential hazards before servicing equipment. A tool or other metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring).
- Always verify the polarity before connecting cables to the batteries.
- Use care when removing or replacing any covers; avoid contacting any circuits.

While unpacking and/or installing the batteries, never:

- place metal objects (including tools) on top of a battery.
- short out the battery's terminals.
- tamper with or block the battery vent caps, if equipped.
- use an open flame near batteries.
- smoke near batteries.
- stack batteries (in or out of their shipping cartons).

Hydrogen gas

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. An explosion could occur when sparks are created near the battery string. Therefore do not install batteries in totally sealed enclosures. During maintenance actions check the battery fan and that the ventilation opening in the battery compartment are free.

Battery terminals

Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections. Always consider the maximum torque specified by the battery manufacturer.

Taking voltage readings

Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken. Review the safety precautions.

Acid spill

If a large acid spill occurs, use agricultural or industrial lime instead of soda for neutralization before clean-up. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after clean-up.

Special Considerations for the Tyco IR-30EC Batteries

Tyco IR batteries are valve regulated rechargeable stationary lead-acid batteries which are conditioned at delivery. The IR-30EC battery has recessed bolt type terminals and a hinged lifting handle which aids the battery installation and prevents shorting terminals when the lifting handle is not used for lifting.

GMT-type fuse

The GMT-type fuse in the low voltage disconnect unit (LVD) can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only GMT-type fuses delivered by Lucent Technologies.

The IR-30EC batteries are provided with a 14AWG assembly terminating with 2 position AMP polarized connector. The standard cable assembly mounted to the IR-30EC batteries is designed for charging currents below 15 A. Charging currents exceeding 18 A will destroy the cable.

If the battery is charged externally the charging current of the external charger must not exceed 18 A under any circumstances if the delivered cable assembly is used.

Boost charging IR-30EC batteries

During boost charging water loss is increased and can result in premature failures caused by cell dry-out.

Boost charging the IR-30EC batteries is not recommended without the concurrence of Tyco. Refer to the Product Manual for IR-30EC and IR-40EC Batteries, Section Operations.

Sulfuric acid

The batteries contain sulfuric acid gel which may cause corrosion to skin. In the event of electrolytic contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water.

In the event of electrolyte in the eye, pour water into the eye and allow at least one liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

General Safety Admonishments

Important general safety instructions

- Read and understand all instructions. For information on proper mounting instructions consult the appropriate section in this installation manual.
- Follow all warnings and instructions marked on the product.
- Do not place the shelves on an unstable cart, a stand, or a table. The product may fall causing serious damage to the equipment.
- Slots and openings in these shelves are provided for ventilation. To protect the shelves from overheating, these openings must not be blocked or covered. This equipment should not be placed in a built-in installation unless proper ventilation is provided.
- Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.

Lightwave safety

A Lucent Technologies lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide cables. This light is at the red end of the visible spectrum. Although, at present, the transmitter power levels are below those known to cause injury to the eye (for example, from a direct inadvertent exposure to the end of an energized fiber), direct exposure at close distances should be avoided.

CAUTION:
Never view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE, since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk for injury. Personnel performing these procedures must be trained in laser safety.*

* Registered trademark of FJW Optical Systems, Inc.

Product safety

CAUTION:
Only trained service personnel should perform the procedures in this document. These procedures involve exposure to high electrical energy and/or current that may result in electric shock and/or injury to untrained personnel during servicing, maintenance and installation of this system.

Electrical Wiring Admonishments

Important Installation Safety Instructions

- Read and understand all instructions and warning labels.
- Installation and maintenance procedures must be followed and performed by trained personnel only. Do not allow non-service personnel to access electrical wiring.
- Voice frequency connections should be connected to telecommunication devices providing primary or secondary protection, as applicable.
- Never install telecommunication wiring during a lightning storm.
- Never install telecommunication connections in wet locations.
- Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the VF, DS1, DS3, test, or alarm interface.
- Never touch uninsulated wiring or terminals carrying direct current or ringing current or leave this wiring exposed. Protect and tape those wires and terminals to avoid risk of fire, electrical shock, and injury to service personnel.
- Use caution when installing or modifying telecommunication lines.
- This product should be operated only from the type of power source indicated on the marking label. For information on proper electrical distribution and power requirements, refer to the Application Schematic drawings that are mentioned in the Appendix A of this manual.
- To reduce the risk of electrical shock, do not reach into, touch anything inside, or disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
- Use only Lucent Technologies manufactured *UL*† recognized circuit packs in this system.

† Registered trademark of Underwriters Laboratories, Inc.

ONU Product Description

2

Overview

The indoor ONU is an extension of the *AnyMedia FAST* shelf. It enables telephony and ATM xDSL applications to be provided efficiently to remote business and residential communities. The ONU is designed to be mounted on an inside wall. It can be equipped with the same type of application packs (APs) as the *AnyMedia FAST* shelf and can provide the same narrowband and broadband services. This chapter briefly describes the principal ONU components.

Contents

Principal ONU Components

Component descriptions

The ONU for indoor applications is wall-mounted and includes all internal cabling. The following components are used or can be used in the ONU:

- The ONU housing for wall mounting with all internal cabling
- The ONU shelf for inserting the optical controller pack (OCP), the eight application packs (APs), and the ringing generator unit (RGU)
- The rectifier shelf, for inserting the power rectifier unit (PRU) and the low voltage disconnect unit (LVD), with the rectifier backplane and connectors
- The 7A fan unit
- The four IR-30EC batteries in the battery compartment

Figure 2-1 shows a partially equipped indoor ONU.

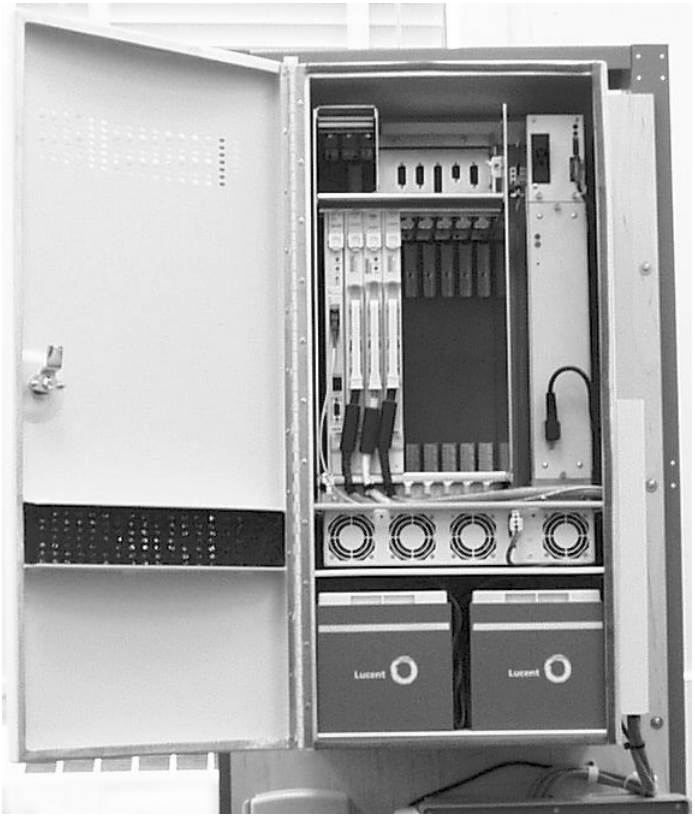


Figure 2-1 Partially equipped indoor ONU (front view)

Overview of the Installation Process

3

Overview

This chapter summarizes the ONU installation and cabling process and lists the tools and test instruments you will need to accomplish the installation.

Contents

Installation Sequence

This manual covers the indoor ONU installation process that starts with the preparation of the wall space. It is assumed that any cable runs to the ONU mounting area are complete.

The recommended installation sequence is as follows:

1. Prepare the wall space.
2. Unpack the ONU and check the completeness of delivery.
3. Mount the Krone cross-connect in the ONU and mount the ONU on the wall.
4. Properly ground the ONU.
5. Check the internal wiring and cabling.
6. Route the cable between the feeder distribution interface (MDF) and the ONU, starting at either end.
7. Install the optional TAP-B cable (if necessary) before installing the tip/ring (T/R) cables (The cable opening of the ONU housing is too small for easy installation of the TAP-B cable after the T/R cables are inserted.)
8. Route all T/R cables to the AP positions and connect them to the blank faceplates.
9. Complete the connections at the MDF, including the cross-connections for the metallic test path, if required. (These steps can be carried out later, if it is more convenient.)
10. Reroute the POTS subscribers, as necessary if ADSL APs are used.
11. Adjust the ONU number inside the ONU shelf.
12. Connect the power cord to the customer's AC power supply.
13. Install the four IR-30EC batteries and connect them to the internal battery cable.
14. Install the ringing generator unit (RGU) in the ONU shelf.
15. Install the power rectifier unit (PRU) and low voltage disconnect unit (LVD) in the rectifier shelf.
16. Apply AC power and check the rectifier voltage.
17. Connect the battery cable to the PRU and charge the batteries for the first time.
18. Install and check the fiber cable.
19. Switch off the low voltage disconnect unit, connect the battery cable and the thermal probe cable to the PRU, and turn on the LVD.
20. Charge the batteries for at least for 48 hours.

21 Equip the ONU shelf with the OCP and with APs, as instructed in *AnyMedia* Access System Commands and Procedures on-line documentation (363-211-103).

Tools and Measurement /Testing Instruments

The following is a list of suggested tools and test equipment needed to unpack the ONU and to complete its installation.

NOTE:
The equipment and/or materials required depends on the particular installation.

Table 3-1. List of tools and equipment

Use for	Tools	Remark
Basic	ESD wrist strap	
	Wire cutters (up to 6 mm^2) and strippers, diagonal cutting pliers, coated-wire stripping tweezer, multi-purpose knife, extension cable 5 m	
	Torque wrench (up to 70 inch-lbs; up to 7 Nm)	
	Hand tool kit: screwdriver sets for standard slotted, Pozidrive and Phillips, wrench sets (open-end/double hex, hexagon socket head/balend), universal and pointed pliers, flat and round file with handle, nut drivers, level (14 in or 350 mm) and back square, string tape measure/folding rule (8 ft or approx 2.4 m) etc.	
	Large tool kit: hammers, claw bar, etc.	
	8 inch/20 cm long flathead screwdrivers (slotted 4 mm and Phillips No. 1)	
	Waterproof fine line marker	
	Floor drilling equipment: roto-hammer or percussion drill with sintered-carbide/ stone drills (only if required)	
Batteries	Splash-proof safety goggles	Only if required
	Cleaning cloth	
	Protective gloves	
	Sandpaper or abrasive cloth	
	Insulated slip joint pliers (6-1/2 inch/16 cm)	
	Insulated socket driver or nut driver set (1/4-inch through 3/4-inch sockets)	
	Insulated combination wrench set (1/4-inch through 3/4-inch)	
	Insulated screwdrivers	

Table 3-1. List of tools and equipment (Continued)

Use for	Tools	Remark
Special: fiber, cabinet,... (only if required)	Lifting and transport equipment: hoists, dolly trucks, straps, etc.	
	Pinch bar, claw-type hammer and plate shears	
	Crimp tool for various connectors of ID type (D-sub)	
	Cable crimpers for 0.025 in^2 (16 mm^2)(for example for *Molex* connectors (No.: 11-01-197))	
	Heat-shrink gun	
	Soldering iron (70 W and 20 W) or soldering station with temperature control, solder tin and holder for soldering iron	
	Wire replacement/insertion tool for *Molex/Faston* connector pins	
	Fuse puller for GMT fuses (for example from Hendry Telephone Products or from Lucent: WP90247, Comcode 406420273)	
	Splice equipment with accessories (for example from Fujikura), Lucent 1040A Rotary Splice Tool kit to assemble mechanical splices, Lucent D181617 Rotary Splice Kit with consumable materials to complete 12 splices, Lucent D181755 PVC Buffer Tubing Kit for blocking cables and protecting up to 100 fibers, if required Lucent AT-8955 Index Matching Gel (2-part mix), prepacked isopropyl alcohol without additives (may be obtained locally)	For example and only if required, depending on fibers used
	Multi-layer tissues made from non-recycled cellulose or optical quality tissue/ lens cleaning paper (for example 9300-0761 from Hewlett-Packard), cotton swabs/Q-tips (for example 9300-1351 from Hewlett-Packard), adhesive cleaning tape (for example 15475-68701 from Hewlett-Packard), isopropyl alcohol without additives (may be obtained locally), pipe cleaner with soft bristles (for coupling cleaning) or fiber cleaning kit (for example kit 15475A from Hewlett-Packard)	Only if required and depending on fiber and fiber test equipment used
	Purified compressed air (for example spray can)	
	Optical microscope, enlargement greater than 40 up to 200, (for example type M10 from Wild or the FIND-R-SCOPE from FJW Optical Systems, Inc.)	For fiber checking only

Table 3-1. List of tools and equipment (Continued)

Use for	Tools	Remark
Test equipment (only if required)	DMM (Digital Multimeter) Tek DM254 or *Fluke* 8060A or equivalent (the accuracy of an equivalent meter should be 0.05 percent on the DC scale), insulated test leads with a diameter of 0.08 in (2 mm) for the probe tips are required for measurement via the battery connectors or via test jacks (on LVD)	
	DC current converter or current probe 1:10 for multimeter used for up to 20 A	Only if required. The reflectometer is mostly used for preparing for acceptance test of the complete fiber cabling.
	Test load of 48 V, 10 A (additional only)	
	Thermometer for ambient temperature measurement	
	Contact thermometer for battery temperature measurement	
	Test equipment for drop test/physical line testing (in the U.S., e.g. ITE-6675 Streak Mate, ITE-7079 AIU Test Fixture; additional only)	
	Fiber test equipment/optical power meter (1310/1550 nm); for example: *Wavetek* OLP-6 or OLP-15B (optical power meter for fiber receiver); *Wavetek* OLS-6 or OLS-15 (optical light source for fiber transmission). Reflectometer *Wavetek* MTS5100 (optical time domain reflectometer),	

Mounting and Grounding the ONU

4

Overview

This chapter describes the procedures for mounting the ONU on a wall and connecting it to the building ground. These mounting procedures must be performed before you connect any external cables to the ONU or power-up the system.

Contents

Wall Mounting the ONU

Uncrating the ONU

In its default configuration, the *AnyMedia* ONU for indoor applications is equipped with the ONU shelf, rectifier shelf and 7A fan assembly. All internal cabling is included. The internal cables are routed and dressed near the positions where they will be connected later and are pre-connected, in some cases.

Uncrate the ONU, inspect it for physical damage and verify that the fan unit and the factory installed shelves inside the ONU are secured. Remove the loose parts delivered with the ONU, the packing list and the drilling template.

Use the packing list to verify that your shipment is complete, including application packs and cables.

Pre-installation

Select the wall where the ONU will be mounted and verify that it will be able to bear the 165 lbs (75 kg) weight of the fully equipped ONU. Use only anchors that are appropriate for the wall material and its condition. For mounting to plywood, verify that the board is at least 1 in (25 mm) thick and fastened securely to the wall. The wood screws furnished with the ONU are for plywood mounting.

Drilling the mounting holes

Use the following procedure to drill the mounting holes:

Step 1 If you will be mounting more than one ONU on the same wall or plywood board, mark the ONU name and number on the wall/ plywood in the space where each ONU is to be located.

Step 2 Ensure that there is at least 32 in (800 mm) free space in front of the ONU you are mounting, as measured from the wall or plywood board. Refer to Figure 4-1 for ONU dimensions.

Step 3 Use Figure 4-2 to make a drilling template for the nine mounting holes. Level and attach the drilling template to the wall/plywood using tape or thumbtacks and mark the positions of the mounting holes.

Step 4 If you are mounting the ONU on a plywood board, drill the pilot holes for wood screws using a drill bit with a diameter of about 1.5 to 1.6 mm. Skip the next step and proceed to Step 8

Step 5 If you are mounting the ONU directly to a masonry wall, verify that the wall is able to bear the weight of the ONU.

Step 6 Using the drilling template, drill mounting holes for wall anchors using a percussion drill having an appropriate diameter for the anchors you will use. Use only anchors appropriate to the wall material/condition.

Step 7 Clean the anchor mounting holes and install the anchors.

Step 8 Remove the template.

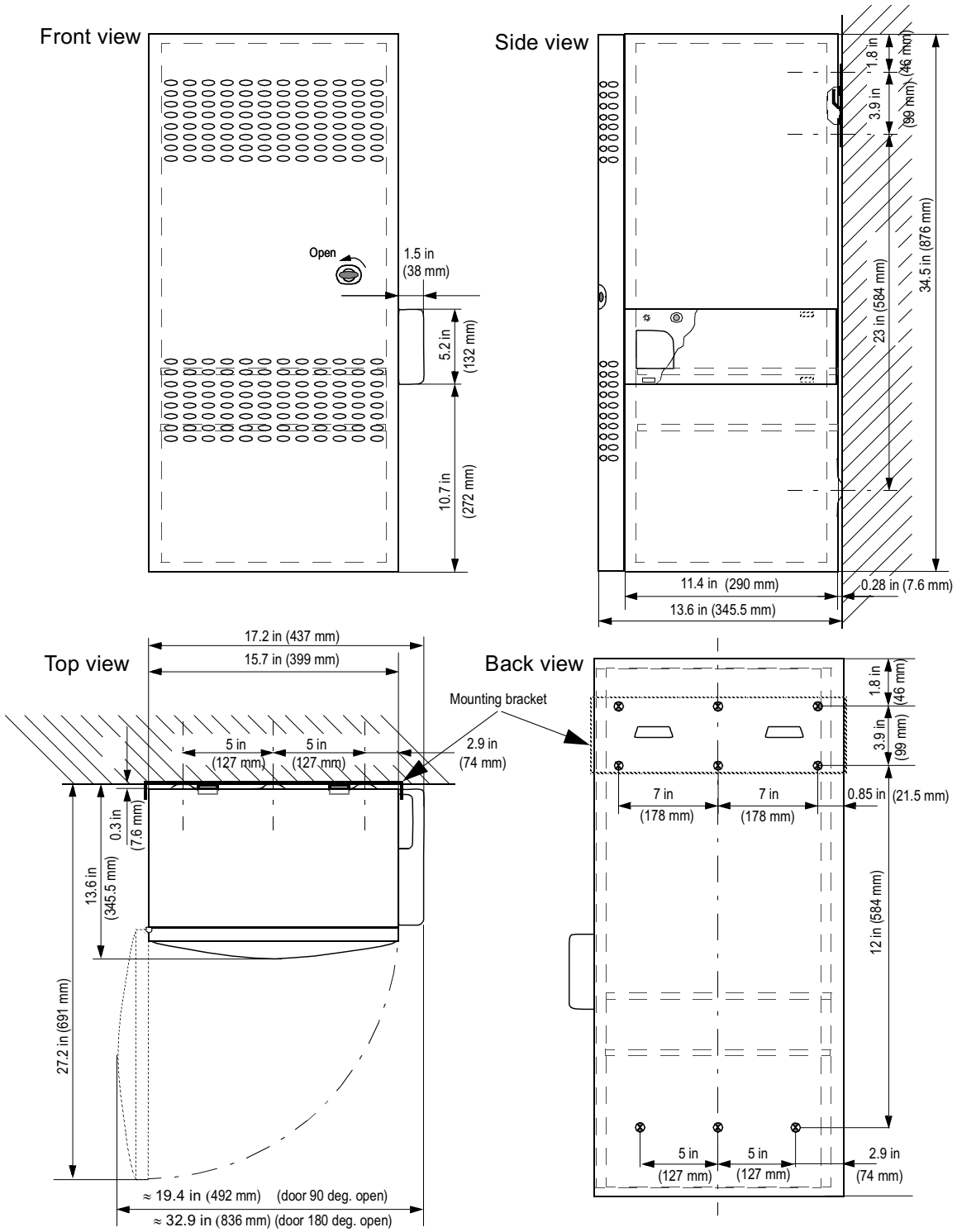


Figure 4-1 ONU mounting dimensions in [mm] and wall layout for mounting

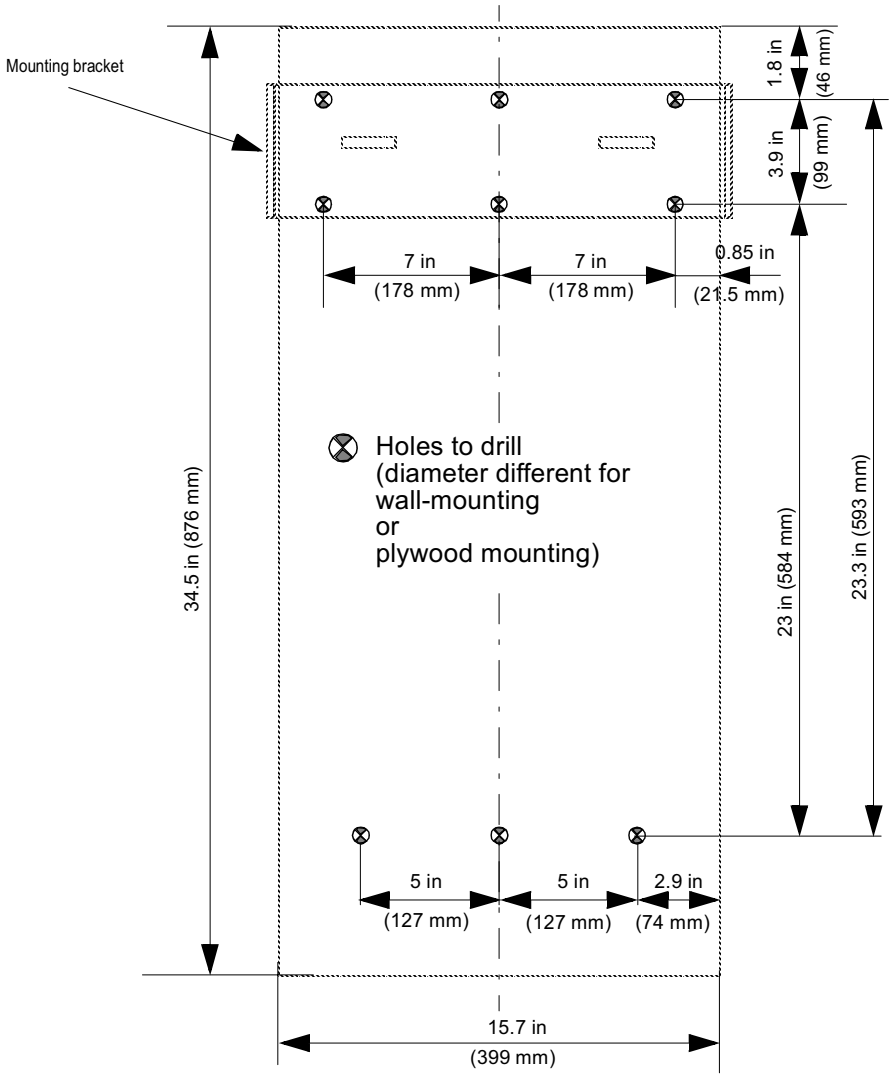


Figure 4-2 Drilling template for wall-mounting/plywood-mounting

Grounding the ONU

Connect the ONU to the site grounding immediately after the ONU housing has been mounted to the wall.

WARNING:

The installation must have an independent ground connection to an approved ground electrode for indoor applications. Grounding circuit continuity is vital for safe operation of the ONU.

The minimum size of the independent ground connection should be ≥6 mm^2 or 9 AWG.

The framework must be correctly connected to the protective ground before the start of work.

Never operate the ONU with a disconnected ground.

Internal ground connections

Figure 4-3 illustrates the grounding approach for powering, ringing, and grounding.

The ONU shelf backplane and the rectifier shelf backplane will support two ground signals:

- **-48RTN** Common analog/digital ground signal and return path for both -48 V power feeders (-48A and -48B)
- **FRMGND** Frameground

Connect the ringing path to the -48 V return.

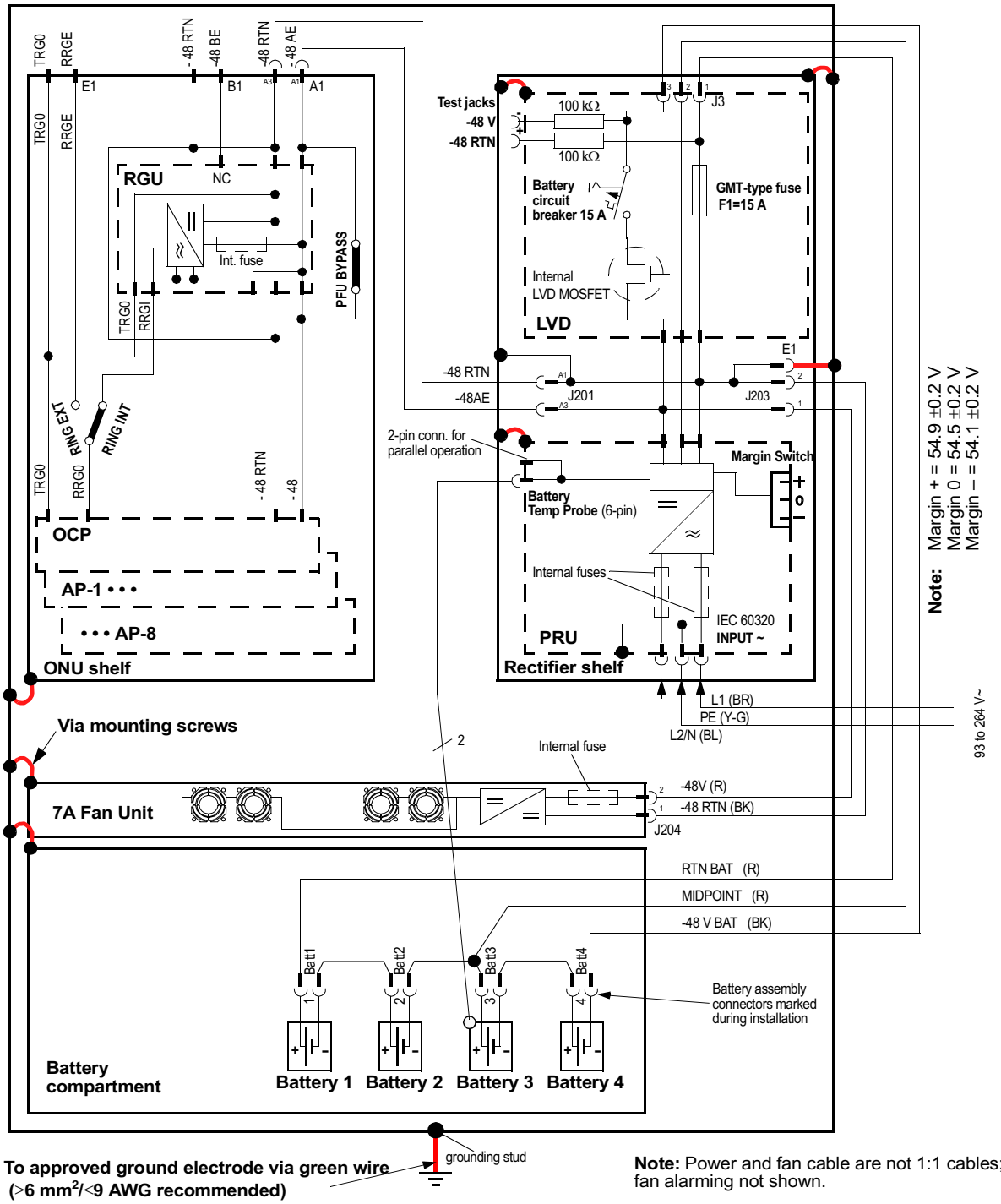


Figure 4-3 Powering, grounding and ringing for the indoor ONU

Grounding points and ESD ground jacks

One ESD ground jackis mounted on the right side of the ONU shelf, as illustrated in Figure 4-4. An ESD warning label is affixed directly below the socket.

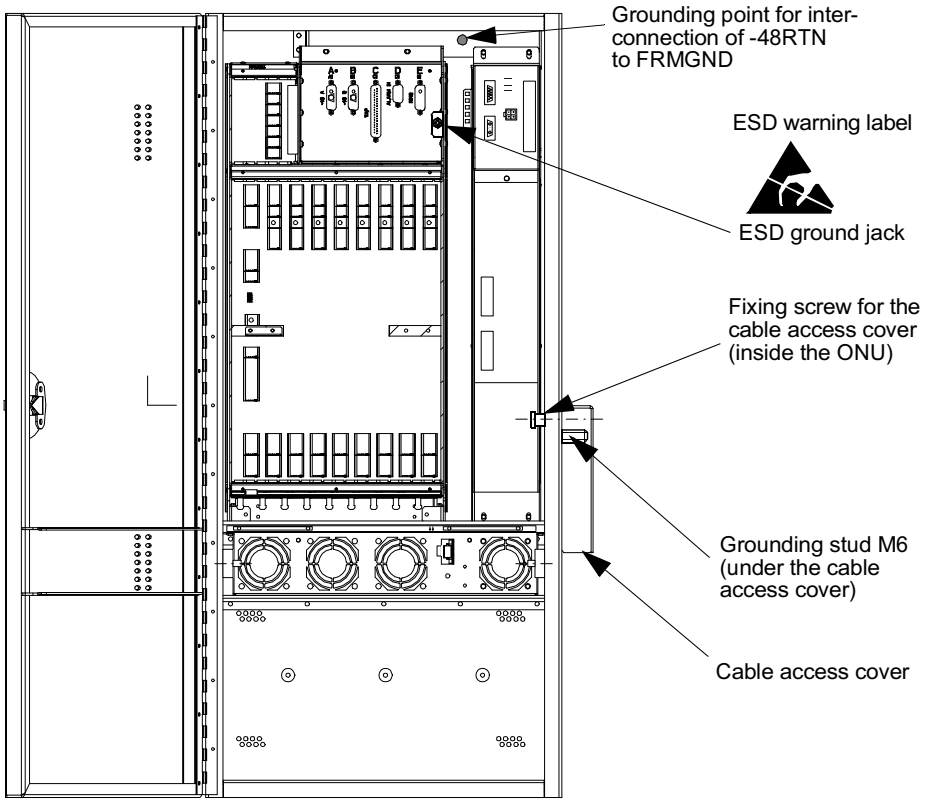


Figure 4-4 ESD ground jack and grounding studs/points

Parts for grounding

Table 4-1 lists the recommended parts for grounding the ONU.

Table 4-1 Recommended parts for grounding

Item	Qty.	Description	Remarks
1	1	External toothed lock washer J6.4	Delivered mounted
2	1	Hexagonal nut M6	
3	1	Cable lug M6, 6 mm^2 (for example *Thomas & Betts* C71 lug, terminal cable lug M6, 6 mm^2)	
4	1	Washer 6.3	
5	1	Green wire (minimum 6 mm^2/9 AWG	

Grounding practices

The wire for grounding is not part of the delivery. Crimp (do not solder) the delivered cable lug to the customer-supplied grounding cable. Terminate or crimp this rack ground wire to the approved ground wire (or ground ring, bonding wire) in the building.

NOTE:
In all cases, comply with local grounding practices. The MDF must have primary protection if the subscribers are located outside the building or the cabling is very long.

Grounding procedure

The ONU grounding connection is illustrated Figure 4-5. Use the following procedure to ground the ONU:

Step 1 Move the cable access cover forward about 5 mm and remove the cover.

Step 2 Crimp (do not solder) the lug for M6 to the grounding wire on the ONU side.

Step 3 Connect the ONU housing to the available protective ground using the shortest route possible. The minimum cross-section of the stranded copper grounding cable must be $\geq$6 mm^2/$\leq$9 AWG.

Step 4 Open the ONU door and loosen the fixing screw for the cable access cover on the right side of the ONU housing. For positions of the cable access cover, see Figure 4-4.

Step 5 Move the cable access cover forward about 1/2 in (12 mm) and remove the cover.

Step 6 Fasten the M6 cable lug at the grounding stud using the external toothed lock washer and the M6 hexagonal nut with torque of approximately 2.5 Nm (see Figure 4-5).

Step 7 Provide the grounding wire on the approved ground side with the connecting material matching to the grounding terminal and connect to the approved grounding point.

Step 8 The two shelves in the ONU are connected to the ONU framework (potential FRMGND) via mounting screws. If required, tighten securely all mounting screws M4 with torque of approximately 1.5 Nm.

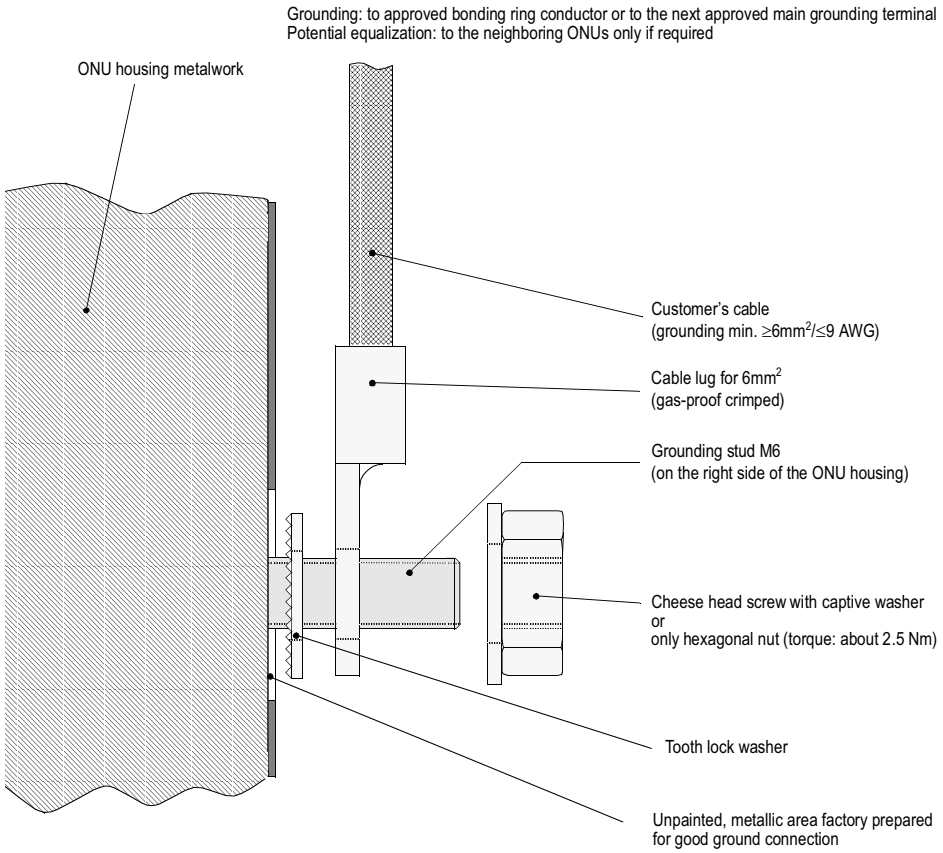


Figure 4-5 ONU Grounding

Checking the ONU grounding

After grounding the ONU, check the connection from the framework to the bonding ring conductor and to neighboring racks. Measure the resistance to ground according to local regulations. A resistance of 1 Ohm or less is recommended.

Connecting Signal Lines

5

Overview

This section describes the procedures for connecting signal lines to the ONU.

Contents

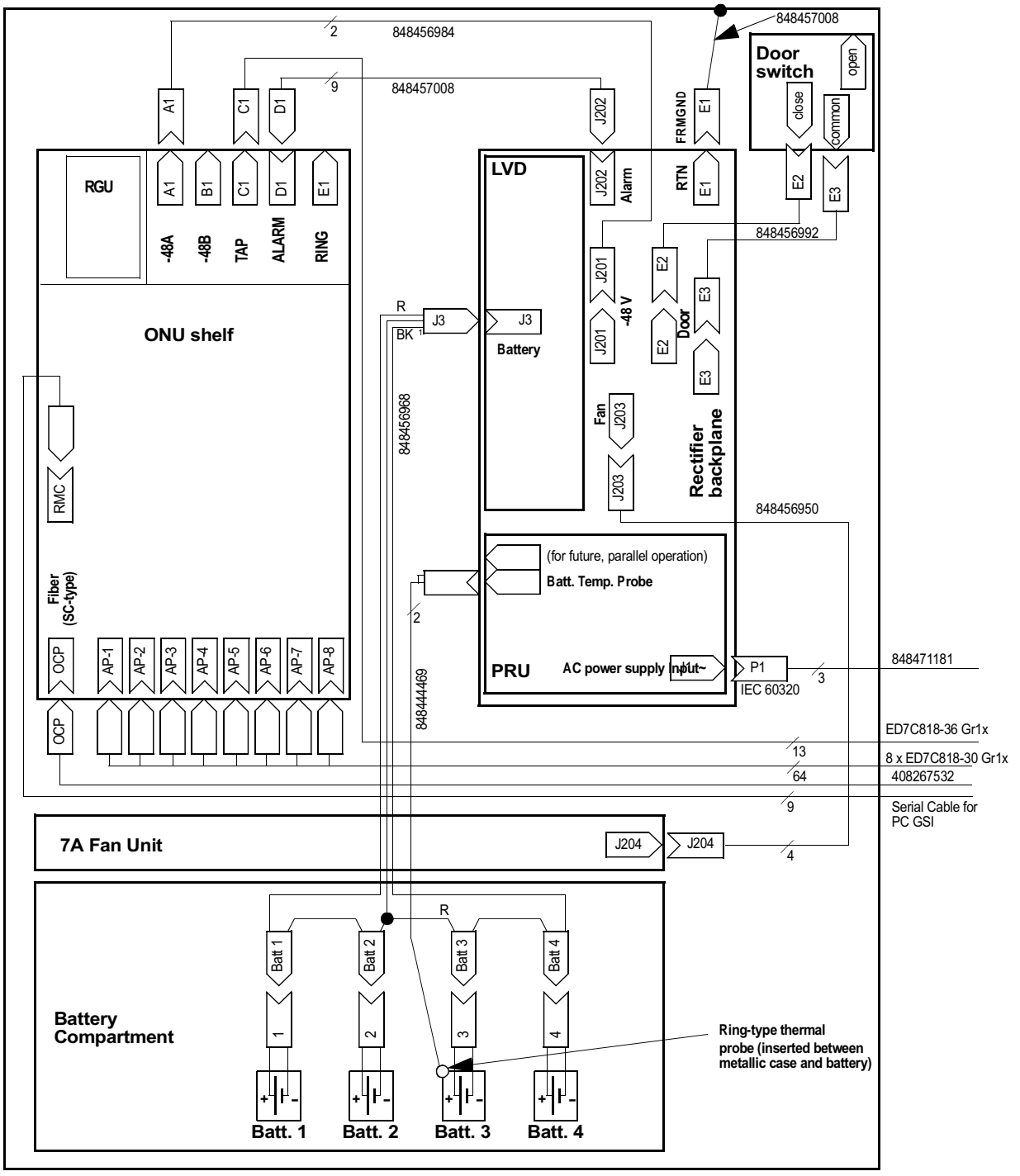
Cabling Inventory

This section describes the internal and external cables of the ONU for wall-mounted indoor applications.

Schematic drawing for indoor application cables

Figure 5-1 illustrates the wiring and cabling of the indoor ONU. The external cables that are inserted and connected during installation appear on the right side of the drawing.

These cables are described in Table 5-1.



Note: For the first deliveries there are rectifiers with an IEC 320 AC inlet.
For this rectifiers the appropriate power cord 848471181 must be used.

Figure 5-1 ONU cabling (indoor application)

Table 5-1 ONU cable connections

Destination 1	Destination 2	Equipment Code or Comcode	Cable used for:
Internal cables, connected at factory			
Rectifier shelf backplane: male J201	ONU shelf: male A1	848456984	Power cable for internal -48 V DC
Rectifier shelf backplane: female J202	ONU shelf: female D1	848457008	Alarm cable
Rectifier shelf backplane: male J203	7A fan unit: male J204	848456950	Fan cable
Rectifier shelf backplane: E2, E3 (plug)	Door switch: the two lower plugs E2, E3	848456992	Intrusion door switch cable
Rectifier shelf backplane: E1 (plug)	Inside ONU housing: upper M6 grounding stud	848467189	Interconnection wire (FRMGND - 48VRTN)
Internal cables, delivered, which have to be connected during installation			
LVD: female J3	Battery dangler cable connectors (female) for battery 1 to 4	848456968	Battery set cable [a]
Rectifier unit: male IEC 320 AC power supply inlet Input~	Customer's power supply, open end (for fixed interconnection) **Must fit to the appropriate rectifier, see footnotes.**	848471181 Issue 1	AC power supply cord[b] 3 m (≈10 feet)
Rectifier unit: male IEC 60320 AC power supply inlet Input~		848506820	AC power supply cord[c] 3 m (≈10 feet)
Rectifier unit: male battery temp. probe connector	Ring-type thermal probe inserted between the metallic case and plastic housing of battery 3	84844446	Thermal probe
External cables, prefabricated, which have to be routed and to be connected during installation[d]			
ONU shelf: AP-1 to AP-8 (also for optional TAP100)	MDF	ED 7C818-30Gr1x	T/R wires, Lucent standard cable 50 ft. to 300 ft. (≈ 15 m to 91.5 m)
ONU shelf: male C1 (option)	MDF	ED 7C818-36Gr1x	TAP-B cable for ONU shelf 50 ft. to 300 ft. (≈ 15 m to 91.5 m)

Table 5-1 ONU cable connections (Continued)

Destination 1	Destination 2	Equipment Code or Comcode	Cable used for:
Fiber cable, prefabricated, which have to be routed and to be connected during installation[e]			
ONU shelf: OCP, SC connector	Fiber termination box: SC connector	408267532	Fiber jumper cable with SC/SC connector
External cable, customer-made (not delivered), which has to be make and has to be routed and to be connected during installation			
M6 stud on the right side panel of the ONU under the cable access cover via cable lug	Ground: approved ground terminal/green wire	external (cable lug for 6 mm^2 / M6 is required)	Grounding

a. Not connected, batteries and LVD will be mounted during installation.

b. Can only be used with the S1:1 rectifier with the IEC60320 receptacle. The cable is not connected; the S1:1 rectifier will be mounted during installation. Connection to customer's power supply after installation.

c. Not used.

d. Most of the ED...Gr**x** cables are orderable with the following length: from 50 ft. up to 300 ft. (from ≈ 15 m up to ≈ 91.5 m).

e. The fiber cable is equipped with an SC-type connector at each end.

Internal pre-connected cables

The internal cables for the indoor application are shown in Figure 5-2. Verify that these cable are intact before connecting the external cables.

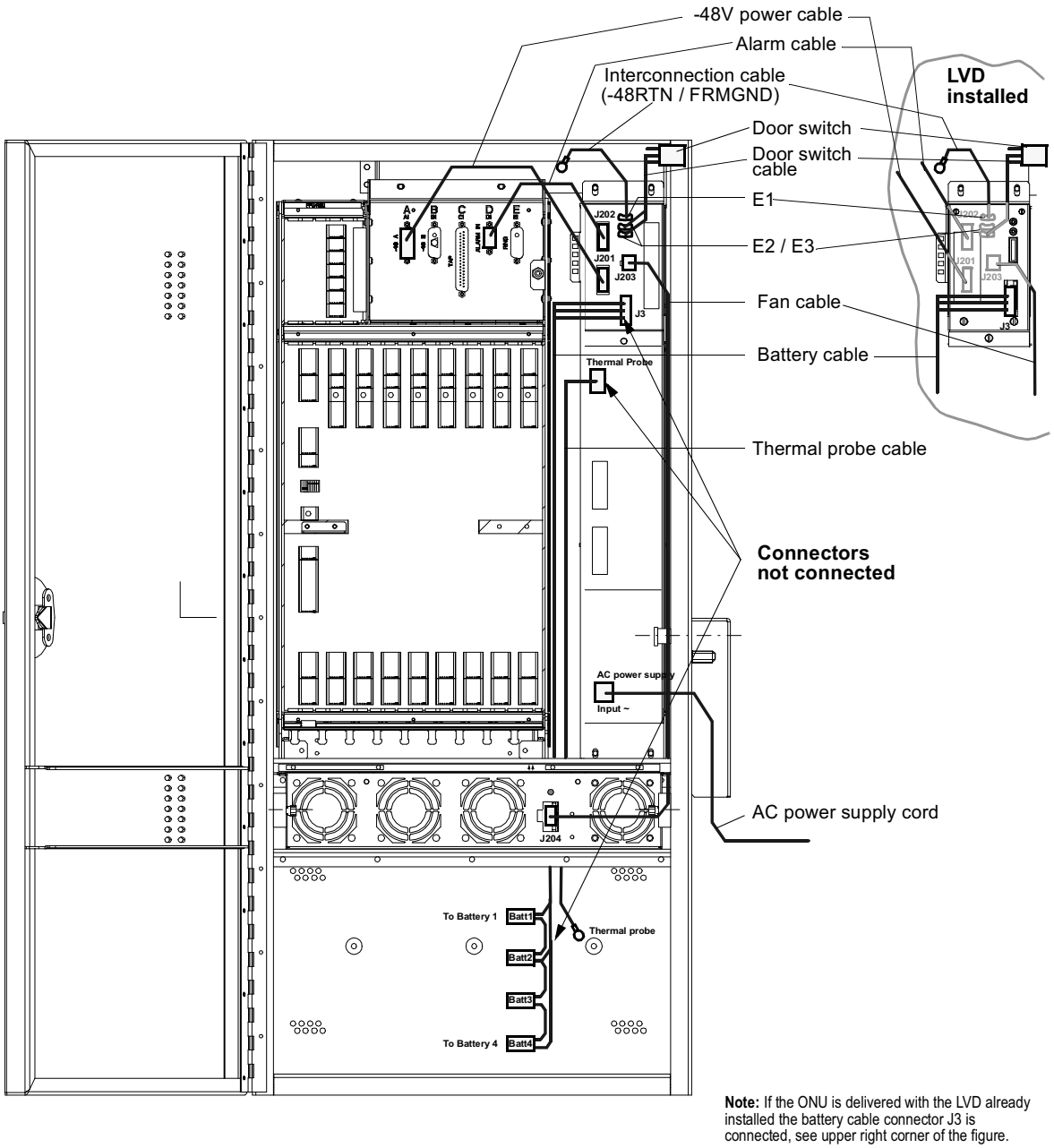


Figure 5-2 Empty ONU with pre-installed cabling

External cables

The right side of Figure 5-3 illustrates the wires and cables that you must insert into the ONU shelf and connect. Instructions are provided in the next section.

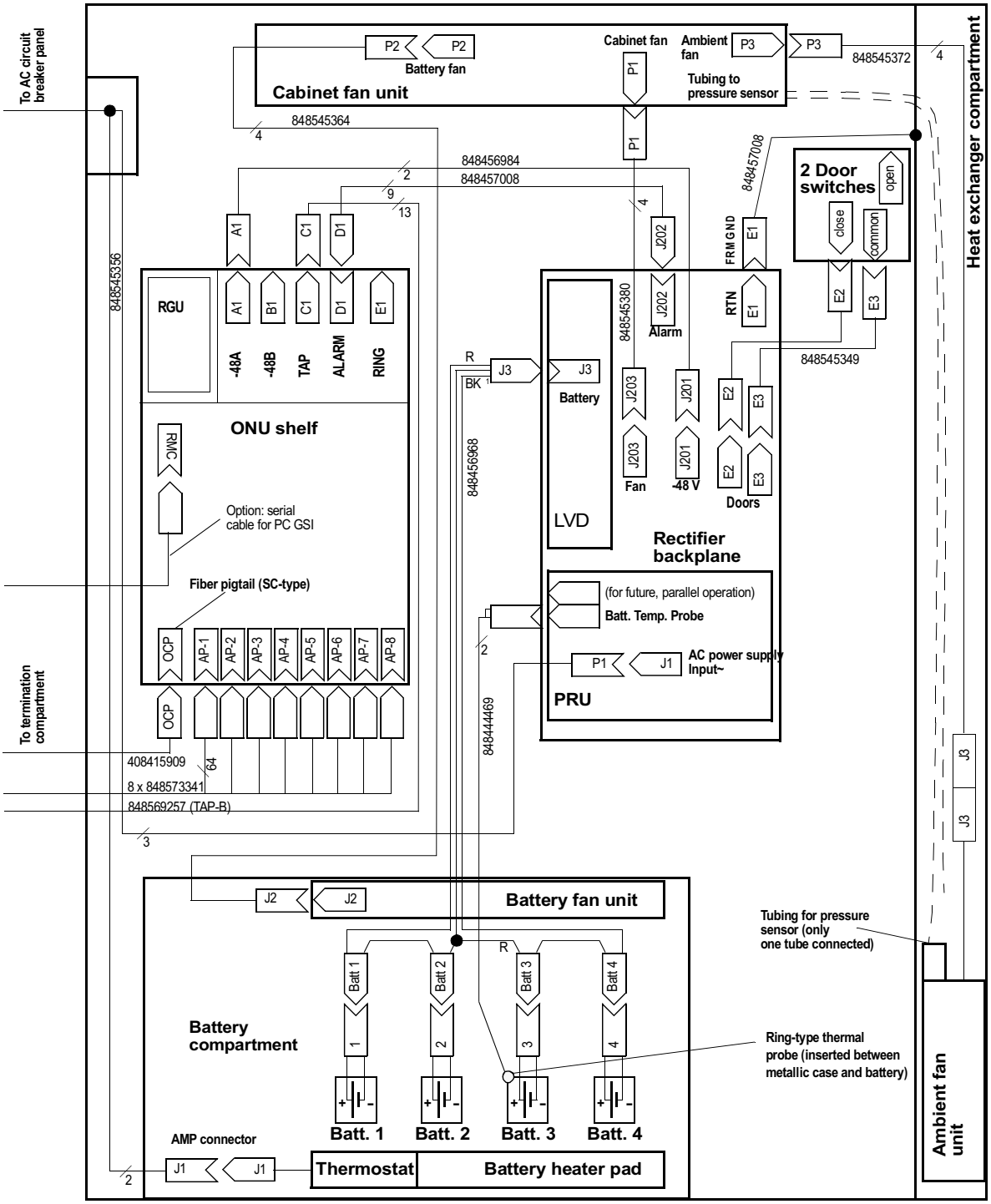


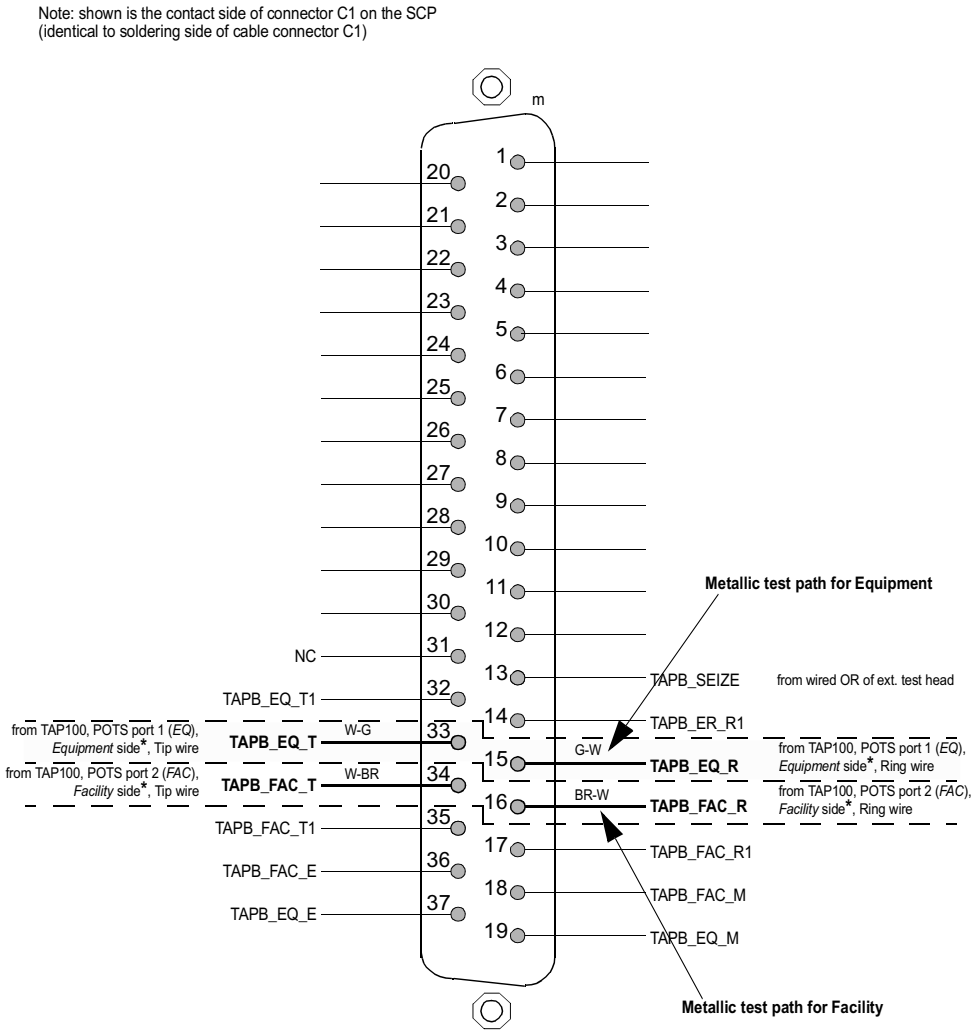
Figure 5-3 Internal ONU cabling inside the electronics compartment (outdoor application)

Installing the TAP-B Cable (Option)

General

This procedure consists of installing the external prefabricated TAP-B cable (ED7C818-36 Group 1x) and connecting its 37-pin connector to C1 (TAP) on the connection panel at the top of the ONU shelf. Afterward you will connect the other end of this cable to the MDF according to local conditions and requirements of the network provider.

Install the TAP-B cable before installing the T/R cables because installed T/R cables restrict the ONU cable opening to the point that the TAP-B cable connector cannot be inserted. If the TAP-B cable must be installed after the T/R cables have been installed, you must remove the TAP-B cable connector housing temporarily or the cable must be installed with its open end from inside the ONU towards the MDF.



*** Note:** *AnyMedia* specifies: Equipment (EQ) as the subscriber side;
Facility (FAC) as the switching side (AP port side).
Cable colors valid for the ED7C818-36 Gr1, ...1A, ...1B, ...1C cable.

Figure 5-4 Wiring of TAP connector C1

Cable length

The TAP-B cable is available in varying lengths; any excess may be cut off to relieve cable rack congestion.

Table 5-2 Length of TAP-B cable (ED7C818-36, Group 1x)

Description	Code	Length
TAP-B Cable	ED7C818-36, Group 1	50 ft. (≈ 15 m)
	ED7C818-36, Group 1A	100 ft. (≈ 30.5 m)
	ED7C818-36, Group 1B	200 ft. (≈ 61 m)
	ED7C818-36, Group 1C	300 ft. (≈ 91.5 m)

TAP-B cable installation procedure

Use the following procedure to install the TAP-B cable:

Step 1 Verify that the T/R cables are not installed.

Step 2 Pull the TAP-B cable assembly with its connector end through the right-hand side of the ONU opening. Route it along the bottom of the rectifier shelf to the gap between the rectifier shelf and the ONU shelf.

Step 3 Lead the cable in the gap upwards through the right opening of the ONU shelf to the 37-pin, male connector C1. For cable routing of the ONU shelf see Figure 5-5.

Step 4 Add cable ties to the rectifier shelf as needed to dress the TAP-B cable.

Step 5 Mate the TAP-B connector with connector C1 of the ONU shelf.

Step 6 Check the labeling on the cable connector; make any required correction. Mark the MDF cable end with the same label designation.

Step 7 Connect the TAP-B cable to the MDF according to local regulations or according to the instructions furnished by the network provider.

NOTE:
The TAP-B cable is a 13-wire cable of which only 5 wires are used. Four of them are for the circuit pair and the drop pair of the metallic test path. The fifth one is for future use. For the cabling/interconnections of the metallic test path see Figure 5-9 on page 5-18.

Step 8 Terminate the tip/ring pairs at the MDF and check the labeling. Note the wire color-coding sequence of the factory-prepared cable assemblies to facilitate the terminations.

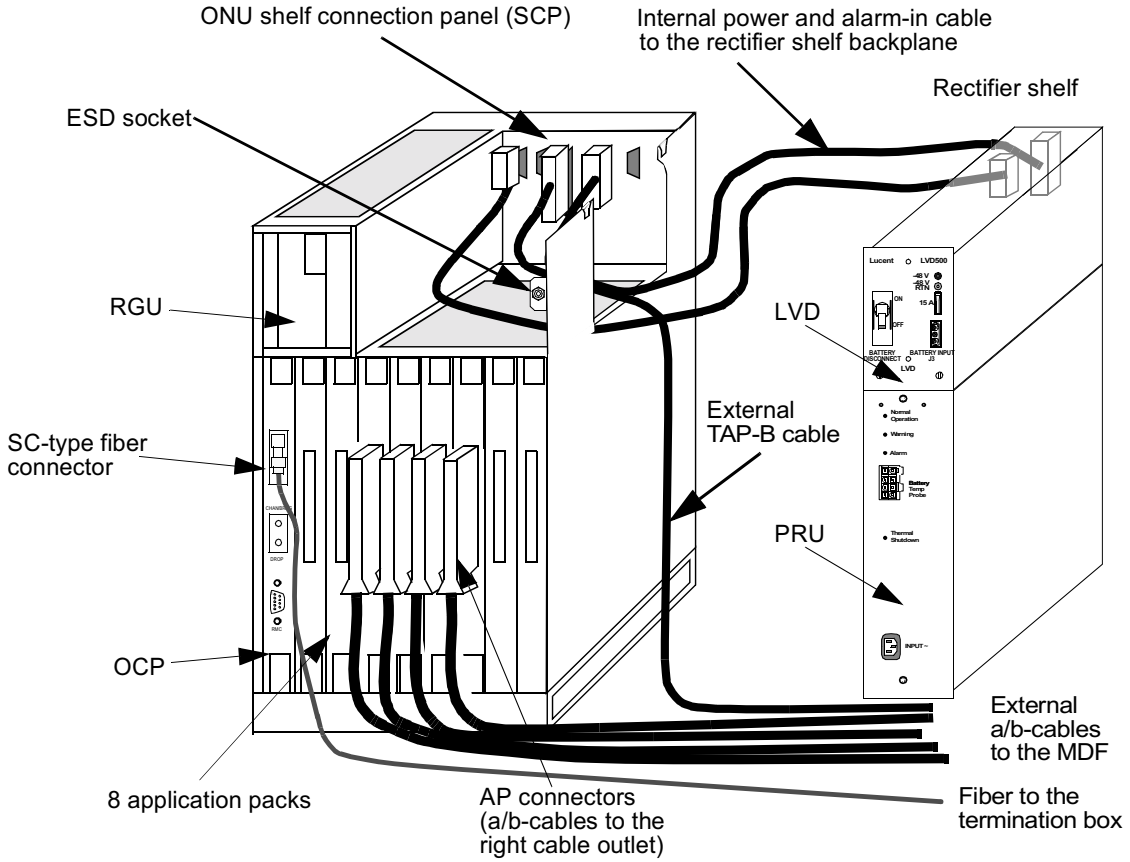


Figure 5-5 ONU shelf cabling arrangement for external cables

Testing the connections to the MDF

Test the TAP-B cable according to local regulations. A recommended practice for the Lucent MDF is to use ITE-6675 Streak Mate and ITE-7079 AIU Test Fixture to test the installed TAP-B cable.

Installing T/R Cables

The procedures below consist of installing the external prefabricated T/R cables (ED7C818-30 Group 1x, used for POTS, ISDN, and ATM xDSL) and connecting them to the ONU shelf blank faceplates (C 847773389) furnished with the ONU shelf. The other end of each T/R cable must be connected to the MDF according to local conditions or requirements of the network provider.

Cable length

The T/R cable is available in varying lengths, however any excess may be cut off to relieve cable rack congestion.

Table 5-3 Length of T/R cables (ED7C818-30, Group 1x)

Description	Code	Length
T/R cable (32 wire pairs)	ED7C818-30, Group 1	50 ft. (≈ 15 m)
	ED7C818-30, Group 1A	100 ft. (≈ 30.5 m)
	ED7C818-30, Group 1B	200 ft. (≈ 61 m)
	ED7C818-30, Group 1C	300 ft. (≈ 91.5 m)

Cable marking (labeling)

If the T/R cable connectors have not been labeled previously, mark them in accordance with the route/system numbering scheme. The MDF circuit labeling should follow this numbering pattern.

Installing and attaching the T/R cables

Install the T/R cables in the following order.

Step 1 Pull the first T/R cable with its connector end through the right-hand side of the ONU opening and route the cable along the bottom of the ONU shelf to the AP-1 position.

Step 2 Orient the mating cable connector so that the T/R cable exits upwards towards the application pack. For cable routing of the ONU shelf see Figure 5-5 on page 5-12.

NOTE:
the quantity of T/R cables that must be installed and to which AP position they must be routed is stated in the engineering work order for the ONU shelf. Alternatively, it must be given by the network provider. A maximum of 96 subscribers can be connected to the ONU.

For positions of the APs see Figure 5-8 on page 5-16.

Step 3 Stamp or mark the cable connector before mating it to its associated AP connector. Mark the MDF cable end with the same label designation.

Step 4 Snap in the cable connector to the blank faceplate. If APs are already installed, lift the ejector of the AP before connecting.

Figure 5-6 illustrates how to remove and insert an AP connector.

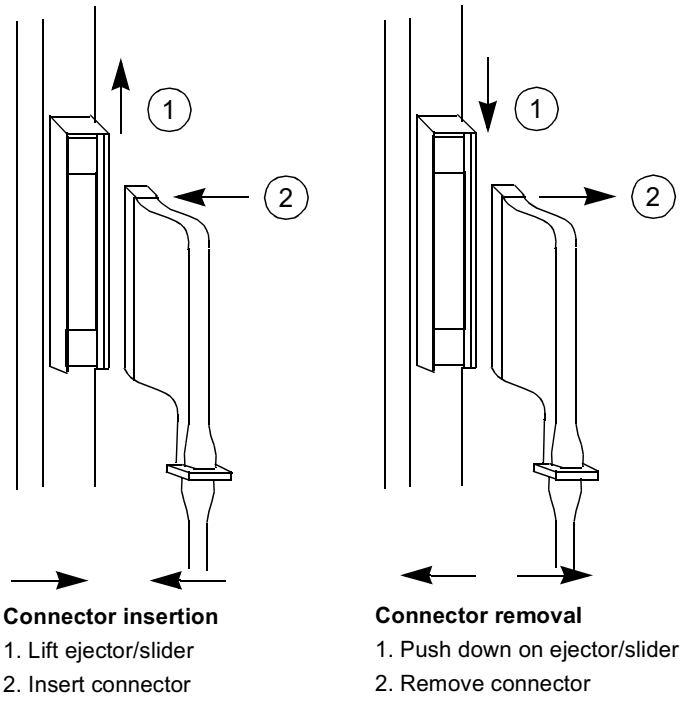


Figure 5-6 Insertion and removal of an application pack connector

Step 5 Arrange the T/R cable so that the T/R cable reaches the grounding bracket fingers of the ONU shelf directly below the application pack.

NOTE:
The T/R cable is partly shielded. An additional braided shield is provided from the application pack connector upward to a length of about 2 ft (0.6 m) Use shrink tubing or cable ties to install T/R cables.

Step 6 Place the T/R cable flush against the grounding bracket finger, so that the braided shield is in good metallic contact with the bracket.

NOTE:
If the shrink tubing covers the braided shield in the grounding finger area shorten the shrink tubing.

Step 7 Snap a cable tie over the cable and grounding bracket and fasten them together to ensure good strain relief.

Step 8 Carefully place the cables into the bottom of the ONU shelf so that eight cables will fit in this area and allow the application packs to be removed.

Step 9 Repeat Step 1 through Step 7 for each T/R cable.

Step 10 Carefully push each T/R cable to the bottom and add cable ties as needed (see Figure 5-7).

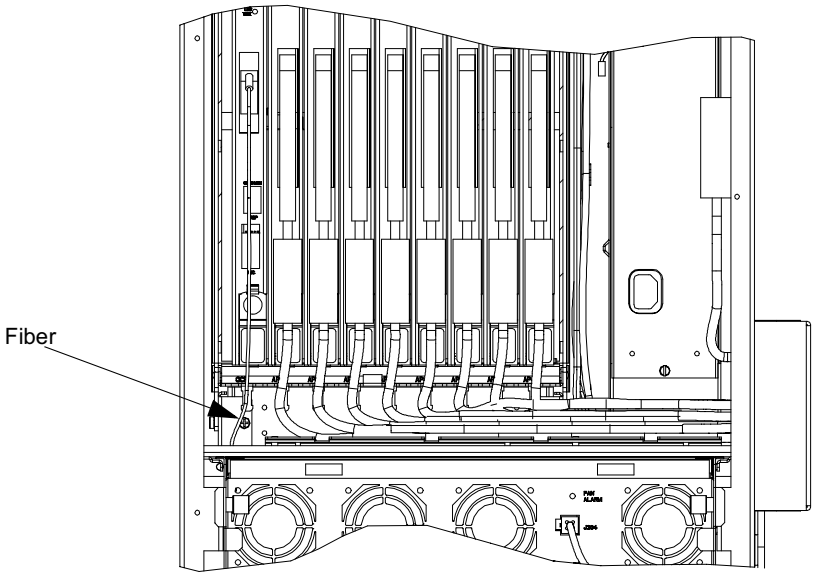


Figure 5-7 Cable routing below the ONU shelf

Step 11 Terminate the tip/ring pairs at the MDF for all installed T/R cables and check the labeling of the cables, connectors, and conductors in accordance with the figures for connectors AP1 to AP8.

Step 12 Note the wire color-coding sequence of the factory-prepared cable assemblies to facilitate the terminations.

NOTE:
If the AP cables are connected via the MDF to subscribers outside the building, the MDF must be equipped with protector blocks and the MDF must be connected to an approved grounding terminal via a separate wire of at least 6 mm^2 (9 AWG).

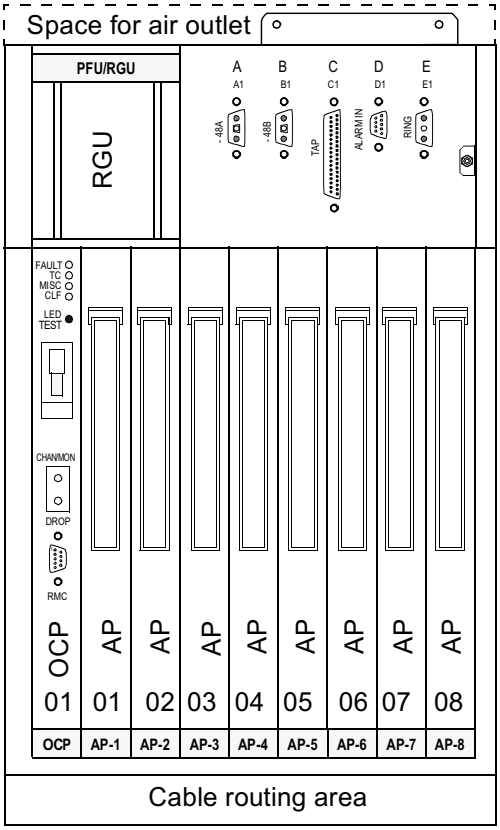


Figure 5-8 Plug-In arrangement and connector arrangement of the ONU shelf

Testing the MDF

Test the MDF according to local regulations. A recommended practice for the Lucent MDF is as follows:

Step 1 Use the ITE-6675 Streak Mate and ITE-7079 AIU Test Fixture to test the installed cables.

Step 2 Repeat step 1 for each T/R cable.

Protector blocks

AnyMedia Access System installations require a protected wire system which consists of gas tube arrestors (gas discharge tube, GDT) on all outside plant telecommunication circuits (primary protection). Follow local regulations or regulations specified by the network provider to install protector blocks.

Installing the TAP100 Cable

Marking the TAP100 cable (option)

The TAP100 cable is only required if the test application pack TAP100 is installed (option). One of the previously installed T/R cables is used for the TAP100 cable.

Use the following procedure to mark the TAP100 cable:

Step 1 If the slot for the TAP100 plug-in is known mark the appropriate T/R cable on the MDF.

Step 2 Locate the 4 wires for circuit numbers 1 and 2 (tip and ring wire of subscribers 1 and 2) and mark them.

NOTE:
Only these 2 ports are used by the TAP100 for the test application path B. Instructions for interconnection of test application paths are provided later in this section.

Primary protection

If the MDF is located outside the building, the T/R cable coming from the TAP100 should have primary protection. Follow local regulations or regulations specified by the network provider to install protector blocks.

Interconnecting the test application paths (option)

The optional Test Application Pack (TAP100) is the internal test head that executes drop measurements.

Each AP can switch any of its subscribers to the General Purpose Bus (GPB). The subscriber can be switched either bridged (connection between port and subscriber line is kept) or split (connection between port and subscriber line is opened) to the GPB.

- The TAP-B cable is a 13-wire cable of which only 5 wires are used. Four wires are used for the circuit pair and the drop pair; the fifth is for future use.
- The TAP100 cable is a normal 64-wire T/R cable of which only 4 wires are used (circuit numbers 1 and 2).

Figure 5-9 on page 5-18 illustrates the cabling of the test bus. Table 5-4, page 5-19 lists the internal connections between the active 4 wires.

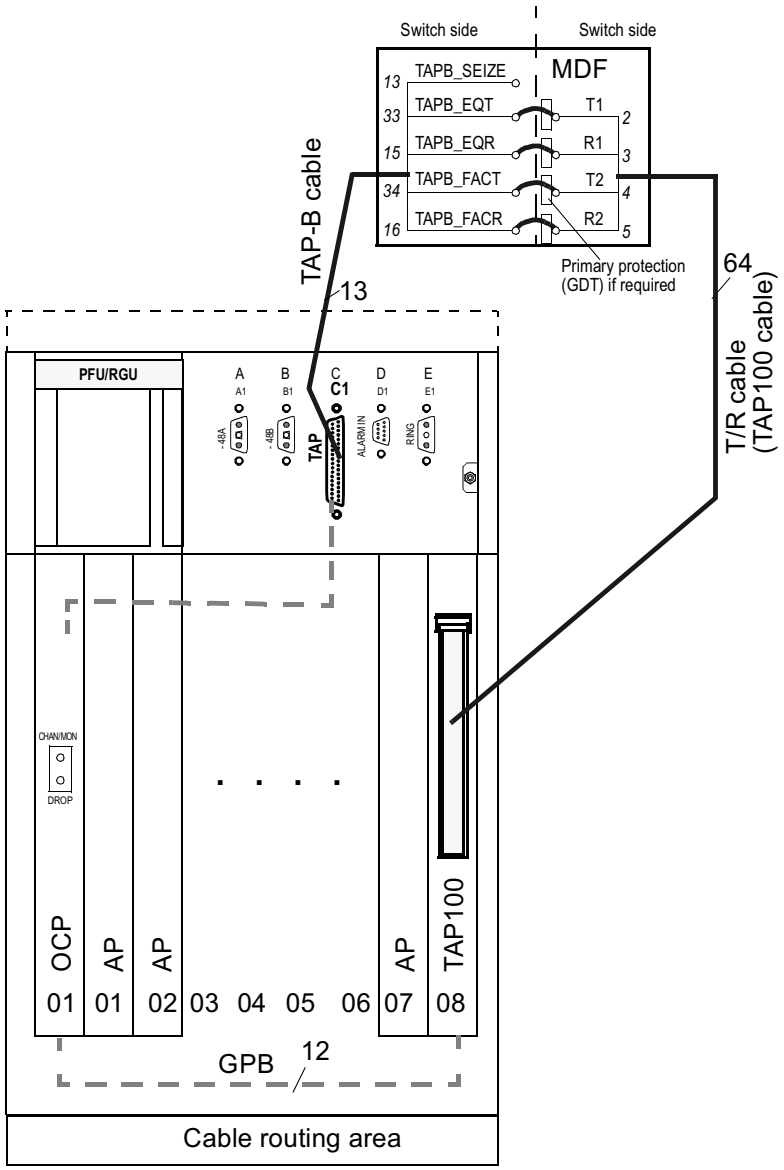


Figure 5-9 Cabling for integrated testing with TAP100 inserted in slot position AP-8

The subscriber lines of the application packs are numbered from 1 to 256. AP8 therefore would use terminals 225 to 256, and the TAP-B cable would use terminals 257 to 271, for example. Nevertheless only 96 narrowband subscribers can be served by the ONU.

TAP100-specific cabling on the MDF

Referring to Table 5-4, page 5-19, make the 4 connections shown in boldface via the MDF if a TAP100 is used in the ONU shelf slot position AP-8: :

Table 5-4 TAP-B cable ED 7C818-36 Gr.1x: ONU shelf, C1 to MDF (example for TAP100 using AP8)

TAP-B Cable ED7C818-36 Gr1x from ONU shelf connection panel to the MDF				**T/R cable ED7C818-30 Gr1x from the TAP100 to the MDF**			
Female conn. C1 (from male C1 on ONU)	***AnyMedia* signal for TAP-B**	**Wire**[a]	**MDF, TAP-B side** (example)	**MDF, TAP100 side** (example)	**Wire**	**Female TAP100 connector** (from male AP8 connector)	***AnyMedia* signal for TAP100**
1...12	not used	-	not used	not used		connected, but not used	-
13	TAPB_SEIZE[b] (multiple testing)	BL-W	257b				not used
14	TAPB_EQ_R1	O-W	258b				-
15	**TAPB_EQ_R[c] (Ring, b-wire)**	**G-W**	**259b**	**224b**	**BL-W**	**3**	**TAP_EQ_R Equipment, (b-wire, port1)**
16	**TAPB_FAC_R[d] (Ring, b-wire)**	**BR-W**	**260b**	**225b**	**O-W**	**5**	**TAP_FAC_R Facility, (b-wire, port2)**
17	TAPB_FAC_R1	S-W	261b			connected, but not used	-
18	TAPB_FAC_M	BL-R	262b				-
19	TAPB_EQ_M	O-R	263b				-
20...30	not used	-	not used				-
31	NC	W-BL	257a				-
32	TAPB_EQ_T1	W-O	258a				-
33	**TAPB_EQ_Tc. (Tip, a-wire)**	**W-G**	**259a**	**224a**	**W-BL**	**2**	**TAP_EQ_T Equipment, (a-wire, port1)**
34	**TAPB_FAC_Td. (Tip, a-wire)**	**W-BR**	**260a**	**225a**	**W-O**	**4**	**TAP_FAC_T Facility, (a-wire, port2)**
35	TAPB_FAC_T1	W-S	261a			connected, but not used	-
36	TAPB_FAC_E	R-BL	262a				-
37	TAPB_EQ_E	R-O	263a				-

a. Cable colors valid for the ED7C818-36 Gr1, ...1A, ...1B, ...1C cable.

b. For future use if the TAP100 is used for multiple NE testing (seizing multi-TAPs) or for multiple testing with the remote test unit (via wired OR), currently not used.

c. Used for crossconnecting to the test application path for Equipment (corresponds to R1/T1 of TAP100 (1st POTS port)).

d. Used for cross-connecting to the test application path for Facility (corresponds to R2/T2 of TAP100 (2nd POTS port)); required for ISDN testing for example.

Installing ADSL Services

Rerouting the ADSL cables

If ADSL APs are used, the engineering work order or the network provider will specify which POTS subscribers are to be provided ADSL service. These subscriber lines must be disconnected from the subscriber side of the MDF and routed to the POTS port “input” terminals for the ADSL AP on the switch side of the MDF. The ADSL “output” terminals must be routed to the terminals on the subscriber side where the original POTS subscriber line was connected. The ADSL AP connector wiring is illustrated inTable 5-5.

Table 5-5 Circuit Assignment for VF Connector (Part 1)

Circuit Number	Wire Colors			LPA300, LPA350,LPA380,LPA432LPA300	POTS + xDSL				
					LPA416()		LPA404	LPA408	
	Tip	Ring	Binder		In	Out		In	Out
1	W/BL	BL/W	Blue	1		1	1		1
2	W/O	O/W		2	1		N/A	1	
3	W/G	G/W		3		2	2		2
4	W/BR	BR/W		4	2		N/A	2	
5	W/S	S/W		5		3	3		3
6	R/BL	BL/R		6	3		N/A	3	
7	R/O	O/R		7		4	4		4
8	R/G	G/R		8	4		N/A	4	
9	R/BR	BR/R		9	N/A	N/A	N/A		5
10	R/S	S/R		10	N/A	N/A	N/A	5	
11	BK/BL	BL/BK		11	N/A	N/A	N/A		6
12	BK/O	O/BK		12	N/A	N/A	N/A	6	
13	BK/G	G/BK		13	N/A	N/A	N/A		7
14	BK/BR	BR/BK		14	N/A	N/A	N/A	7	
15	BK/S	S/BK		15	N/A	N/A	N/A		8
16	Y/BL	BL/Y		16	N/A	N/A	N/A	8	

Table 5-5 Circuit Assignment for VF Connector (Part 1) (Continued)

Circuit Number	Wire Colors			LPA300, LPA350,LPA380,LPA432LPA300	POTS + xDSL				
					LPA416()		LPA404	LPA408	
	Tip	Ring	Binder		In	Out		In	Out
17	W/BL	BL/W	Orange	17	N/A	N/A	N/A	N/A	N/A
18	W/O	O/W		18	N/A	N/A	N/A	N/A	N/A
19	W/G	G/W		19	N/A	N/A	N/A	N/A	N/A
20	W/BR	BR/W		20	N/A	N/A	N/A	N/A	N/A
21	W/S	S/W		21	N/A	N/A	N/A	N/A	N/A
22	R/BL	BL/R		22	N/A	N/A	N/A	N/A	N/A
23	R/O	O/R		23	N/A	N/A	N/A	N/A	N/A
24	R/G	G/R		24	N/A	N/A	N/A	N/A	N/A
25	R/BR	BR/R		25	N/A	N/A	N/A	N/A	N/A
26	R/S	S/R		26	N/A	N/A	N/A	N/A	N/A
27	BK/BL	BL/BK		27	N/A	N/A	N/A	N/A	N/A
28	BK/O	O/BK		28	N/A	N/A	N/A	N/A	N/A
29	BK/G	G/BK		29	N/A	N/A	N/A	N/A	N/A
30	BK/BR	BR/BK		30	N/A	N/A	N/A	N/A	N/A
31	BK/S	S/BK		31	N/A	N/A	N/A	N/A	N/A
32	Y/BL	BL/Y		32	N/A	N/A	N/A	N/A	N/A

Table 5-6 Circuit Assignment for VF Connector (Part 2)

Circuit Number	Wire Colors			POTS + xDSL		ISDN	HDSL2	SDSL/ SHDSL
				LPA810		LPU116	LPS104	LPS716()/ LPS702
	Tip	Ring	Binder	ADSL	POTS			
1	W/BL	BL/W	Blue	1		1	1	1
2	W/O	O/W		2		2	N/A	2
3	W/G	G/W		3		3	2	3
4	W/BR	BR/W		4		4	N/A	4
5	W/S	S/W		5		5	3	5
6	R/BL	BL/R		6		6	N/A	6
7	R/O	O/R		7		7	4	7
8	R/G	G/R		8		8	N/A	8
9	R/BR	BR/R			9	9	N/A	9
10	R/S	S/R			10	10	N/A	10
11	BK/BL	BL/BK			11	11	N/A	11
12	BK/O	O/BK			12	12	N/A	12
13	BK/G	G/BK			13	13	N/A	13
14	BK/BR	BR/BK			14	14	N/A	14
15	BK/S	S/BK			15	15	N/A	15
16	Y/BL	BL/Y			16	16	N/A	16
17	W/BL	BL/W	Orange		17	N/A	N/A	N/A
18	W/O	O/W			18	N/A	N/A	N/A
19	W/G	G/W			19	N/A	N/A	N/A
20	W/BR	BR/W			20	N/A	N/A	N/A
21	W/S	S/W			21	N/A	N/A	N/A
22	R/BL	BL/R			22	N/A	N/A	N/A
23	R/O	O/R			23	N/A	N/A	N/A
24	R/G	G/R			24	N/A	N/A	N/A
25	R/BR	BR/R			25	N/A	N/A	N/A
26	R/S	S/R			26	N/A	N/A	N/A
27	BK/BL	BL/BK			27	N/A	N/A	N/A
28	BK/O	O/BK			28	N/A	N/A	N/A
29	BK/G	G/BK			29	N/A	N/A	N/A
30	BK/BR	BR/BK			30	N/A	N/A	N/A
31	BK/S	S/BK			31	N/A	N/A	N/A
32	Y/BL	BL/Y			32	N/A	N/A	N/A

Table 5-7 Circuit Assignment for VF Connector (Part 3)

Circuit Number	Wire Colors			POTS + xDSL		OCU	
				LPA416 & LPA419		LPA605	
	Tip	Ring	Binder	In	Out	Transmit	Receive
1	W/BL	BL/W	Blue		1	1	
2	W/O	O/W		1			1
3	W/G	G/W			2	2	
4	W/BR	BR/W		2			2
5	W/S	S/W			3	3	
6	R/BL	BL/R		3			3
7	R/O	O/R			4	4	
8	R/G	G/R		4			4
9	R/BR	BR/R			5	5	
10	R/S	S/R		5			5
11	BK/BL	BL/BK			6	6	
12	BK/O	O/BK		6			6
13	BK/G	G/BK			7	7	
14	BK/BR	BR/BK		7			7
15	BK/S	S/BK			8	8	
16	Y/BL	BL/Y		8			8
17	W/BL	BL/W	Orange		9	9	
18	W/O	O/W		9			9
19	W/G	G/W			10	10	
20	W/BR	BR/W		10			10
21	W/S	S/W			11	11	
22	R/BL	BL/R		11			11
23	R/O	O/R			12	12	
24	R/G	G/R		12			12
25	R/BR	BR/R			13	N/A	N/A
26	R/S	S/R		13		N/A	N/A
27	BK/BL	BL/BK			14	N/A	N/A
28	BK/O	O/BK		14		N/A	N/A
29	BK/G	G/BK			15	N/A	N/A
30	BK/BR	BR/BK		15		N/A	N/A
31	BK/S	S/BK			16	N/A	N/A
32	Y/BL	BL/Y		16		N/A	N/A

Connecting POTS in the ADSL AP

The following figure illustrates how to route the subscriber lines carrying POTS-only services to convert them to subscriber lines for carrying POTS and data services (ADSL).

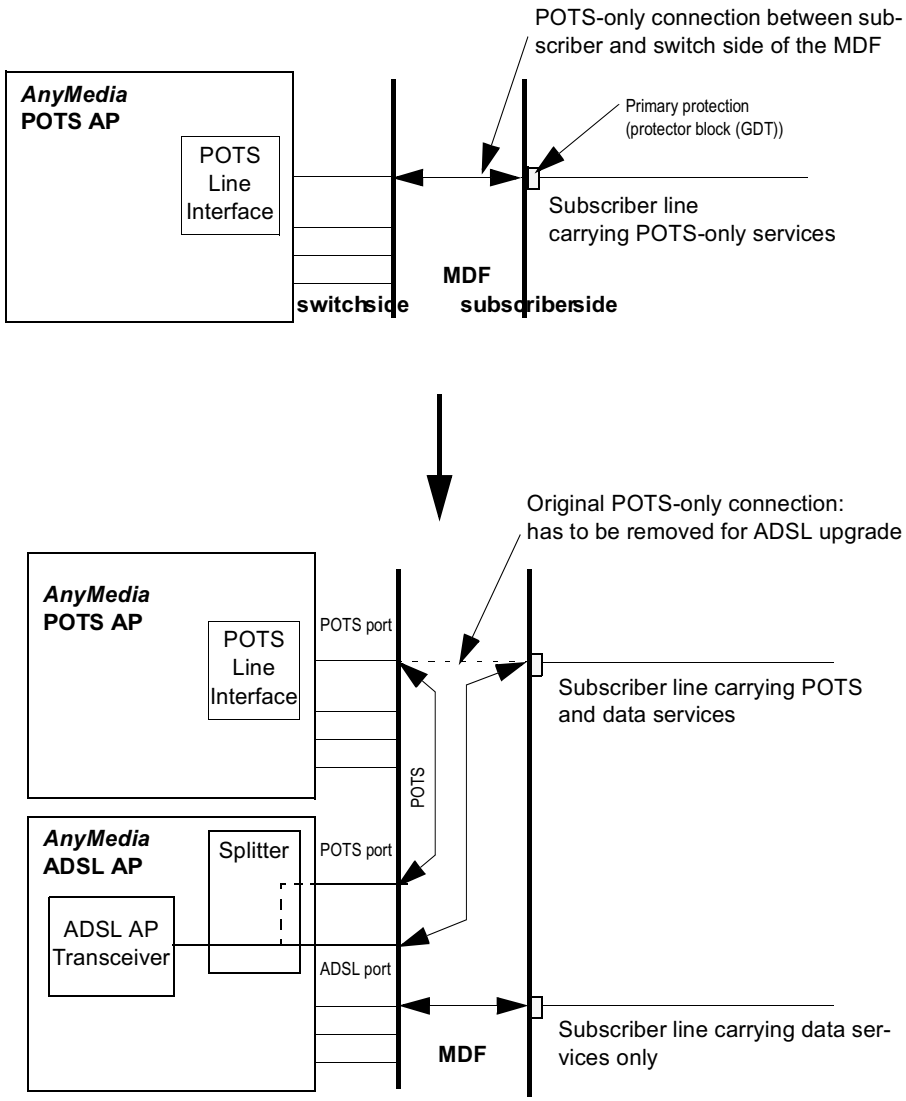


Figure 5-10 Principle for rerouting POTS over ADSL

ONU Addressing

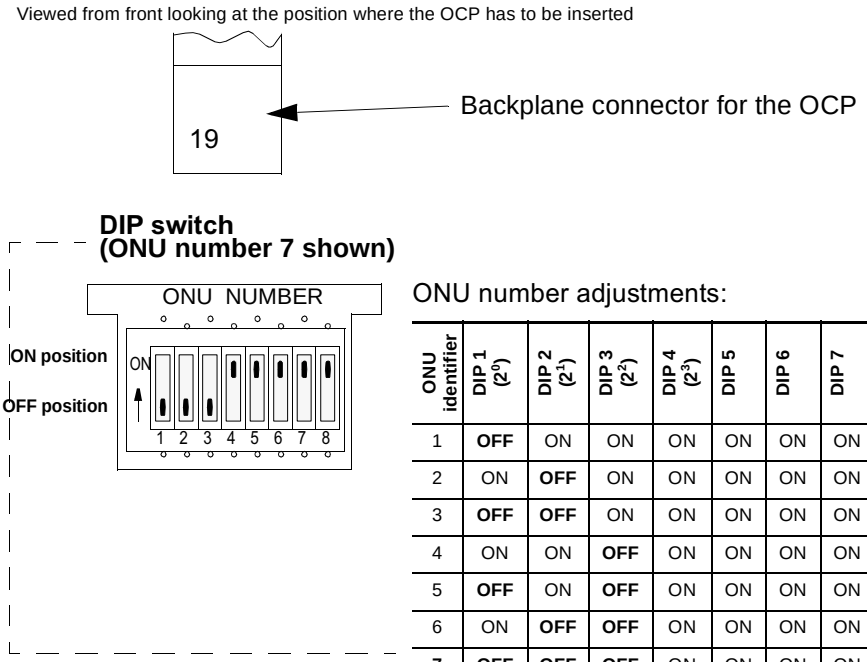
The ONU shelf is equipped with an 8-fold DIP switch. The DIP switch is located on the ONU backplane near the position where the OCP will be inserted. The DIP switch is front-accessible if the OCP is not installed.

The switches are ON in the upper position.

To adjust the DIP switch, proceed as follows:

Step 1 If required disconnect the T/R cables and the blank faceplates of the slots AP-1 to AP-4.

Step 2 Locate the DIP switch on the left side of the ONU shelf backplane. Adjust the 8 switches to ON/OFF as stated in the engineering work order using a very small screwdriver. The switches are inverse binary coded. The address adjustments for the ONU number 1 to 8 can be found in Figure 5-11.



ONU number adjustments:

ONU identifier	DIP 1 (2^0)	DIP 2 (2^1)	DIP 3 (2^2)	DIP 4 (2^3)	DIP 5	DIP 6	DIP 7	DIP 8
1	**OFF**	ON	ON	ON	ON	ON	ON	ON
2	ON	**OFF**	ON	ON	ON	ON	ON	ON
3	**OFF**	**OFF**	ON	ON	ON	ON	ON	ON
4	ON	ON	**OFF**	ON	ON	ON	ON	ON
5	**OFF**	ON	**OFF**	ON	ON	ON	ON	ON
6	ON	**OFF**	**OFF**	ON	ON	ON	ON	ON
7	**OFF**	**OFF**	**OFF**	ON	ON	ON	ON	ON
8	ON	ON	ON	**OFF**	ON	ON	ON	ON

Figure 5-11 DIP switch for ONU addressing (on the OCP position)

NOTE:
When adjusting the DIP switches, take care not to bend or break any backplane connectors on the backplane.

Step 3 Check the adjusted ONU address carefully; a later correction is difficult due to the reduced space caused by the installed and cabled application packs.

Step 4 Insert the blank faceplates and attach the T/R cables removed/ disconnected temporarily in Step 1.

Connecting AC Power

6

Overview

This chapter provides instructions for preparing the AC power cord and connecting it from the ONU shelf to the customer's external 120/240 V AC power source.

Contents

Installing the AC power cable

This procedure consists of preparing the AC power cord and connecting it between the ONU shelf and the customer's external power source of nominal 120/240 V AC.

The ONU is delivered with an AC power cord of about 10 feet (3 m) stored in the ONU housing. The cable is rolled up and attached on the outer right side of the housing. The cable is equipped with the IEC 60320 plug on the ONU side and has open ends on the customer side. Use AC power cord 848506820 for the IEC 60320 receptacle. Make a permanent connection on the customer's side of the AC power cord.

Connect the PE/green wire of the customer's AC source wire to the central approved grounding point according to local regulations.

Recommended fusing

Ensure that the customer's power source is fuse protected. There are no field replaceable fuses for the AC power inside the ONU. Use a circuit breaker or main breaker to facilitate maintenance.

The permissible fuse/circuit breaker values are listed in Table 6-1

Table 6-1 Fusing values for AC power

Nominal AC Voltage	Fuse Value for 16 AWG, or Larger	Conventional Tripping Current
120 V AC	13 A to 16 A	No more than 1.4 x nominal fusing value
220/240 V AC	10 A to 16 A	

NOTE:
The 540 W power rectifier unit for the indoor ONU is classified in over-voltage category 2 (according to IEC 60664-1) locations only. Power transients should never exceed 2.5 kV. Additional surge arrestors may be required depending on the site conditions.

Connecting AC Power

Connect the AC cables as follows:

Step 1. Verify that the customer's AC power source is switched to "OFF" and ensure that no one else will be able to turn it "ON." Mark the OFF-state if required.

Step 2 Measure the voltage on the customer's power line and verify that it is de-energized. If required short the deactivated lines to ground. Follow local regulations.

Step 3 Verify that the fuse/circuit breaker is consistent with Table 6-1, page 6-2

Step 4 If the ONU shelf has been equipped with the PRU, verify that the AC connector is not inserted in the PRU's AC receptacle.

Step 5 Be sure that the grounding connections have been checked. If not check the ground according to "Checking the ONU grounding" on page 4-9.

Step 6 Route the AC power cable from the ONU to the customer's power source. *Do not connect*. Use the appropriate power cord type for the IEC 60320 or IEC 320 AC receptacle according to the rectifier used.

Step 7 Strip the AC power cable to a length of 1¼ in (30 mm). Strip each of the three wires to a length of 3/8 in (10 mm).

Step 8 If using a cable with flexible or stranded wire, then press multicore cable ends onto each stripped end of the cable wire.

Step 9 Route the cable to the AC source terminals and attach the cable with cable ties as needed.

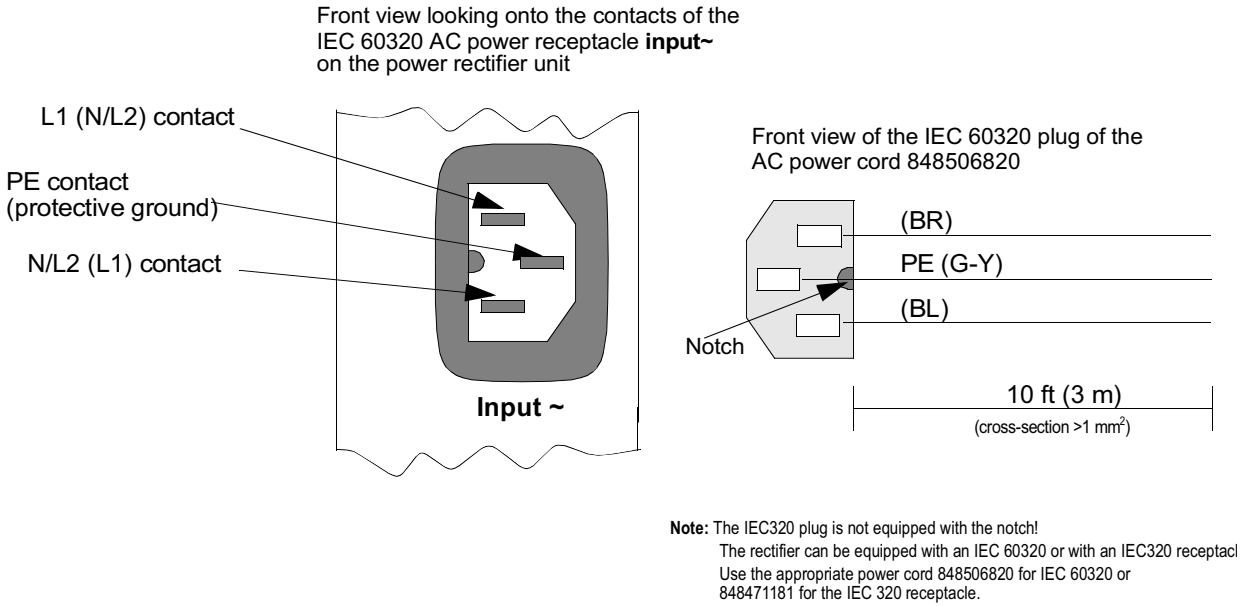


Figure 6-1 IEC 60320 AC power connector and power cord

Step 10 Insert the PE wire into the PE terminal and screw tight or connect/fix.

Step 11 Insert the brown and the blue wire into the correct terminals for L1 and L2/N and screw tight or connect/fix. For connecting follow local regulations.

Step 12 Check that the wires are fixed.

Step 13 If you shorted the deactivated power lines in Step 2, remove the short. Observe local regulations.

Step 14 If you are planning to continue the ONU installation process without interruption, switch the AC power “ON.”

Installing the Batteries

7

Overview

This section provides the procedures for unpacking, inspecting, and mounting the batteries in the ONU battery compartment.

NOTE:
If you are familiar with the battery installation and with the storage/charging procedures and warranty considerations, you can skip to page 7-9 and begin by unpacking the batteries.

Contents

Battery Option

Ordering batteries

The standard configuration of the *AnyMedia* ONU for indoor applications does not include batteries. However, the housing is designed to accept four optional type IR-30EC batteries, which are available from Tyco. For ordering information, see the *AnyMedia® Access System (24 Channel) Ordering Guide*, 363-211-125.

Battery description

The batteries are equipped with a 14 AWG lead assembly with a keyed 2-pin connector. The battery cable to the rectifier/LVD is equipped with four matching connectors. A battery is illustrated in Figure 7-1. The optional batteries will be delivered packed in a wooden box containing the following:

Table 7-1 Delivered battery set

Qty.	Comcode	Type	Consisting of:
4	407928761	IR-30EC	12-volt, valve-regulated, lead-acid IR Series I battery, with 14 AWG lead assembly terminating with pre-connected 2-pin plug
1	107078859	157-622-020	Product Manual IR Series Batteries (Issue 7 or later)
8			Screws (2 per battery, thread 10-32 x 0.50)[a]
1			Battery type label[b]

a. Already assembled for the 14 AWG lead assembly. **Note:** These screws are not M5 screws.

b. Sticker already attached to the battery. Used for marking the installation date, see Figure 7-4.

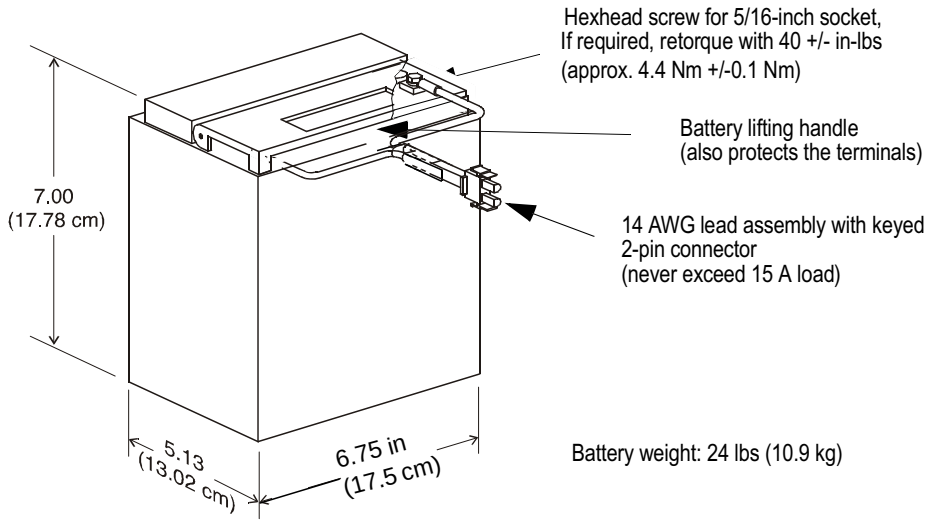


Figure 7-1 IR-30EC battery

Battery Safety

General safety precautions

For safe battery handling, always observe the following basic precautions:

- Use only properly insulated tools and test equipment.
- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses, acid-resistant gloves, rubber overshoes and apron.
- Test circuits before touching.
- Lock out and tag any circuit breakers or fuses whenever possible to prevent accidental turn-on.
- Be aware of potential hazards before servicing equipment.
- Do not short the battery.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring).
- Take care when removing or replacing any covers or brackets. Avoid contacting terminals.
- Always verify the polarity before connecting cables to the batteries.
- Use a damp soft cloth for cleaning batteries. Do not use solvents, paraffin, abrasive or proprietary cleaning fluids.

While unpacking and/or installing the batteries:

- Never place metal objects (including tools) on top of a battery.
- Never short out the battery terminals.
- Never use an open flame near batteries.
- Never stack batteries (in or out of their shipping cardboard boxes).
- Never transport or move batteries so that their weight is supported by the terminal connections.
- Never charge batteries that are visibly damaged or frozen (typically at temperatures below -40°C if the battery is fully charged).

Gas discharge

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. An explosion could occur when sparks are created near the battery string. Do not place batteries in a sealed enclosure. Freshly charged batteries are especially prone to discharging explosive gases for about 24 hours after charging.

Sparks

To avoid sparks, ensure that batteries are not charging or discharging before loosening or removing battery connections. Sparks can trigger an explosion and short circuit other battery modules, causing a fire. The GMT-type fuse in the LVD can produce sparks during interruption or clearing of a fault on a high energy circuit. Any mechanical power switches and also static electricity are sources of spark gaps.

Short circuits

Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measurements. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken.

WARNING:
Exercise extreme care to avoid any short circuit across the battery terminals. Even a single battery poses a potentially high energy hazard if shorted. Shorting a battery may result in explosion of the battery, injury to the installer, and damage to equipment. A tool or other metallic object causing the short may be thrown or vaporized due to the battery energy.

Conductive surface

If the battery is to be installed on an electrically conductive surface, a non-conductive mat or surface should be placed between the battery and the conductive surface.

Contact with electrolyte

In the event of electrolyte contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water. In the event of electrolyte in the eye, pour water into the inner corner of the eye and allow at least one liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

Acid spills

If large acid spillage occurs, use agricultural or industrial lime instead of soda for neutralization before cleanup. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after cleanup.

Battery Handling and Preparation

This section describes how to install the Tyco IR-30EC battery string and provides test procedures for verifying the integrity of the installation.

NOTE:
Install the batteries after all cables have been installed.

The requirements for storage, handling, external charging, and maintenance are different for each battery manufacturer. For IR-30EC batteries, follow the procedures provided in the Product Manual for IR Series Batteries.

Required tools, supplies and equipment

You will need the following tools and materials to install and test the battery string:

- Splash-proof safety goggles, acid-resistant gloves, rubber overshoes, and apron
- Cleaning cloth
- Lime and/or soda (sodium bicarbonate)
- Insulated socket driver or nut driver set (1/4-inch through 3/4-inch sockets) and torque wrench (0 to 60 in-lbs, 6 Nm) for maintenance/replacement only
- Sandpaper or abrasive cloth for cleaning the battery compartment only
- DMM (Digital Multimeter), for example, Tek DM254 or *Fluke* 8060A or equivalent. The accuracy of an equivalent meter should be 0.05 percent on the DC scale.
- Current converter or current probe 1:10 for multimeter used for up to 20 A
- Thermometers for measuring the ambient temperature and the battery temperature (contact type)
- Waterproof fine line marker for marking batteries and the connectors, also required to write the installation date onto the batteries.
- A Class C fire extinguisher (kept within reach)

Battery handling

Before handling batteries, read and understand the sections of the *Product Manual IR Series Batteries* that apply to IR-30EC batteries.

When removing containers from the shipping van, place them on a dolly truck in their horizontal shipping positions. Verify that the containers have not been damaged. It is important that all containers be handled with care and not dropped. The weight of the packed batteries in their shipping container is about 132 lbs (60 kg) for four batteries of type IR-30EC.

Do not apply silicone grease to IR-30EC batteries, as this can interfere with the battery housing and other electronic components.

Shipping and storing IR-30EC batteries

When transporting crates or storing IR-30EC batteries in a warehouse, do not stack more than two battery shipping containers high. Always store the shipping container in the upright position as marked on the container. Provide adequate ventilation during storage.

Storage time limit

The IR-30EC batteries are shipped in a charged state. The open circuit voltage for a fully charged battery is: 12.84 to 12.96 V.

Batteries may suffer irreversible capacity loss if stored in the open circuit state for a long period without recharging. The maximum time that a fully charged IR-30EC battery may remain on open circuit is 6 months at a temperature of 25°C, or 3 months at temperatures exceeding 32°C. The date by which the battery must be recharged is stamped on the cardboard shipping box (see Figure 7-2).

NOTE:
Depending on where the battery was manufactured, the charging date may also be found on a sticker attached to the battery housing.

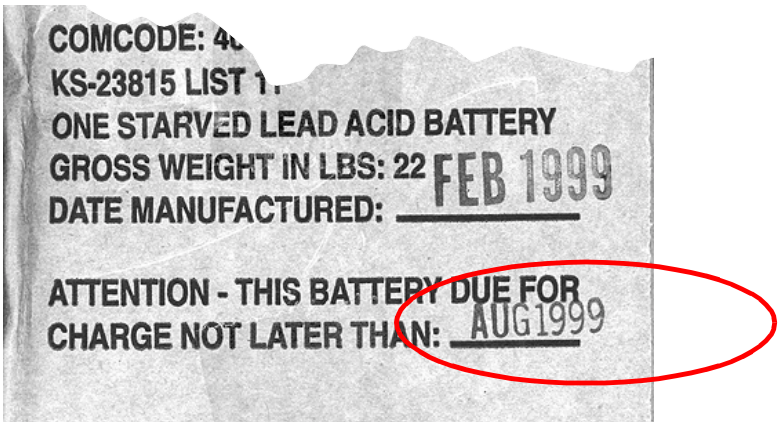


Figure 7-2 Example for a cardboard box with “charge no later than” date

Initial charging

If the batteries cannot be installed within the indicated time period, they must be charged externally. Follow the instructions in the chapter “Initial Charging” in the Product Manual for IR Series Batteries. A copy of these instructions is included in Figure 7-3.

The purpose of the initial charge is to compensate for self discharge that occurs in the interval between manufacture and installation. Under normal circumstances, the battery will regain most of its capacity after several hours on float charge; 90% capacity should be obtained within 24 hours of float charge.

Battery Condition	Action
All batteries have similar date codes and storage histories and none are more than 6* months old or they have been maintained according to the *Battery Storage* section of this product manual.	Make voltage and polarity checks and connect string(s) to plant. Charge at the float voltage of 13.5 ±0.06 volts per battery
The batteries have dissimilar date codes (more than one month apart) and they are within the required recharge period (charge-by date).	Using an external charger**, charge the string at 13.98 ±0.06 volts per 12V battery for 24 hours. Continue the charge for another 24 hours at the plant float voltage: 13.5 ±0.06 volts. Make voltage and polarity checks and connect the string(s) to the plant
The batteries are older than 6* months or have not been maintained according to the *Battery Storage* section of this product manual.	Do not install. Replace batteries.
*If the storage temperature exceeds 90°F (32°C), the open circuit time should not exceed 3 months. ** The charger must have overcurrent protection in its output, must be able to remain across the batteries in case of an AC power failure, and should not have crowbar protection. (Crowbar protection is an option used on some commercial portable power supplies that clamps a short across the output lead of the rectifier when the rectifier senses a higher voltage at the load than it is generating. This feature should not be used with batteries.)	

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COPY of the Tyco Product Manual IR-30EC and IR-40EC Batteries (Issue 7, Comcode 107078859)

Figure 7-3 Copy of the initial charging recommendation of IR-30EC batteries

NOTE:
If batteries are older than the allowed open circuit time and have not been maintained in this period, they must not be installed and should be replaced.

Unpacking and completeness check

Use the following procedure to unpack the battery and check the shipment for completeness:

Step 1. Move the pallet with the wooden box containing the batteries and the battery accessories in close proximity to the ONU.

NOTE:
Use appropriate material handling equipment to move the battery pallet. An IR-30EC battery weighs about 22 lbs (10 kg).

Step 2 Using slip joint pliers, remove all the staples/nails from the wooden battery shipping container and dispose of them properly.

Step 3 Locate the loose parts delivered with the batteries including the Product Manual IR Series Batteries (Issue 7 or later, Comcode 107078859).

NOTE:
If there are any problems with the delivered equipment or if any items are missing, refer to the job specification or equipment order for the name and telephone number of the local manager to contact and to rectify the problem.

Step 4 Locate the Installation and Maintenance Record in the Product Manual IR Series Batteries and reproduce it or use the copies in Appendix A Installation and Maintenance Record

Use the installation and maintenance record to record the parameters measured during installation and at quarterly maintenance procedures. The completed forms will be required for warranty validation.

Battery inspection and initial charging

Use the following procedure to inspect the battery and prepare it for installation:

Step 1. The packing list includes the order number. Record this order number in the Installation and Maintenance Record.

Step 2 Take out the first battery and place the battery on a level surface.

Step 3 Inspect the battery for shipping damage/obvious damage and for any sign of acid spillage.

Step 4 Check the battery for fractured housings. Batteries with fractured housings are defective and must not be used. Return damaged batteries to the manufacturer in their original packing.

Step 5 Mark the first battery, the 2-pin connector and the cardboard box with the numeral 1. This number is required for the installation record.

Step 6 Verify that the battery has not reached the open circuit time limit (see Figure 7-2 on page 7-8).

Step 7 Follow the instructions for *Initial Charging* in the Product Manual IR Series Batteries (see Figure 7-3). Observe the battery

manufacturer's charging requirements. Charging procedures are vendor-specific and can vary for different battery types.

NOTE:
Return damaged batteries to the manufacturer. Record any indications of acid spillage on the bill of lading before signing it. Acid spillage is a valid criterion for rejecting a battery. If it is determined that the battery should be returned to the manufacturer, it will be easier to return at this point than if the battery has been installed.

Step 8 Note this battery number and the battery serial number, which can be found on the battery sticker in the Installation and Maintenance Record. Refer to Figure 7-4 for the location of the serial number.

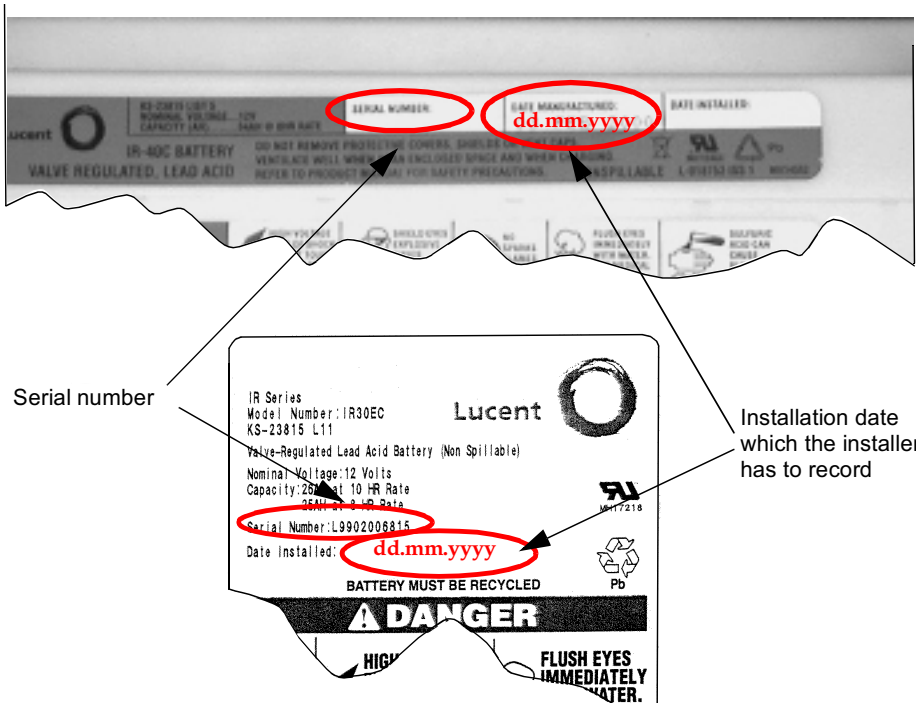


Figure 7-4 Battery labels showing the battery serial number and installation date

NOTE:
Depending on the manufacturing site, the serial number may also be found on a sticker attached to the battery housing.

Step 9 Measure the open circuit voltage of Battery 1 and record it in the Installation and Maintenance Record.

NOTE:
In a running system the IR-30EC battery may be discharged to 10.5 V.

NOTE:
If the battery voltage is 12.84 V or below, the complete battery string must be charged by the internal power rectifier unit immediately after mechanical installation. Otherwise, the batteries must be charged externally.

NOTE:
If the measured battery voltage is below 12 V the battery should be considered defective (cell short) and may not be installed.

Step 10 Record the installation date on the sticker of each battery and also in the Installation and Maintenance Record in the field *Date Installed*.

Step 11 Repeat Steps 4 to 10 for the other 3 batteries, marking them sequentially 2 though 4 in Step 5

Installing the Batteries

Battery arrangement

Figure 7-5 illustrates the arrangement for the 4 IR-30EC batteries. The battery compartment is located in the lower part of the ONU housing.

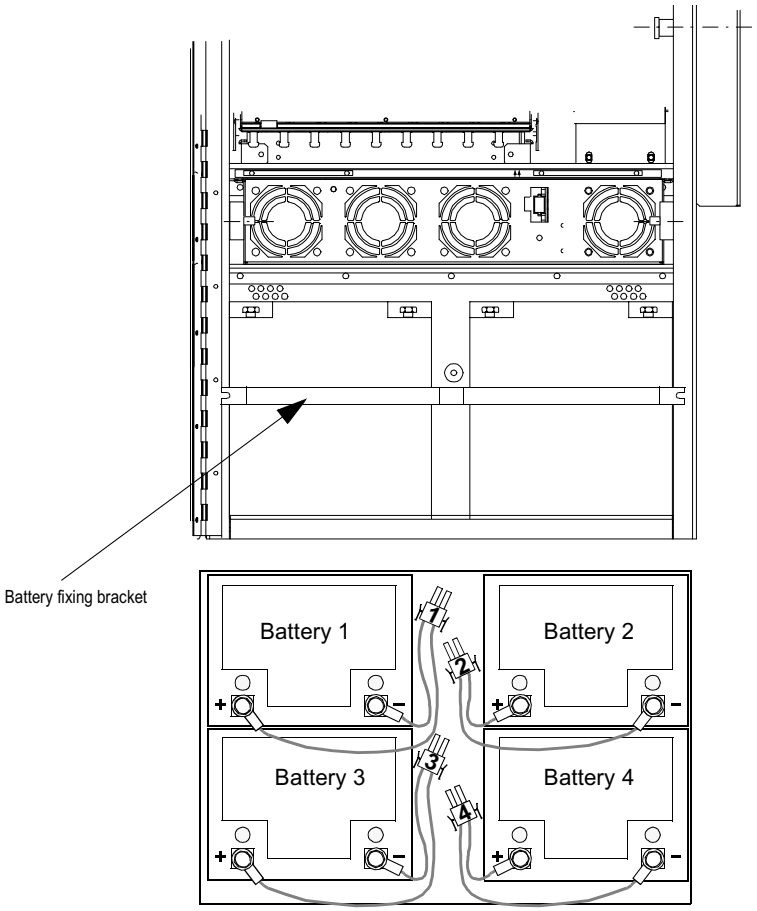


Figure 7-5 Battery arrangement (top view)

Installation procedure

Place the batteries in the battery compartment and secure them as follows:

Step 1. If an LVD is installed, ensure that the battery circuit breaker is switched OFF. Refer to Figure 8-1 on page 8-2 for the location of the LVD.

Step 2 If a PRU is installed, ensure that the AC power cord is not connected. Refer to Figure 8-1 on page 8-2 for the location of the PRU.

Step 3 Remove the locking screws that secure the battery hold-down bracket and remove this bracket.

Step 4 Locate the battery cable and thermal probe cable and move them out of the way.

Step 5 Position the first battery (No. 1) with its terminals facing to the front in the rear left corner of the battery compartment, as shown in Figure 7-5. Move the 2-pin battery assembly to the right.

Step 6 Repeat with the second battery (No. 2) and position it in the rear right corner of the ONU. Move the 2-pin battery assembly to the left.

Step 7 Repeat with batteries No. 3 and No. 4 as shown in Figure 7-5.

Step 8 Move the batteries 1 and 3 and also batteries 2 and 4 close together and move them to the side walls of the housing.

Step 9 Verify that the connector J3 on the rectifier side is not connected. For location of the LVD and the other parts see Figure 8-1 on page 8-2.

Step 10 Connect the keyed 2-pin plugs of the batteries to the appropriate connectors of the battery cable and arrange the battery cabling in the empty space between the batteries.

Step 11 Measure the battery string voltage on the outermost pins of the battery cable connector J3 and record in the Installation and Maintenance Record. Verify that the batteries are connected properly and that the polarity is correct.

Step 12 Locate the thermal probe and insert between the metallic case and the battery housing of battery 3 as shown in Figure 7-6.

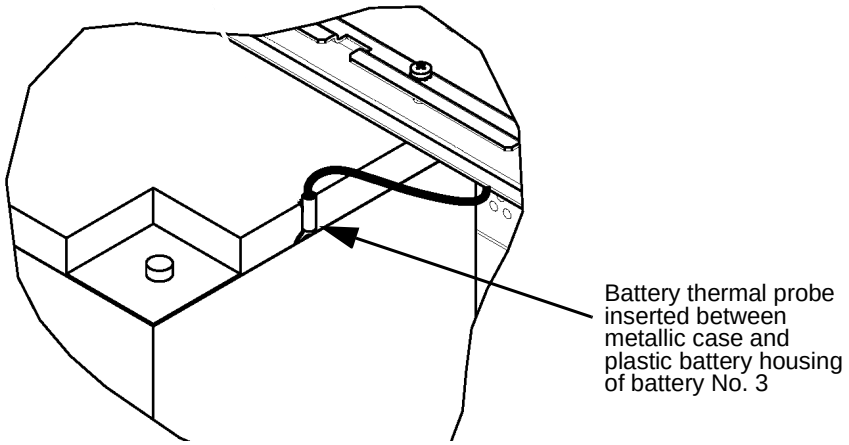


Figure 7-6 Position of the thermal probe

Step 13 Locate and mount the battery hold-down bracket.

System Power Up

8

Overview

This chapter provides the procedures for installing power-related modules, applying AC power and activating the batteries.

Contents

Modules and Ordering Codes

The next three sections explain how to install the power rectifier unit (PRU), low voltage disconnect (LVD) and ringing generator unit (RGU) modules in their assigned shelf positions, as illustrated in Figure 8-1. The ordering codes for these modules are listed in Table 8-1.

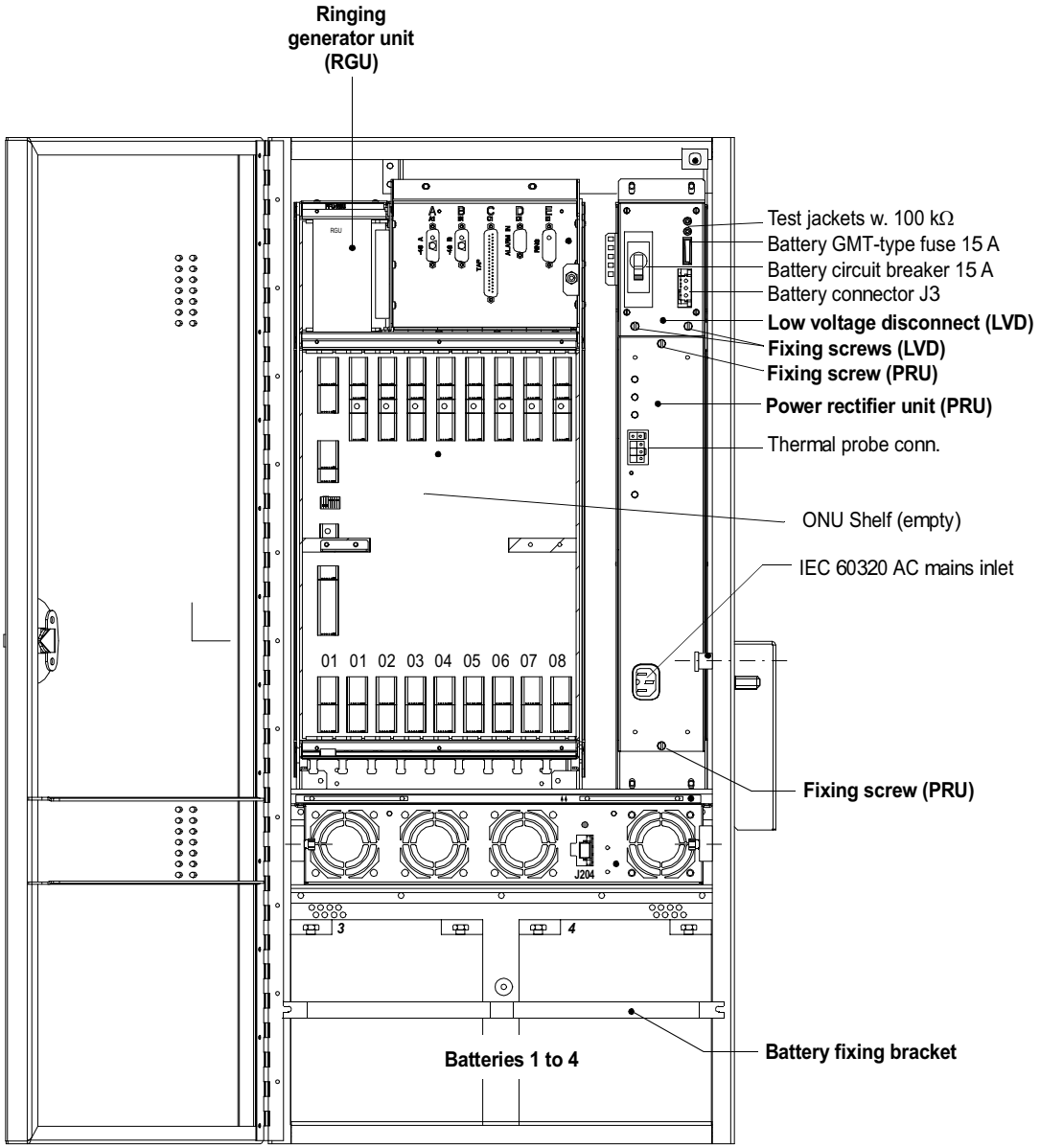


Figure 8-1 ONU with LVD, PRU, RGU and empty ONU shelf

Table 8-1 Module Codes

Module Designation	Comcode	Apparatus Code
Power rectifier unit 540 W (PRU)	108595844	RS0540, S1:1
Low voltage disconnect unit (LVD)[a]	108784109	LVD500, S2:2
Ringing generator unit (RGU)	108489741	RGU500

a. Can be installed already. Only LVDs with Issue S2:2 or later may be used! Any LVD marked S1:1 for series and vintage should be replaced with the new version marked S2:2 or later.

Installing the PRU

PRU features

The PRU is powered by the AC power supply (93 to 264 V; 47 to 63 Hz) through the IEC 60320 AC power receptacle. The PRU is buffered by four IR-30EC batteries which are connected to the PRU through the LVD.

NOTE:
The PRU must be Issue 1:1, or later, as indicated on the label attached to the PRU. The PRU issue can also determined by the IEC 60320 receptacle on the PRU faceplate (“hot-type” receptacle).

PRU installation procedure

To install the PRU, proceed as follows:

Step 1 Move the AC power supply cord aside so that the empty rectifier shelf inside the ONU is freely accessible.

Step 2 Unpack the PRU and locate the 3-position Margin switch on top, as illustrated in Figure 8-2.

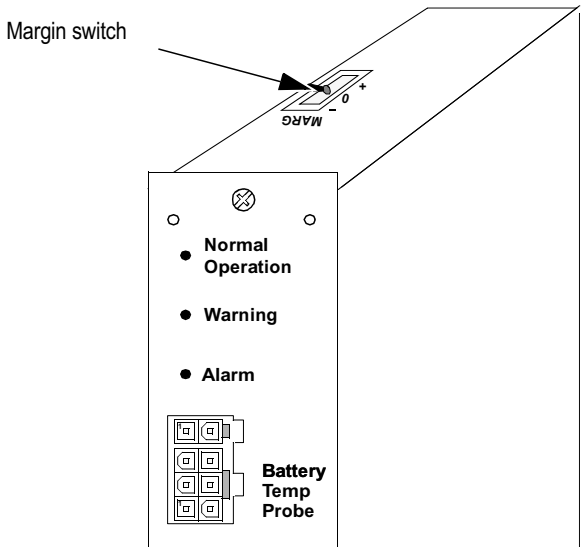


Figure 8-2 Position of the Margin switch

Step 3 For the IR-30EC batteries used in the indoor ONU application, adjust the Margin switch to the **“-”** position. If other batteries are used, the engineering work order will specify the required setting.

Step 4 Slide the PRU into the lower position of the rectifier shelf, as shown in Figure 8-1. Push the PRU into the shelf and tighten the two fixing screws on the top and bottom of the faceplate.

Installing the LVD

LVD functions and features

The LVD is designed to connect the 4 IR-30EC batteries to the PRU and is equipped with an automatic disconnect feature that disconnects the batteries when the battery voltage drops below -42.5 V. Figure 8-3 illustrates the position of the controls and indicators on the LVD faceplate.

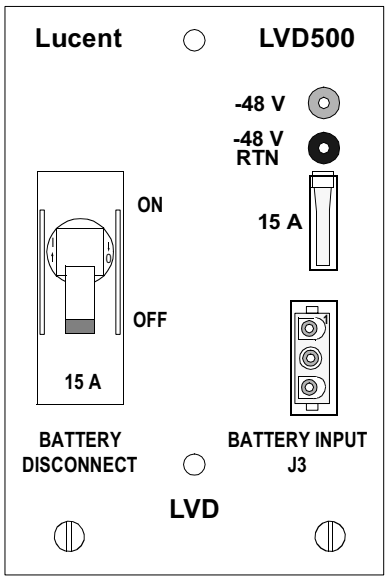


Figure 8-3 LVD Faceplate

The LVD is equipped with test jacks for the -48 V supply. These jacks are connected to the path between the batteries and the battery fuse/circuit breaker. The output voltage of the PRU measured on these jacks will be decreased by the voltage drop caused by the internal protection resistors and the internal resistance of the rectifier equipment. The voltage drop depends on the input resistance of the multimeter used.

LVD installation procedures

To install the LVD, proceed as follows:

Step 1 If the LVD is already installed, switch the battery circuit breaker to OFF, disconnect the battery cable J3 on the LVD, and proceed to Step 3 If the LVD is not installed, continue with Step 2

Step 2 Unpack the LVD and verify that the battery circuit breaker is switched to OFF. If not, switch to OFF.

Step 3 Verify that the GMT-type fuse is 15 A. If not, locate the spare 15 A GMT-type fuses (Comcode: 408026243) which have been separately packed and replace the fuse.

Step 4 Slide the LVD into the upper position of the rectifier shelf, as shown in Figure 8-1. Push the LVD into the shelf and tighten the left and right fixing screws on the bottom of the faceplate.

WARNING:
Do not connect the battery cable to LVD connector J3. If required, disconnect this cable.

Installing the Optional RGU

RGU functions

To support POTS applications, the ONU shelf must be equipped with the RGU, which is delivered separately. (For ordering see the *AnyMedia® Access System (24 Channel) Ordering Guide*, 363-211-125.) Jumpers can be used to adjust the RGU ringing frequency, as described in the following installation procedure. The factory setting is 20 Hz.

RGU installation procedure

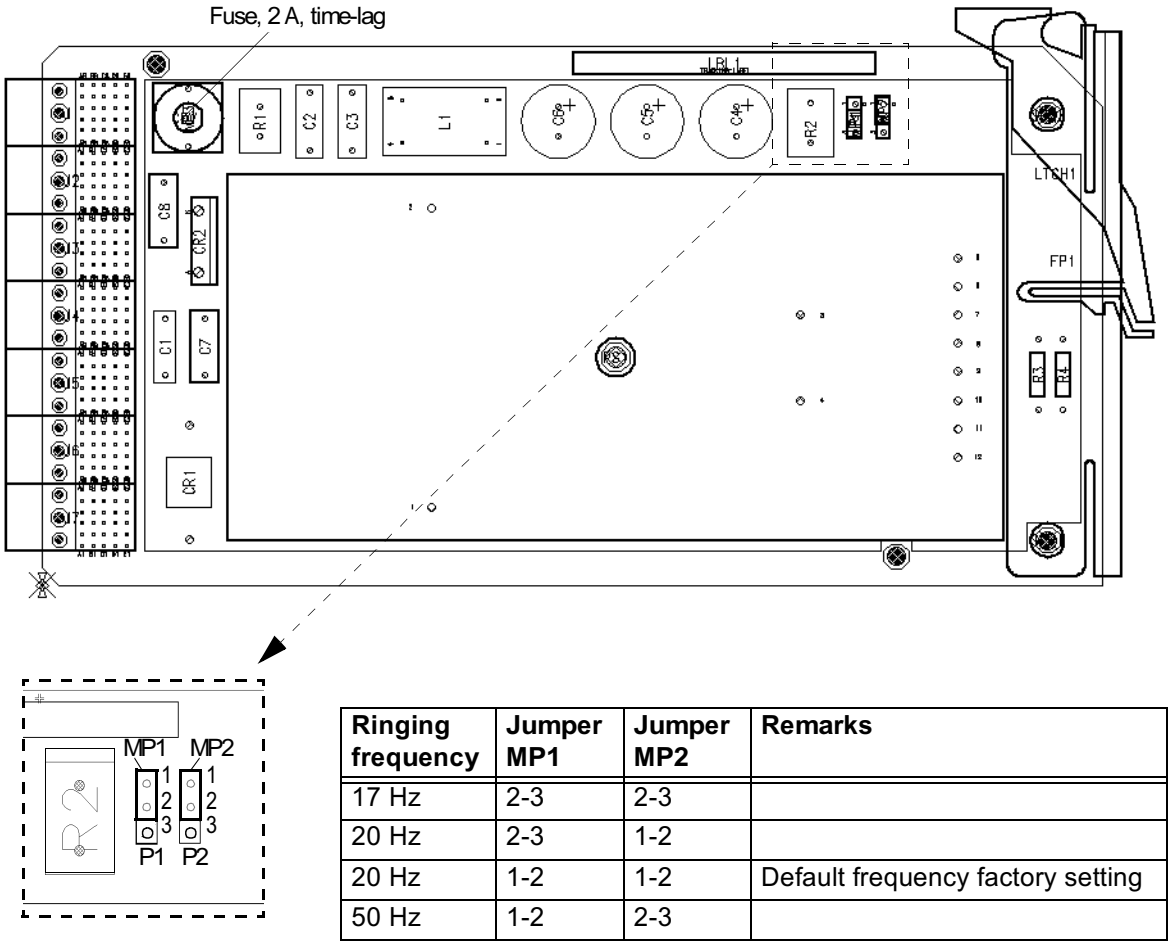
Use the following procedure to install the RGU:

Step 1 Unpack the RGU and verify that the jumpers are set to 20 Hz. Figure 8-4 illustrates the jumper positions that correspond to the available ringing frequencies.

Step 2 Verify that the latch on the RGU is swung out (OPEN position). If it is not, swing the latch upwards about 90 degrees.

Step 3 Slide the RGU into the upper position of the ONU shelf with the printed board to the right, and push the RGU into the shelf. See Figure 8-1 for the RGU shelf position.

Step 4 Lock the RGU in position by pressing firmly on the rounded indentation on the top latch until it clicks into place.



Ringing frequency	Jumper MP1	Jumper MP2	Remarks
17 Hz	2-3	2-3	
20 Hz	2-3	1-2	
20 Hz	1-2	1-2	Default frequency factory setting
50 Hz	1-2	2-3	

Figure 8-4 Location and settings of the jumpers MP1/MP2 on the RGU

Applying AC Power

The AC power supply should be connected to the customer's AC power source, as described in Connecting AC Power on page 6-3.

To apply AC power, proceed as follows:

Step 1 Be sure that the ONU housing is correctly connected to an approved ground. Otherwise, check the grounding continuity (see Checking the ONU grounding on page 4-9).

Step 2 For the first power-up, be sure that no packs are inserted in the ONU shelf except the RGU. Temporarily remove any packs that have been inserted.

Step 3 Verify that the battery cable is not connected to connector J3 of the LVD.

Step 4 Locate the AC plug and connect to the to the IEC60320 receptacle near the AC breaker panel.

Step 5 Inside the electronics compartment, locate the AC plug and connect it to the IEC60320 AC power supply receptacle of the PRU.

Step 6 If the customers AC power source is equipped with a circuit breaker, switch the AC circuit breaker to ON.

Response: All fan units will turn on, though all LEDs on the cabinet fan unit may not light. The LEDs on the PRU should exhibit the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Extinguished	Batteries not connected
Warning	Yellow	Lights	Thermal probe not connected
Alarm	Red	Lights	Batteries not connected
Thermal Shutdown	Red	Extinguished	Rectifier o.k.

Step 7 Check visually or by listening that all fans in the fan units work properly. Check the air current above the ONU and above the rectifier shelf.

Step 8 Connect the thermal probe cable connector to the connector Battery Temp Probe of the PRU.

Response: The LEDs should exhibit the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Off	Batteries not connected
Warning	Yellow	Off	Thermal probe connected
Alarm	Red	On	Batteries not connected
Thermal Shutdown	Red	Off	Rectifier o.k.

Checking the Rectifier and Batteries

For the first charging, the batteries and the rectifier should be checked for the correct polarity and charging voltage.

NOTE:
If the delivered thermal probe is used and connected (thermistor 10kΩ ± 0.1%), the PRU voltage is temperature compensated with -72 mV/°C in the temperature range from -5°C to +53°C. If the thermal probe is not connected the rectifier voltage is fixed to about -52.5 V (≙ 53°C). The maximum voltage is limited to about -57 to -58 V.

NOTE:
Due to the two protective 100 kΩ resistors of the test terminals in the LVD, the measured voltage will be about 1 V lower than expected. For the Fluke 8060A multimeter, the voltage drop will be exactly 1 V at 25°C ambient temperature.

Verifying the batteries and rectifier

Use the following procedures to check the batteries and rectifier:

Step 1 Locate in the Installation and Maintenance Record where the battery readings, the installation date and the first readings have been recorded. (See Appendix A Installation and Maintenance Record.)

Step 2 Verify that the battery cable is not connected to battery Input connector J3 of the LVD.

Step 3 Switch the battery circuit breaker on the LVD to ON.

Step 4 Measure the rectifier voltage on the test terminals on the faceplate of the LVD. Add -1 V (due to the voltage drop caused by the protective resistors) and record in the installation record.

NOTE:
Due to the internal voltage drop in the LVD, the voltage measured on the test terminals will be 1 V lower than the voltage that is applied to the ONU shelf.

Alternatively, you can measure the rectifier voltage at the terminals of battery input connector J3 on the faceplate of the LVD without voltage drop, but you must take care to avoid short circuiting the rectifier. Figure 8-5 illustrates the wiring of J3.

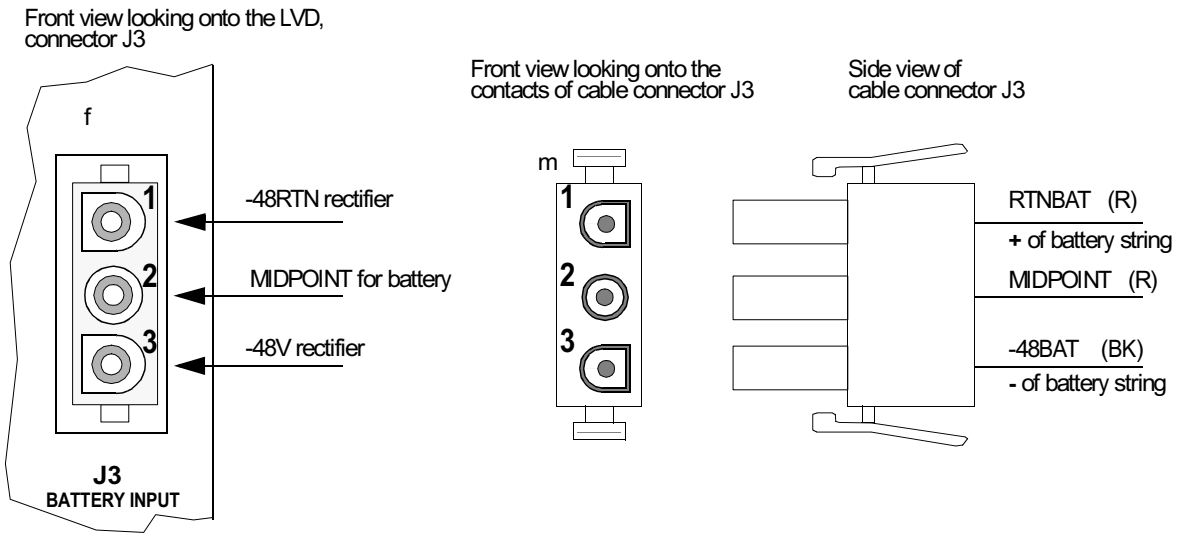


Figure 8-5 Wiring of connector J3 for the LVD and wiring of battery cable connector J3

Step 5 Switch the battery circuit breaker to OFF.

Step 6 Locate the 3-pin battery cable connector J3 and measure the battery string voltage on the outermost connector pins. The outer pin with the black wire is the negative terminal of the battery string. Record the string voltage in the installation record.

NOTE:
Between the middle pin (MIDPOINT) and the outer -48BAT pin (black wire) you will measure the string voltage of batteries 4 and 3; between the middle pin (MIDPOINT) and the outer RTNBAT pin (red wire) you will measure the string voltage of batteries 1 and 2.

Connecting and Charging the Batteries

CAUTION:
Before you connect the batteries, switch the battery circuit breaker OFF. If the batteries are connected to a working rectifier, the charging current can be about 13 A, which can cause arcing. When connecting the batteries to a working rectifier, the allowed difference between the battery and rectifier voltage must be below 0.05 V.

Procedure for connecting and charging the batteries

Follow these procedures to connect and charge the batteries:

Step 1 Verify that the battery circuit breaker on the LVD is switched to OFF.

Step 2 Connect the battery cable to battery Input connector J3 of the LVD.

Step 3 Switch ON the battery circuit breaker on the LVD.

Response: The LEDs indicate the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Lights	Batteries connected
Warning	Yellow	Extinguished	Thermal probe connected
Alarm	Red[a]	Lights or extinguished	Battery balance failure[b] or batteries and rectifier o.k
Thermal Shutdown	Red	Extinguished	Rectifier o.k.

a. Flashes at overload.

b. If batteries are charged for the first time this failure can be ignored for the first 48 hours.

Step 4 Record the charging date in the installation record.

Step 5 Charge the batteries for at least 48 hours without interruption.

Step 6 After 48 hours, switch OFF the battery circuit breaker on the LVD and locate the battery cable connector J3 inserted in J3 of the LVD.

Step 7 Disconnect J3 to measure the open circuit battery string voltage.

Step 8 Measure the string voltage on the outermost pins of the battery cable connector J3 and record in the installation record. See Figure 8-5 on page 8-13 for the wiring of J3.

NOTE:
The measured voltage must be at least -51.2 Volts. Due to the inner voltage drop in the LVD, the battery voltage measured on the test terminals will be 1 V lower than the actual battery string voltage.

NOTE:
Do not interrupt the first charging, and the batteries should be charged fully before discharging them on a working ONU.

Step 9 Connect the battery cable connector J3 to the LVD.

Step 10 Switch the battery circuit breaker to ON.

NOTE:
It is recommended that you leave the batteries connected to the rectifier.

Fan Unit and Battery Maintenance

9

Overview

This chapter covers the recommended maintenance procedures for the *AnyMedia* ONU fan units and batteries.

Contents

Maintenance Actions

Fan units

Check the fan filter for cleaning or replacement 2 months after the initial installation. Subsequently, check the fan filter at a maximum interval of 6 months.

Depending on the working conditions, the fan should be replaced after 40,000 working hours (about 4 years and 7 months if working 24 hours a day). Replace defective fan units immediately.

Batteries

IR-30EC batteries have a guaranteed lifetime of 5 years. Replace the batteries after 5 years to ensure performance. Depending on the working conditions, the batteries should be replaced at a shorter interval if the ambient temperature remains permanently in the range above 77°F (25°C).

Operating the IR-30EC battery for any length of time above 77°F (25°C) will result in reduced performance and premature failure. Operation or storage for a significant interval of time above 122°F (50°C) may reduce or void the product warranty.

Cleaning the Fan Filter

The ONU fan filter ordering codes are listed inTable 9-1

Table 9-1 Fan filter for replacement

Designation	Comcode	Apparatus Code
Fan filter FF-X55 (Class 2, 324A)	848456943	NA

Cleaning methods

Clean the fan filter using low-pressure warm water or a vacuum cleaner.

- For washing the filter, use low-pressure warm water and mild detergents (no chlorine or bleach). Rinse from the exhaust side and push dirt out.
- For vacuum cleaning, the direction of the cleaning airflow must be the reverse of the operational airflow. Vacuum the intake side only.

Filter replacement criteria

Replace the fan filter when:

- You first notice restricted air movement over the electronics
- At the first signs of overheating
- If the filter is destroyed - partly or completely.
- It has reached the allowed number of cleaning cycles, as stated in the filter manufacturer’s data sheet.

Replacing the fan filter

You can safely replace the fan filter while the fan is running. *Do not de-energize the fan*. If a spare filter is available, replace the fan filter and the remove it for cleaning, as described previously.

Use the following steps to replace the filter:

Step 1 Locate the fan filter directly above the fan unit. Pull the filter out using the two plastic loops illustrated in Figure 9-1 below.

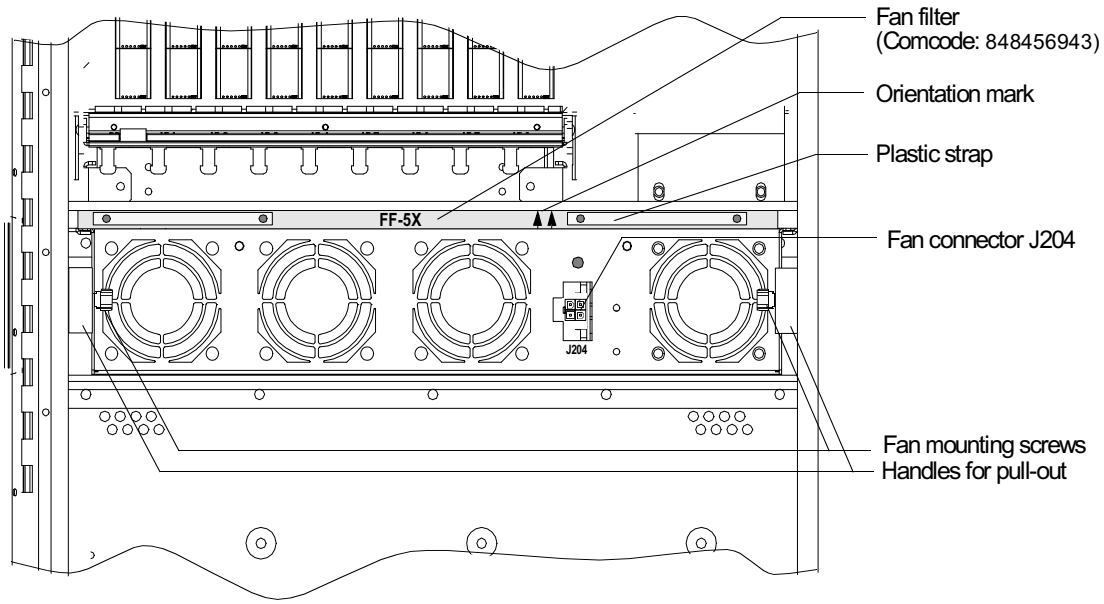


Figure 9-1 Position of the fan unit with the fan filter and the mounting elements

Step 2 Insert the new filter into position with the two arrows on the metalwork pointing up. The arrows are pointed upwards when the filter designation (for example, “FF-X5”) is right-side up.

Step 3 Push the filter firmly to the back until it no longer protrudes.

Replacing the Fan Unit

Fan unit ordering codes

The ONU fan filter ordering codes are listed in Table 9-2

Table 9-2 Fan unit for replacement

Designation	Comcode	Apparatus Code
7A fan unit (C-1669, No. 848403754-A)	108583428	N.A.
Fan filter FF-X55 (Class 2, 324A)	848456943	N.A.

Replacing the fan unit

Use the following procedure to replace the fan unit:

Step 1 Referring to Figure 9-1, locate the filter cable connector J204 on the right side of the fan unit and disconnect.

Step 2 Remove the fan filter and dispose of it properly.

Step 3 Loosen the two captive mounting screws about 7 turns.

Step 4 Pull out the fan unit using the two handles. Take care that the fan cable is not crushed. Push the cable to the right side.

Step 5 Remove the fan unit and dispose of it properly.

Step 6 Insert the new fan unit. Move the fan cable down and to the right so that it is not squeezed.

Step 7 Tighten the two captive mounting screws.

Step 8 Insert the new filter into position with the two arrows on the metalwork pointing up. The arrows are pointed upwards when the filter designation (for example, “FF-X5”) is right-side up.

Step 9 Push the filter firmly to the back until it no longer protrudes.

Step 10 Connect the fan cable to connector J204.

Step 11 Check by listening or by observing the red Fan Alarm LED to ensure that all fans in the fan unit work properly. Check the air current above the ONU and above the rectifier shelf.

Battery Maintenance Practice

Battery safety

For safe battery handling, always take the following basic precautions:

- Use only properly insulated tools and test equipment.
- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses.
- Test circuits before touching.
- Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn-on.
- Be aware of potential hazards before servicing equipment.
- Identify exposed hazardous electrical voltages on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring.)
- Take care when removing or replacing any covers. Avoid contacting any circuits.
- For cleaning batteries use a damp soft cloth only. Do not use solvents, paraffin, abrasive or proprietary cleaning fluids.

DANGER:
A battery short circuit will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete system.

Be aware of potential hazards before servicing battery equipment.

You must always use properly insulated tools and test equipment for installing and connecting batteries.

When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

While maintaining the batteries, you must:

- **Never** place metal objects (including tools) on top of a battery.
- **Never** short out the battery terminals.
- **Never** use an open flame near batteries.

Gas explosion

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations.

NOTE:
Mechanical power switches and electrostatic voltages are sources of spark gaps!

An explosion can occur when sparks are created near the battery string. To avoid sparks, check that the batteries are not charging or discharging before loosening or removing battery connections. Provide adequate ventilation.

GMT fuses

The GMT-type fuses in the low voltage disconnect unit (LVD) can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only GMT fuses specified by Lucent Technologies.

Battery connections

To avoid loose connections, take care to avoid stripping the bolt and/or nut threads by overtightening the inter-battery connectors.

Electrolyte contact

In the event of electrolyte contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water. In the event of electrolyte contact with an eye, allow at least one liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

Acid spills

If large acid spill occurs, use agricultural or industrial lime instead of soda to neutralize the acid before cleanup. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it safely, according to local regulations. Wash hands and face thoroughly after cleanup.

Battery Maintenance Procedures

Maintenance routines

The maintenance routines for the IR-30EC batteries are classified into two categories:

- Required (Table 9-3)
- Suggested (Table 9-4).

Always follow the battery manufacturer's recommended maintenance schedules procedures, which supersede the instructions provided in this chapter.

NOTE:
Failure to adhere to these maintenance schedules will void the warranty for IR-30EC batteries.

NOTE:
Battery maintenance procedures can interrupt the battery buffering for the ONU shelf and cause a shut-down of the complete ONU.

Maintenance intervals for IR-30EC batteries

Use the manufacturer's installation and maintenance record forms or the copies of the Installation and Maintenance Record provided in Appendix A.

The following maintenance intervals are mandatory for IR-30EC batteries.

Table 9-3. Required maintenance intervals for IR-30EC batteries

Routine	Action	Interval
Battery string voltage	Measure / record	Quarterly
Battery voltage	Measure / record	Quarterly
Inter-battery connections	Inspect	Quarterly
	Clean (if necessary)	As needed
Inter-battery connections	Retorque if the 14 AWG lead has been replaced	As needed
Battery string current	Measure / record	Optional or quarterly depending on the Maintenance Record used
Battery temperature	Measure / record	
External charging	Charge only if required / record	

Table 9-4. Suggested maintenance routines (additional)

Routine	Action	Interval
Discharge test	Measure / record	Optional

Battery String Float Voltage

Required tools

You will need the following tools and materials to install or test the battery string:

- Splash-proof safety goggles, acid-resistant gloves, rubber overshoes and apron
- Cleaning cloth
- Lime and/or soda (sodium bicarbonate)
- Insulated socket drive or nut driver set (1/4-inch through 3/4-inch sockets) and torque wrench (0 to 60 in-lbs, 6 Nm) for maintenance/replacement
- Sandpaper or abrasive cloth (for cleaning the battery compartment only)
- DMM (Digital Multimeter), Tek DM254 or *Fluke* 8060A or equivalent. (The accuracy of an equivalent meter should be 0.05 percent on the DC scale.)
- Current converter/transformer or current probe 1:10 for multimeter usable up to 20 A.
- Thermometers for measuring the ambient and battery temperature (contact type).

A Class C fire extinguisher should be reachable.

Determining the float voltage

To ensure safe and efficient battery operation, always maintain the battery at the proper float voltage, which is determined as follows:

Battery string voltage = recommended float voltage per battery $\times$ number of batteries.

The float voltage required is ambient temperature dependent. The PRU will adapt this charging voltage with -72 mV/°C,. The recommended float voltage per IR-30EC battery is 13.5 V $\pm$0.06 V at a battery temperature of 77°F (25°C).

For example, a 4-battery string of IR-30EC batteries should be floated at:

Battery string voltage = 13.5 V $\times$ 4 batteries $=$ 54.0 V $\pm$0.24 V

NOTE:
The required charging voltage is different for other battery types. Always use the values provided by the battery manufacturer.

Measuring the voltage of the battery string

Read battery string voltages periodically to ensure that they are floating properly. A Fluke 8060A DMM (digital multimeter) is suitable for battery voltage readings.

The accuracy of an equivalent meter should be 0.05 percent on the DC scale. Check the meter periodically for accuracy and calibration.

You may use either of the following methods to measure the string voltage on the battery cable connector J3:

- Measure on the wiring side of the battery cable connector J3 plugged in the LVD by inserting the probes into the opening for the wires using small test probes
- Measure on the contact side of the battery cable connector J3 disconnected from the LVD by inserting the probes into the contacts.

CAUTION:
Be aware that maintenance actions will interrupt the battery buffering for the ONU shelf if the battery circuit breaker is switched OFF and J3 is disconnected. A loss of AC power during these maintenance procedures will cause a shut-down of the complete ONU.

CAUTION:
Observe the following precautions to avoid short circuits during battery maintenance procedures:

- Use insulated probes for measuring.
- Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations.
- Connections at the meter must be secure and free of any possibility of touching or becoming grounded.
- Never remove connections at the meter end without first disconnecting the test leads from the battery.
- Remove test lead connections at the battery immediately after each reading is taken.

Battery string measurement procedure

Use the following procedure to measure the battery string voltage:

Step 1 Locate in the Installation and Maintenance Record where the battery readings, the installation date and the first readings have been recorded. Verify that the batteries have been on continuous, uninterrupted float for at least 48 hours.

Step 2 Switch the battery circuit breaker to OFF.

Step 3 Locate and disconnect the 3-pin battery cable connector J3. The wiring for connector J3 is illustrated in Figure 9-2.

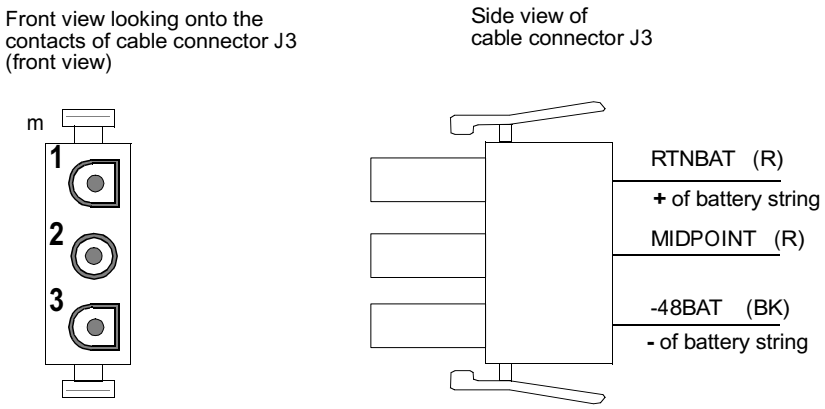


Figure 9-2 Wiring of battery cable connector J3

Step 4 Measure the battery string voltage on the outermost connector pins. The outer pin with the black wire is the negative terminal of the battery string.

- Measure the string voltage of batteries 4 and 3 between the middle pin and the outer "-" pin (black wire).
- Measure the string voltage of batteries 1 and 2 between the middle pin and the outer "+" pin (red wire).

Requirement: The string voltage must be at least: 51.2 V.

Step 5 Record the string voltage in the Installation and Maintenance Record.

You can also measure the string voltage without interrupting the buffering by measuring on the wiring side of the battery cable connector J3 plugged in the LVD by inserting the probes into the opening for the wires using small test probes.

Measuring the voltage of a single battery

Measure the individual battery voltages periodically to ensure that they are floating properly. Readings for each battery must be within ±0.18 V of the string average (calculated by dividing the string voltage by the number of batteries in the string).

Additionally the power rectifier unit is equipped with a supervision component that compares the voltage of batteries 1 and 2 (1st partial string) to the voltage of batteries 3 and 4 (2nd partial string).

CAUTION:
The maximum difference between these voltages is 1.7 V. Values greater than 1.7 V will generate a rectifier balance failure.

CAUTION:
Be aware that maintenance actions will interrupt the battery buffering for the ONU shelf if the battery circuit breaker is switched OFF and J3 is disconnected. A loss of AC power during these maintenance procedures will cause a shut-down of the complete ONU.

To measure battery voltage, the battery string must be disconnected from the rectifier. Observe the following precautions to avoid short circuits during battery maintenance procedures:

- Use insulated probes for measuring.
- Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations.
- Connections at the meter must be secure and free of any possibility of touching or becoming grounded.
- Never remove connections at the meter end without first disconnecting the test leads from the battery.
- Remove test lead connections at the battery immediately after each reading is taken.

Individual battery measurement procedure

Use the following procedure to measure the voltage of an individual battery:

Step 1 Locate in the Installation and Maintenance Record where the battery readings, the installation date and the first readings have been recorded. (See Appendix A Installation and Maintenance Record) Verify that the batteries have been on continuous, uninterrupted float for at least 48 hours.

Step 2 Switch the battery circuit breaker to OFF.

Step 3 Locate and disconnect 2-pin battery connectors Batt1 through Batt4 in the battery compartment. The wiring for the 2-pin battery connector is illustrated in Figure 9-3.

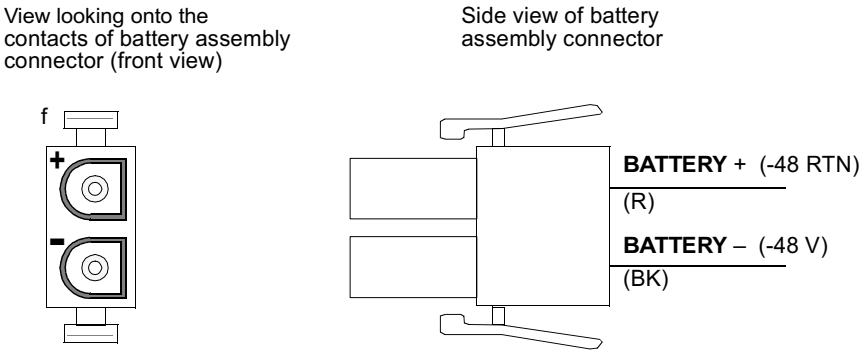


Figure 9-3 Wiring of the 14 AWG lead battery assembly connectors

WARNING:
The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker. When taking voltage readings, a short in this area can cause an arc that will destroy batteries and cables, leading to malfunctioning of the complete ONU.

Step 4 Measure the battery voltage for each battery on the 2-pin 14 AWG lead assembly connector and record the battery voltage in the Installation and Maintenance Record.

Because float readings are affected by discharges and recharges, these readings must be taken when the batteries have been on continuous, uninterrupted float for at least *one week*.

Any fully charged IR-30EC battery at float that reads less than 13 V at 77°F (25°C) is considered to be shorted and must be replaced*. For battery replacement procedures, see Battery Replacement on page 9-20.

Step 5 Connect the battery connectors Batt1 to Batt4.

Step 6 Switch the battery circuit breaker on the LVD to ON.

* For the IR-30EC batteries it is recommended to replace all 4 batteries if the batteries are older than about 1 to 2 years.

External Charging

The Tyco IR-30EC batteries may be charged either by constant potential or constant current chargers.

CAUTION:
Boost charging the IR-30EC batteries is not recommended without the concurrence of Tyco. Refer to the Product Manual for IR-30EC and IR-40EC Batteries, Section Operations.

Charging voltage for IR-30EC batteries

- **Constant potential charger for IR-30EC batteries.** A potential of **13.5 ±0.06 V** per battery is recommended for an ambient temperature of 77°F (25°C) for constant potential charging.

NOTE:
For constant voltage application, failure to reduce the float voltage in systems without temperature compensation may result in premature failure or thermal runaway.

- **Constant current charger for IR-30EC batteries.** The battery manufacturer specifies that when batteries are used in plants with a constant current charger, such as Lucent Technologies 337A1, a constant current that results in 13.38 to 14.4 V per battery at ambient temperature of 77°F (25°C) is recommended for float-standby applications.

The IR-30EC batteries are equipped with cable assemblies and a keyed 2-pin connector. The cable is designed for **15 A** current at maximum.

WARNING:
The standard cable assembly mounted on the IR-30EC batteries is designed for charging currents below 15 A. Charging currents exceeding 18 A will destroy the cable. If the battery is charged externally, in no case should the charging current of the external charger be allowed to exceed 18 A if the delivered cable assembly is used.

NOTE:
For battery replacement, the battery manufacturer specifies the following: Any **fully** charged IR-30EC battery **at float** that reads less than 13 V at 77°F (25°C) is considered shorted and must be replaced.

Voltage ripple for external charging

The amount of AC voltage ripple present on the charging voltage for the battery can seriously affect battery performance. Excessive ripple could result in sharply reduced battery life and increased gassing rates.

Both the amplitude and frequency of the ripple affect the degree of battery degradation. As a guideline for IR-30EC batteries, the charging voltage ripple for the battery should not exceed 60 mV peak-to-peak per battery or last longer in duration than 8 ms.

Battery Compartment Maintenance

Cleaning and inspecting

Inspect the batteries and the battery compartment visually at least twice a year (or more often, if warranted). If necessary, clean the batteries and the battery compartment using a soft cloth dampened in water. Inspect the delivered battery cable assemblies for corrosion. Report any sign of acid or corrosion to Lucent Technologies.

Acid spills and corrosion

If acid spills occur, clean the battery compartment properly. A wire brush may be used to clean acid spills in the battery compartment. Any damaged areas must be re-varnished.

WARNING:
When cleaning the metal battery compartment with a wire brush, do not let it come in contact with the battery terminals or inter-battery connectors, which can short circuit the batteries and cause considerable damage.

Retorquing inter-battery connections

The inter-battery connections for the battery cable assemblies are factory delivered. You will only need to retorque these connections when you are replacing the batteries or the cable assembly.

NOTE:
The battery is equipped with 10-32 x 0.50 screws. *Do not* use M5 screws as replacements for the original screws.

If retorquing is required retorque IR-30EC batteries with:

40 ±10 inch-pounds (about 4.4 Nm) for IR-30EC batteries.

CAUTION:
Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections.

Ensure that all battery connections are tight with the exception of the connection that is being opened.

For retorquing use an insulated torque wrench. Use the torque values specified by the battery manufacturer.

CAUTION:
An explosion could occur if sparks are created near the battery string.

Check that the batteries are not charging or discharging before loosening or removing battery connections as sparks may occur.

Switch the battery circuit breaker to "OFF."

Use insulated tools and discharge all static electricity from your body before performing any work.

As always, adequate ventilation must be provided.

Battery Replacement

Any fully charged IR-30EC battery at float that reads less than 13 V at 77°F 25°C is considered shorted and must be replaced. For IR-30EC batteries, it is recommended that all 4 batteries be replaced if they are older than about 1 to 2 years.

Installation and Maintenance Record

A

Installation and Maintenance Record

The following two pages are copies for the Installation and Maintenance Record from the Product Manual IR Series Batteries (Issue 7, Comcode 107078859).

Installation and Maintenance Record (Page 2)

Company Name: ____________________ Site Address: ____ Battery Type: *IR-30EC*

Temperature Measurements on Selected Batteries

	Measurement Date										
Battery Number	Initials										
1											
2											
3											
4											

String Float Current Measurements

	Measurement Date										
Battery Number	Initials										
1											
2											
3											
4											

Battery Capacity Measurements

Test Date	Battery Temperature	Start Voltage (Vdc)	End Voltage (Vdc)	Test Current (A)	Test Start Time	Test End Time	Percent Capacity

Installation and Maintenance Record

Installation and Maintenance Record (Page 1)

Company Name: ____________ Site Address: ________________________ Battery Type: *IR-30EC*

String Voltage: ____________ Voltage across charge and discharge buses: __________ Voltage Difference: ________

If the voltage difference between the string and the charge/discharge buses is less than 0.05V, the system is ready. Make individual battery voltage measurements and record in the table below.

Voltage Measurements on Individual Batteries												
		Measurement Date										
		Initials										
Battery Number	Serial Number	Order Number										
1												
2												
3												
4												

List of Acronyms

A

A/D	analog/digital
AAL	ATM adaptation layer
ABN	active balance network
ABSBH	average busy season busy hour
AC	alternating current
ACD	automatic call distributor
ACE	ATM circuit emulation
ACF	AC fault
ACO	alarm cutoff
ADPCM	adaptive differential PCM
ADSL	asymmetric digital subscriber line
ADSL-R	ADSL transceiver unit—remote end
AFM	ATM feeder multiplexer
AID	access identifier
AIP	access interface platform or alarm interface panel (not used as ac)
AIS	alarm indication signal
AIS-L	alarm indication signal-line
AIU	access interface unit
ALC	automatic loss control; automatic level/loss compensation

ALC5	automatic loss compensation—5
ALIT	automatic line insulation test
AMI	alternate mark inversion
ANSI	American National Standards Institute
AOS	*AnyMedia* Access System operations software
AP	application pack
APOG	applications, planning, and ordering guide
ARM	access resource manager
ASCII	American standard code for information interchange
ATM	asynchronous transfer mode
ATU	alarm test unit
ATU-C	ADSL transceiver unit - Central Office
ATU-R	ADSL transceiver unit - remote end
AWG	American wire gauge

B

B8ZS	bipolar with eight zeros substitution
BAIU	broadband access interface unit
BB	broadband
BCF	battery cell fault
BDFB	battery distribution fuse bay
BER	bit error ratio
BIST	built-in self-test
BITS	building integrated timing supply
BRI	basic rate interface
BRITE	basic rate interface transmission extension
BT	bridged tap
BVC	bearer virtual channel
BVPT	bearer virtual path termination
BWM	broadcast warning message

C

C/N	carrier-to-noise ratio
CAC	connection admission control
CALRS	centralized automatic loop reporting system
CASTL	customer advocate system test lab
CBR	constant bit rate
CC	clear channel
CCITT	international telephone and telegraph consultative committee
CCN	customer change notice
CCS	hundred call seconds
CD-ROM	compact disk - read only memory
CDV	cell delay variation
CDVT	cell delay variation tolerance
CES	circuit emulation service
CES-IWF	circuit emulation service interworking function
CEV	controlled environment vault
CF	current feed
CHAN/MON	channel testing and monitoring (switch side)
CIT	craft interface terminal
CL	center line
CLF	carrier line failure
CLP	cell loss priority
CMI	control mode idle
CMIS	common management information service
CN	change notice
CO	central office
COACH	customized online aid for customer help
COMDAC	common data and control
COPM	customer operations and program management
CORRCNT	corrected HEC error counter
COT	central office terminal

CPE	customer premises equipment
CPFT	customer premises facility terminal
CPI	calling party identification
CPS	cabinet power system
CR	critical
CRC	cyclic redundancy check
CRV	call reference value
CS	current sink
CSA	carrier serving area
CSMD/CD	carrier sense multiple access/collision detection
CSS	controlled slip seconds
CSS-P	controlled slip seconds-path
CSU	channel service unit
CTS	customer technical support
CTU	craft test unit
CU	channel unit
CV	coding violation
CV-L	coding violation-line
CV-LFE	coding violations-line - far end
CV-P	coding violation-path
CV-S	coding violations-section
CVC	control virtual channel
CVPT	control virtual path termination

D

DACS	digital access cross-connect system
dB	decibel
dBm	decibel referenced to one milliwatt
DC	direct current
DCD	received line signal detector
DCE	data communication equipment
DCLU	digital carrier line unit

DCN	data communication network
DCS	digital cross-connect system
DCTP	direct current test pair
DDL	delivered data link
DDM	digital data multiplexer
DDS	digital data services
DFI	digital facilities interface
DHCP	dynamic host configuration protocol
DID	direct inward dialing
DIP	dual in-line package
DLC	digital loop carrier
DLCI	data link connection identifier
DM	degraded minute
DMT	discrete multitone
DMU	digital measurement unit
DNIS	dialed number identification service
DNS	domain name service
DNUS	digital network unit–subscriber
DOD	direct outward dialing
DP	data port or dial pulse
DPFU	dual power feed unit
DPO	dial pulse originate
DPT	dial pulse terminate
DRAM	dynamic random access memory
DS0	digital signal, level 0
DS1	digital signal, level 1
DS3	digital signal, level 3
DSL	digital subscriber line
DSP	digital signal processor
DSR	DCE ready
DSU	data service unit

DSX	digital signal cross-connect
DSX-1	digital signal cross-connect, level 1
DSX-3	digital signal cross-connect, level 3
DTC	digital trunk controller
DTE	data terminal equipment
DTMF	dual tone multifrequency
DU	data unit
DX	duplex

E

EBS	enhanced business service
EC	error correction
ECI	equipment catalog item
E&M	ear and mouth
EM	element manager
EMC	electromagnetic compatibility
EMF	electromotive force
EMI	electromagnetic interference
EMS	element management system
EOC	embedded operations channel
EPD	echo path delay
ERL	echo return loss
ES	errored seconds
ES-L	errored second-line
ESD	electrostatic discharge
ESF	extended superframe
ES-L	errored seconds-line
ES-LFE	errored seconds-line far end
ES-P	errored seconds-path
ES-S	errored seconds - section
ETO	equalized transmission only

F

4TDM	four-wire tandem
FC	failure count
FC-L	failure counts-line
FC-LFE	failure counts-line - far end
FCC	Federal Communications Commission
FCM	fuse circuit module
FDI	feeder distribution interface
FE	far end
FEAC	far end alarm and control
FELP	far end loopback
FITL	fiber in the loop
FITs	failure in 10^9 hours
fpm	flashes per minute
FPT	framed path termination
FSA	first site application
FSAN	full service access network
FTP	file transfer protocol
FX	foreign exchange
FXO	foreign exchange office
FXS	foreign exchange station
FRMGND	frameground

G

GA	general availability
GCRA	generic cell rate algorithm
GOS	grade of service
GPB	general purpose bus
GPC	general purpose communications
GR-303	Telcordia Technologies, Inc. Standard GR-303
GSFN	generic signaling function

GSI	graphical system interface
GTL	Gunning transceiver logic
GTSIP	global technical support information platform

H

HBER	high BER
HCS	header check sequence
HDBH	high day busy hour
HDLC	high-level data link control
HDSL	high bit rate digital subscriber line
HDSL2	high bit rate digital subscriber line-second generation
HDT	host digital terminal
HEC	header error code
HTTP	hypertext transfer protocol
Hz	hertz

I

I/O	input/output
IAD	integrated access device
IAT	integrated access terminal
IATSI	IAT system interface
IBERT	integrated bit error test
ICLE	initial customer laboratory evaluation
ICP	IMA control protocol
ID	identifier
IDCU	integrated digital carrier unit
IDLC	integrated digital loop carrier
IDT	integrated digital terminal
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IMA	inverse multiplexing for ATM
IMLT	integrated mechanized loop testing

INA	integrated network access
INIT	initialization/diagnostic
IP	Internet protocol
IPX	Internet packet exchange
IS	in service
ISDL	integrated subscriber digital line
ISDN	integrated services digital network
ISO	international organization for standards
ISP	Internet service providers
ITU	International Telecommunications Union
IV	ICP cell violation
IV-IMA	IPC violations (count of errored, invalid or missing IPC cells)
IXC	interexchange carrier

K

kbps	kilobits per second
kBps	kilobytes per second
kHz	kilohertz
kW	kilowatt

L

LAN	local area network
LAPD	link access protocol D-channel
LBO	lightguide build out
LCD	loss of cell delineation
LDS	local digital switch
LED	light-emitting diode
LFACS	loop facilities assignment and control system
LFP	logical feeder port
LLN	logical line number
LMI	local management interface
LOCD	loss of cell delineation

LOF (lof)	loss of frame
LOFA	loss of frame alignment
LOP	loss of pointer
LOS (los)	loss of signal
LOST	loss of signal timeout
LSAS	line side answer supervision
LTD	local test desk
LTF	loop test frame
LTS	loop test system
LULT	line unit network termination
LUNT	line unit network termination
LVD	low voltage disconnect

M

mA	milliampere
MAT	Metropolitan Area T-carrier
Mbps	megabits per second
MBps	Megabytes per second
MBS	maximum burst size
MDF	main distributing frame
MDS2	metallic distribution shelf 2
MDSU	metallic distribution server unit
MEA	mismatch of equipment and attributes
MHz	mega hertz
MIB	management information base
MJ	major
MLTS	multiline telecommunications system
MMSU	modular metallic service unit
MN	minor
MR	modification request
ms	millisecond
MSC	metallic shelf controller

MSG	message switch
MTBF	mean time between failures
MTU	maximum transfer unit
MVEC	majority vote error correction

N

NB	narrowband
NCTE	network channel terminating equipment
NE	near end or network element
NEBS	network equipment building systems
NEC	national electric code
NI	network interface
NIC	network interface card
NMP	network management protocol
NMS	network management station
nrt-VBR	nonreal time variable bit rate
NSA	nonservice affecting
NT 1	network termination - 1
NTP	network time protocol
NTT	no test trunk
NTR	network timing reference
NVDS	nonvolatile data storage
NVPS	nonvolatile program storage

O

OAM&P	operations, administration, maintenance, and provisioning
OAP	optical application pack
OC	optical carrier
OCD	out of cell
OCP	optical controller pack
OCU	office channel unit
OE	originating equipment

OHT	on-hook transmission
OLIU	optical line interface unit
ONU	optical network unit
OOS	out of service
OPS/INE	operations system for intelligent network
OS	operations system
OSMINE	operations systems modification of intelligent network elements
OSP	outside plant
OTGR	operations technology generic requirements

P

P-AIS	path alarm indication signal
P/AR	peak to average ratio
PAM	pulse amplitude modulation
PBX	private branch exchange
PC	personal computer
PCI	peripheral component interconnect
PCM	pulse code modulation
PCR	peak cell rate
PDF	portable document format
PDU	protocol data unit
PFP	physical feeder port
PGTC	pair gain test controller
PIDB	processor interface data bus
PLAR	private line automatic ring
PLCP	physical layer convergence protocol
PLN	physical line number
PLR	pulse line repeater
POTS	plain old telephone service
ppm	parts per million
PPP	point to point protocol
PRC-Access	Product Realization Center-Access

PRF	power rectifier fault
PRI	primary rate interface
PRS	primary reference source
PRU	power rectifier unit
PSAP	public safety answering point
PSC	protection switching counts
PSD	power spectral density
PSDM	power spectral density mask
PSES	p-bit severely errored seconds
PSTN	public switched telecommunications network
PTU	power and test unit
PVC	permanent virtual circuit
PVP	permanent virtual path

Q

QMON	quality monitoring
QoS	quality of service

R

RACO	remote alarm cutoff
RADSL	rate adaptive digital subscriber line
RAI	remote alarm indication
RAM	random access memory
RCLK	receive clock
RC/V	recent change/verify
RD	ring down
RDI	remote defect indication
REFCLK	reference clock
REN	ringing equivalence number
RFI	remote failure indication
RGU	ringing generator unit
RIP	routing information protocol

RMC	remote maintenance connection
RMU	remote measurement unit
ROC	remote operations channel
R-S	Reed-Solomon
RSF	receive signal failed
RT	remote terminal
rt-VBR	real time variable bit rate
RTAC	regional technical assistance center
RTLP	receive transmission level point
RTU	remote test unit
Rx-UUS-IMA	receive unusable seconds-IMA

S

SA	service affecting
SARTS	Switched Access Remote Test System
SAS-P	severely errored framing/alarm indication signal seconds-path
SCEC	second channel error correction
SCR	sustained cell rate
SDSL	symmetric digital subscriber line
SEFS	severely errored framing seconds
SEFS-P	severely errored framing seconds-path
SEFS-S	severely errored framing seconds-section
SES	severely errored seconds
SES-P	severely errored second-path
SES-S	severely errored seconds-section
SES-IMA	severely errored seconds-IMA
SES-L	severely errored seconds-line
SES-LFE	severely errored seconds-line far end
SES-P	severely errored seconds-path
SES-S	severely errored seconds-seconds
SF	superframe
SHDSL	single-pair high speed digital subscriber line

shelf_PCR	shelf peak cell rate
SID	source identifier
SL	selecting slope
SNMP	simple network management protocol
SNR	signal to noise ratio
SONET	synchronous optical network
SWDL	software download

T

TAP	test access path
TAP100	test application pack
TBCU	test bus control unit
TC	TAP connected
TCA	threshold crossing alert
TCP/IP	transmission control protocol/Internet protocol
TDM	time division multiplexing
TDR	time domain reflectometry
TL1	transaction language -1
TL1SI	TL1 system interface
TLP	transmission level point or test level point
TMC	timeslot management channel
TMS	transmission (test) measuring set
TO	transmission only
TOS	test operations system
TR	technical reference
TR-08	Telcordia Technologies, Inc. Standard TR-008
TSA	timeslot assignment
TSC	test system controller
TSG	timing signal generator
TSI	time slot interchange
TTF	transmission test facility

TTLP	transmit transmission level point
Tx-UUS-IMA	transmit unusable seconds-IMA

U

UART	universal asynchronous receiver/transmitter
UAS	unavailable seconds
UAS-IMA	unavailable seconds-IMA
UAS-L	unavailable seconds-line
UAS-LFE	unavailable seconds-line far end
UAS-P	unavailable seconds-path
UBR	unspecified bit rate
UCC	universal communication channel
UDP	user datagram protocol
UDT	unstructured data transfer
U-DSL	U-interface digital subscriber line
UIP	user interface panel
UNCCNT	uncorrected HEC error counter
UNI	user network interface
UPC	usage parameter control
USB	universal serial bus
UPN	urgent problem notification
UVG	universal voice grade

V

VB	virtual bank
VBR	variable bit rate
VC	virtual circuit (traditional DLC services) or virtual channel (ATM xDSL services)
VCC	virtual channel connection
VCI	virtual channel identifier
VCOT	virtual central office terminal
VDC	volts direct current

VDSL	very high speed digital subscriber line
VF	voice frequency
VFDE	voice frequency data enhancement
VGA	video graphics array
VoDSL	voice over digital subscriber line
VOM	volt ohm meter
VP	virtual path
VPC	virtual path connection
VPI	virtual path identifier
VPN	virtual private network
VPT	virtual path termination
VRLA	valve-regulated lead-acid
Vrms	volts root mean square
VRT	virtual remote terminal
VT	virtual tributary

W

WAN	wide area network
WATS	wide area telephone service
WL	working length
WRR	weighted round robin

X

XTC	extended test controller

Z

ZBS	zero byte substitution
ZCS	zero code suppression

Glossary

Numerics

10BaseT — IEEE 802.3 standard for Ethernet transmission over unshielded twisted pair.

A

Access interface platform — A family of equipment that provides cost-effective and flexible access for different services; e.g., voice and data, using a common platform.

ACE COMDAC — An ATM COMDAC which implements circuit emulation service (CES) for the DS1 links to the backbone network using unstructured data transfer mode (UDT).

Admissible bandwidth — The amount of bandwidth allocated to a service category in the upstream and downstream directions (not applicable to UBR). The sum of the effective bandwidths allocated to a ll connections supported by a service category, divided by the overbooking factor of that service category, must no exceed the admissible bandwidth of this service category. The admissible bandwidth of a service category may not exceed the shelf PCR.

ADSL-lite — A version of asymmetric digital subscriber line (ADSL) that is less expensive than full-rate ADSL and that operates at a lower bit rate than full-rate ADSL. This version of ADSL is specified in ITU-T G.992.2.

AFMO logical feeder port — An entity used to address a SONET path or a protection group.The logical feeder port concept allows addressing of attributes or entities that are common to all physical feeder ports associated with the logical feeder port and that are independent of simplex or duplex mode. The AFMO and the AFMDS3 have two logical feeder ports.

AFMO physical feeder port
Corresponds to the physical termination of the optical feeder. The physical feeder port concept allows the addressing of SONET physical medium, selection, and line layer entities. An *AnyMedia* shelf has two physical feeder ports when using one AFMO in simplex mode and four physical feeder ports when using two AFMOs in duplex mode.

***AnyMedia* operations gateway**
Operations access for up to 20 RTs via universal communication channels (UCCs).

Application layer (OSI)
A layer of OSIRM. Provides the management of communications between user applications. Examples include e-mail and file transfer.

Asymmetric digital subscriber line (ADSL)
A method of data transmission over unloaded copper loops. The data rate transmitted toward the end user is typically much higher (e.g., 6 Mbps) than the data rate transmitted by the end user (e.g., 640 Kbps).

Asynchronous transfer mode (ATM)
A high-speed connection-oriented mulitplexing and switching method that utilizes fixed-length cells to support multiple types of traffic. Transmission is synchronized at the start and end of each character, allowing different types of services to be carried over one system.

ATM adaptation layer (AAL)
A set of internationally standardized protocols and formats that define support for circuit emulation, packet video and audio, and connection-oriented and connectionless data services. There are four standard protocols defined for AAL—AAL1, AAL2, AAL3/4, and AAL5.

AAL5 is used for bursty LAN traffic and uses the conventional five-byte ATM header. AAL5 does not support cell multiplexing.

ATM feeder
The connection from the AFM to the ATM transport network. This connection may be either DS3, DS1, or OC-3c. The ATM feeder may connect directly to an ATM switch or access concentrator device. In addition, the connection between the AFM and the switch or access concentrator may incorporate a multiplexer. In daisy-chained configurations, the ATM feeder for each AFM, except the one closest to the switch or access concentrator, connects to the previous AFM in the chain. This connection may be direct or through a multiplexer. Note that daisy-chaining is available only with DS3 and OC-3c AFMs.

ATM-RSF on ADSL line
Ten consecutive seconds with each second having one or more of the following anomalies:

At least 18 ADSL superframes with ATM HEC anomalies

At least one ADSL superframe with ATM cell delineation anomalies.

ATM technology Asynchronous transfer mode is a data communications format in which transmission is synchronized at the start and end of each character, allowing different types of services to be carried over one system.

ATM traffic statistics For the *AnyMedia* Access System, ATM traffic statistics refers to the performance monitoring function for ATM cell counts. ATM traffic statistics can be collected either at the shelf level, or for specific connections. At the connection level, the technician may choose to activate ATM traffic statistics for all connections on an AP, for all connections on an end-user port, or for an individual connection.

ATM xDSL subsystem The *AnyMedia* Access System components that are needed to provide ATM xDSL services, i.e., the AFM, OAP, OCP, ADSL AP, SDSL AP and SHDSL AP. Note that the OAP and OCP can carry both ATM xDSL and traditional DLC traffic and are included in both the ATM xDSL and traditional DLC subsystems. Components that only carry traditional DLC services (e.g., the TDM COMDAC) are not included in the ATM xDSL subsystem. The ACE COMDAC is a component of both the traditional DLC and ATM xDSL subsystems.

Attenuation of ADSL line The difference in dB between the power received at the far end and the power transmitted by the near end.

Authentication Process used to verify that only those users or operating systems authorized to access the system are permitted to do so and to ensure that the user or operating system is only allowed to alter or extract its authorized data.

Auto discovery Automatically updates and maintains an inventory of the *AnyMedia FAST* shelf.

Autonomous reports Messages sent by the *AnyMedia* Access System to operations systems or element managers (EMs) to report conditions such as errors, faults, and threshold crossings. The *AnyMedia* Access System's processors decide when or what messages are sent; they are not externally requested.

B

Basic rate interface (BRI) An ISDN access interface type made up of two B channels, each at 64 kbps, and one D channel at 16 kbps (2B+D).

B channel An ISDN bearer service channel that can carry either voice or data at a speed of 64 kbps.

Bit error ratio The quality of transmission is measured in the number of errored bits per number of bits received.

Broadband services High speed data and asynchronous transfer mode services.

C

Cell	A fixed-length 53-octet packet used in ATM. The AM cell has a 5-octet header and a 48-octet payload.
Cell delay variation (CDV)	The amount of difference between a cell's expected arrival time and its actual arrival time. Also called "jitter".
Cell delay variation tolerance (CDVT)	A parameter which, in CBR transmissions, determines the level of jitter (i.e., cell delay variation). The upper bound on the jitter measurement is the CDVT.
Cell header	A 5-octet header that defines control information used in processing, multiplexing, and switching cells.
Cell loss priority	A field in the ATM cell header showing two levels of priority for ATM cells. CLP=0 cells are a higher priority than CLP=1 cells and may be discarded if there is a congestion to preserve the cell loss ratio of CLP=0 cells.
Cell loss ratio (CLR)	The value the network agrees to offer as an objective over the lifetime of the connection. This value is specified per service class at the turn-up.
Cell transfer delay (CTD)	The transit delay of an ATM cell successfully passed between two designated boundaries on the *AnyMedia* Access System, when the system is loaded conservatively.
Cells received	The total number of cells that the shelf received from the CPE.
Channel	The electronics portion of a digital loop carrier line; typically from the tip/ring output of the channel unit or application pack toward the central office. Includes up to the switch interface if integrated DLC. Includes the transmit and receive DS0s, codecs, and hybrids.
Circuit emulation service (CES)	An ATM configuration that allows the ATM network to act as a transparent transport pipe for constant bit-rate circuits.
CES interworking function (CES-IWF)	That part of a CES system that interfaces the signal to be emulated, converting such signals to ATM format in the transmit direction and converting ATM signals to the original format in the receive direction.
Circuit pack protection	The capability for a given pack to relinquish its functionality to another instance of the same circuit pack. The circuit pack that provides system functionality is called the *active* pack, while the circuit pack that protects the active pack is called the *standby* pack. When a switch occurs, the roles of the active and standby circuit packs are reversed. A switch occurs, for example, when the active pack fails or when an administrator issues an OAM&P command.

***ClearReach* feature**	The *ClearReach* feature for the *ConnectReach* and *ConnectReach Plus* terminals that improves modem performance. The *ClearReach* feature requires voice frequency data enhancement (VFDE) in the *AnyMedia FAST* shelf.
Collocation	Grouping entities in the same physical location.
Common unit	A unit, or application pack, that performs the main bandwidth management and control for the *AnyMedia FAST* shelf.
Competitive access	The ability for nonincumbent carriers to provide local access.
Configuration management	Consists of a set of functions to exercise control over elements in the network, including initialization, parameter setting, starting and stopping, and collection of information about the configuration.
Connection admission control (CAC)	CAC is a set of actions taken by the network during the call set-up phase to determine whether a connection request can be accepted, should be rejected, or may be re-allocated based on QoS definitions.
COSET	The header error co-setting (55 hex by ATM standards) is used to maintain a value other than zero in the header error code (HEC) field. If the first four bytes in the header are zero, the HEC derived from these bytes is also zero. When this occurs and there are a string of zeros in the data, the receiver cannot determine the cell boundaries. Therefore, it is recommended that the value 55 hex be added to the HEC before transmission.
Craft interface terminal (CIT) port	The port on the craft test unit (CTU) where the graphical system interface (GSI) or a TL1 system interface (TL1SI) is connected.
Customer premises equipment (CPE)	Equipment that resides and is operated at a customer site.
Cyclic redundancy check (CRC)	An algorithm that detects bit errors causes in data transmission.

D

D4	A framing and synchronization format for T1 transmission facilities.
Dangler cable	Cable that effectively brings a backplane connector to the front of the shelf.
Database evolution	When AFM software is upgraded to provide new features, it is usually necessary to adapt or extend the database structure to accommodate these features. This is done automatically as part of software activation and is termed database evolution.
Data communications (or circuit termination) equipment (DCE)	A modem or network communications interface device.

Data terminal equipment (DTE)	Data processing equipment that interfaces to the communications network (DCE).
DC alarm services	Point-to-point metallic services that connect subscriber premises with fire, police, or security services' monitoring locations. These services are delivered by the MDS2 shelf using DC circuit-emulation technology provided by *MCU* CUs from Tollgrade Communications, Inc.
D channel	The ISDN out-of-band (16 kbps in BRI) signaling channel that carries the ISDN user signals or can be used to carry packet-mode data.
Degrowth	The removal of circuit packs or traffic from a system via a provisioning operation (may be accompanied by the physical removal of associated equipment, but this is not required).
Digital bypass pair	A pair of MDS2 CUs (such as the *Tollgrade MCU*-5405 CUs) that provide the equivalent of a metallic bypass pair without requiring a physical copper pair.
Digital data services	Digital data services refer to 64 kbps clear channel digital service provided between the customer and the CO.
Digital signal 0 (DS0)	One 56-kbps framed channel out of the 24 contained in a DS1 channel.
Digital signal 1 (DS1)	The North American standard 1.544-Mbps digital channel.
Digital signal 3 (DS3)	The North American standard 44.736-Mbps digital channel.
Discarded cells	Cells that are dropped to avoid exceeding a particular connection's traffic contract.
Distribution cable	The cable from the field side of an FDI to the customer's ready access case or distribution box, but not including the drop (formal definition) or inside wiring.
Downstream direction	Transmission direction from ATM data network or telephony switch to customer.
Downstream VP	In a daisy chain, a VP that terminates on a shelf that is farther away from the ATM transport network than the shelf being addressed. "Downstream" here does not refer to the direction of transmission.
Drop	Formal definition is the short cable from an aerial ready access case or buried plant distribution box to the customer's house, not including inside wiring. Informally used, especially when describing test configurations like "splitting access," to be equal to line or loop. In this latter informal case (loop), it is all the copper cable to and including the telephone set.
Dropped cells	The number of cells that are dropped as a result of exceeding either a particular connection's traffic contract or the total allowable bandwidth of the shelf.

DS1 framing format The prescribed recurring pattern of bits transmitted that enables the receiver to identify the start of a frame and the frame number in a sequence of frames. The system supports two different DS1 frame formats, extended superframe (ESF), or superframe (SF).

DS1 link The general term *DS1 link* can denote a physical DS1 link when using a TDM COMDAC, or a circuit emulated link when using an ACE COMDAC.

DS1 logical feeder port These ports are associated with the VRT structure of the *AnyMedia* Access System. The VRT structure allows the flexible assignment of APs and CUs to VRTs that are associated with specific functional needs of partitioning the *AnyMedia* Access System. Three forms of VRTs are allowed: GR-303 (up to 3 allowed), TR-08 (up to 20 allowed), and INA (up to 20 allowed). The total number of VRTs and the DS1 content of each VRT are limited by the total number of DS1 physical feeder ports. Any DS1 physical feeder port can be associated with any DS1 logical feeder port.

DS1 physical feeder port These ports provide two twisted pair transmit/receive DS1 interfaces to the *AnyMedia* Access System. Up to 20 DS1 physical feeder ports are available and are physically identified through the AID with the DS1 (shelf number), pack number (1 to 5), and the port number (1 to 4).

Dying gasp A message the ATU-R transmits to the ATU-C when its electrical power is being shut off. The message indicates to a service technician or an administrator that an interruption on an ADSL line was caused by a power interruption at the ATU-R and not caused by a transmission failure or an *AnyMedia FAST* shelf failure.

E

Early packet discard The early packet discard function ensures that the ATM equipment discards entire AAL5 packets during periods of congestion. This is especially important when a relatively large number of Transmission Control Protocol (TCP) sources contend for a particular bottleneck.

Effective bandwidth A measure of the amount of bandwidth a connection uses. For CBR connections, it equals PCR. For VBR connections, it is a function of PCR, SCR, MBS, and CLR. For VBR connections, this measure is defined differently for different congestion points on the same connection. The CAC algorithm uses this measure at potential congestion points when determining whether to admit a new connection.

Errored cells Cells having an invalid header field after HEC procedures are completed.

Errored cells received The number of cells that the shelf received from the CPE with detected errors.

ES on upstream SDSL line The corrected HEC error counter (CORRCNT) and the uncorrected HEC error counter (UNCCNT) event counter data are accumulated and mapped to ES. The total count in one second is the number of ESs. The HEC error counter data is accumulated, and the ES counts are reported on a 15-minute and 1-day basis. The CORRCNT counter tracks the number of corrected HEC errors. The UNCCNT counter tracks the number of uncorrected HEC errors.

Ethernet A LAN that uses the CSAM/CD media access method and operates at 10 Mbps, usually over coax medium.

F

Facility protection The capability for a system to choose which signal from two facilities to pass along to the internal, unprotected transmission paths. A system switches from one facility to the other, for example, when the facility being used fails or when an administrator issues an OAM&P command.

Fault management Consists of a set of functions, such as testing, that enable the detection, isolation, and correction of abnormal operation of the telecommunications network and its environment.

Feeder cable The portion of a customer loop from the central office switch (integrated), or from the main distribution frame (MDF) to the office side of the feeder/distribution interface (FDI). In the case of DLC it includes the DLC line plus any copper cable from the RT to the FDI.

Fixed wireless network A digital loop carrier (DLC) system that uses wireless (radio) transmission through the air as the distribution medium to the home, replacing the traditional copper wire outside plant. A radio unit is mounted on the outside of the home (network interface unit) and is connected to standard twisted pair wiring within the home.

FLASH memory device A nonvolatile memory device that may be reprogrammed in the field through software download.

Framed path termination The physical framer device on the ACE COMDAC which terminates a DS1 signal delivered by a CES-IWF. There is one framed path termination corresponding to each logical DS1 port on the ACE COMDAC.

Front and rear access The mounting of the bay with its back away from a wall, etc., which allows access to the rear of the shelves.

Front-only access The mounting of the bay with its back next to a wall, etc., which prohibits access to the rear of the shelves.

Full-rate ADSL The version of asymmetric digital subscriber line (ADSL) defined by *ANSI* T1.413.

G

General user — User login that allows access to all messages except those for Security Management messages that affect other users, such as login creation and deletion, and password modification for all user classes.

Generic cell rate algorithm (GCRA) — For each cell arrival the GCRA determines whether the cell conforms to the traffic contract of the connection. The GCRA is defined with two parameters: the increment (I) and the limit (L).

Generic signaling function — A parameter required for provisioning of subscriber service. The generic signaling function is used to condition the *AnyMedia FAST* shelf loop interface circuit to provide the desired signaling protocol. The values are based on Network Channel Interface (NCI) codes described in Telcordia Technologies, Inc. TR-TSY-000335.

GET — The simple network management protocol (SNMP) operation used by the OS to retrieve specified information such as the values of MIB variables.

Global ATM parameters — Includes the *FAST* shelf VPIs and the ATM operations channel VPI and VCI (also known as ATM OAM&P PVC).

Graphical system interface (GSI) — The GSI is part of the Management Interface package of software that is an interface to control and maintain the *AnyMedia FAST* shelf telephony and data services and subshelves.

Guaranteed bandwidth — The portion of the feeder throughput (feeder bandwidth) made available to a service category to be used during periods of sustained congestion. Guaranteed bandwidth is explicitly specified for CBR, rt-VBR, and nrt-VBR by means of provisioning the weights for the Weighted Round Robin (WRR) Scheduler. The sum of all guaranteed bandwidths may not exceed the feeder bandwidth.

H

Hi-cap — High capacity (hi-cap) subscriber services direct DS1 paths from subscriber equipment to the serving CO.

High BER on ADSL line — Ten consecutive seconds with each second having one or more of the following anomalies:

At least 18 ADSL superframes with ADSL CRC anomalies

At least 0.1 seconds in which the received power has dropped to 6 dB below the reference power

At least one ADSL superframe with synchronization anomalies.

High BER on upstream SDSL line

The SDSL signal received from the CPE is considered to be in a high-BER condition when ten consecutive SESs have occurred. The high-BER condition is cleared when ten consecutive seconds have occurred that are not SESs. The system tracks SESs for the SDSL signal received from the CPE. An SES for upstream SDSL transmission is observed when either of the following conditions exists during a given clock second:

If the number of HEC errors (corrected and uncorrected) divided by the number of cells received is greater than or equal to 0.3, then SES occurs.

If at least one los or lof occurs, then SES occurs.

If an auto change in bit rate occurs, start over in both cases.

High bit rate digital subscriber line (HDSL)

A method of transmitting T1 over twisted-pair copper lines. Unlike other DSL types, HDSL uses four wires (two pairs). HDSL supports 1.544 Mbps full-duplex transmission.

I

IAT01

IAT01 indicates an IAT type supported by a proprietary (modified D4) interface such as *ConnectReach* and *ConnectReach Plus* terminals.

IAT02

IAT02 indicates an IAT type supported by a D4 open interface.

IATSI view

A window available on the GSI that is launched by executing the `ACT-IAT` TL1 command.

IMA group

An operational collection of IMA links that functions to multiplex and de-multiplex ATM cells in a cyclical fashion among the links, to form a higher bandwidth logical path between a pair of IMA terminals separated by multiple feeders. The AFMDS1 pack uses one group and up to eight links, with a direct, one-to-one mapping between the links and feeders.

IMA link

A circuit path within the AFMDS1 that connects its feeder interface with a circuit that combines the link's broadband payload (ATM cells) with the payload of other links, in the downstream direction, and distributes the composite ATM payload cells among the links in the upstream direction.

Integrated access device (IAD)

A device on the customer premises that consolidates traffic from several subscriber interfaces into a single pipe. Often, the pipe connects to a host terminal that consolidates traffic from several IADs into a larger pipe.

Integrated configuration

A remote terminal (RT) connected to a local digital switch (LDS) digital interface without a central office terminal (COT).

Integrated Mechanized Loop Testing (IMLT) IMLT is a feature of the *5ESS* switch that allows LoopCare (formerly MLT) to use the directly connected test unit (DCTU) of the *5ESS* switch to make metallic tests on subscriber loops (including those on digital loop carrier systems).

Integrated services digital network (ISDN) CCITT I-series recommendation that defines the digital network standard for integrated voice and data network access and services and user-network messages.

Inventory management Consists of a set of functions to track, report, and ensure adequate supplies of equipment.

L

Latency In the *AnyMedia* Access System, this parameter is used to choose whether or not interleaving is used on an ADSL circuit. If the latency parameter is set to Interleaved, then interleaving is used. If the Latency parameter is set to Fast, then interleaving is not used. This parameter is called Latency because the amount of transmission delay through an ADSL transmission span is affected by interleaving.

Legacy services A large set of service types traditionally supported by the DLC network element (NE).

Lightguide build out (LBO) An attenuation network for optical signals between ATM circuit packs in an ATM switch or multiplexer and the AFMOs in an *AnyMedia* shelf, or between separate AMFOs in multiple *AnyMedia* shelves in a daisy chain. LBO guarantees the proper signal level.

Line Formally represents the connection from the customer's telephone to the switch. Has been recently used to represent the copper cable from the DLC channel unit's or application pack's tip/ring output to the customer's telephone. Used equivalent to "loop," but usually does not include the telephone set.

Local login Login into the *AnyMedia* Access System via the CIT or External System LAN 10BaseT interface from the collocated GSI or dumb terminal.

Local test desk LTD is a test position located in a local end office that is capable of accessing and making metallic tests on subscriber loops served out of that office (including those on digital loop carrier systems).

Local VP A VP that is cross-connected at the VP level on the AFM.

LOF on ADSL line ADSL frame synchronization has been lost at the ADSL for at least 2.5 seconds.

LOF on upstream SDSL line

The SDSL signal from the CPE is considered to be in a LOF condition after 2.5 ± 0.5 seconds of contiguous lof defect. The LOF condition is cleared when 10 ± 0.5 seconds have occurred that do not have the lof defect. The loss of cell delineation (LOCD) event counter data is mapped to lof. The firmware collects this 0.5-second interval data. If there are 2.5 seconds of contiguous lof, it is considered to be LOF. This LOCD event counter data is accumulated and reported on a 15-minute and 1-day basis.

Logical feeder port

An entity used to address a SONET path or a protection group. The logical feeder port concept allows addressing of attributes or entities that are common to all physical feeder ports associated with the logical feeder port and that are independent of simplex or duplex mode. The AFMO has two logical feeder ports.

Logical ports

Port assignments made through software, as opposed to actual, physical ports.

Loop

Formally represents the connection from the customer's telephone to the switch. Has been recently used to represent the copper cable from the DLC channel unit's or application pack's tip/ring output to the customer's telephone. Used equivalent to "line," but may include the telephone set also.

LoopCare

LoopCare (formerly called MLT) is a Tollgrade testing operations system capable of making both narrowband and broadband tests on subscriber lines and of analyzing and reporting the results of these tests.

LOS on ADSL line

Received power has dropped to 6 dB below the reference power. The timing threshold is as follows:

Downstream: 1.5 seconds

Upstream: 2.5 seconds.

LOS on upstream SDSL line

The loss of signal interrupts are timed, accumulated, and stored and are mapped to los. The loss of signal timeout (LOST) is used to time the los. If the LOST bit is set, then it is a LOS condition. The firmware collects this data, accumulates it, and reports the number of los occurrences on a 15-minute and 1-day basis. The LOS failure parameter is the accumulated los.

M

Management Interface

The Management Interface is a package of software that is used for managing traditional DLC services and ATM xDSL services.The Management Interface allows the user to provision a single NE at a time through its GSI, while simultaneously monitoring alarms of multiple NEs through its Network Maintenance Manager. It is installed on a personal computer running under the *Windows* operating system.

Management information base (MIB) Declaration of a collection of objects that defines the network or network element (NE) for a given interface protocol. For example, there is a MIB defined for access using the simple network management protocol (SNMP) and a different MIB defined for access using the protocol of the GR-303 Embedded Operations Channel (EOC).

Maximum burst size (MBS) Specifies the largest burst of data above the insured rate that will be allowed temporarily on an ATM PVC, but will not be dropped at the edge by the traffic policing function, even if it exceeds the maximum rate.

In the signaling message, the burst tolerance is conveyed through the MBS, which is coded as a number of cells. The burst tolerance together with the sustainable cell rate and the generic cell rate algorithm determine the MBS that may be transmitted at the peak rate and still be in conformance with the generic cell rate algorithm.

Metallic bypass pair A physical copper pair running between the CO and the RT site that allows a test head located at the CO to perform metallic tests on RT subscriber drops.

Minimum bit rate The minimum rate at which the ADSL and SDSL and SHDSL link will train, upstream and downstream. This rate is used to in determining whether a new connection can be admitted to the shelf.

Mismatch of equipment and attributes (MEA) alarm This alarm signals that the equipped pack and its provisioning do not match. The alarm is cleared either by deleting the cross-connect or by replacing the pack with one that supports the service category.

Multiplexing The technique of combining multiple single channels onto a single aggregate channel for sharing facilities and bandwidth.

Multi-point grounding The circuit and frame (earth) grounds are tied together at each piece of equipment. This allows battery return to use the building ground as a path. Multi-point grounding is also called mesh, integrated ground plane, or common bonding network . (See single-point grounding.)

N

Narrowband services Services include voice and voice-frequency data transmission.

NE name The network element (NE) name is a unique provisioned name given to an *AnyMedia* shelf. This name is identified by the GSI as the site ID.

Network Maintenance Manager The Network Maintenance Manager is part of the Management Interface package of software that is used to monitor alarms over multiple NEs. The Network Maintenance Manager allows a user to choose which NEs to monitor, to filter viewed alarms, and to manage the display of these alarms

Non-real time variable bit rate (nrt-VBR)	A service category for data traffic that has no fixed timing relationships but has a guaranteed QoS. Statistical multiplexing is provided to make optimum use of network resources.
Nonvolatile data storage (NVDS)	That part of the database which is retained even after a power failure, for example, provisioning parameters.
Nonvolatile program storage (NVPS)	Nonvolatile memory on the COMDAC and the AFM used to store the load image.

O

OLIU	An optical line interface unit (OLIU) circuit pack interfaces with a SONET multiplexer's optical line in the transmit and receive directions.
Open systems interconnection reference model (OSIRM)	A seven-layer model that defines the protocol standards for data communications.
Operations system (OS)	A centralized system of software and/or hardware for remotely testing or administering telecommunications equipment (e.g., SARTS, LoopCare [formerly MLT], OPS/INE, etc.)
Optical carrier level *N* (OC-*N*)	The optical carrier level signal in SONET that results from an STS-*N* signal conversion. In SONET, the basic transmission speed unit is 58.34 Mbps.
Overlay solutions	Additional infrastructure to carry new services.

P

Packet switch public data network (PSPDN)	A public data network that utilizes packet switching technology (X.25, SMDS, ATM).
Partial packet discard (PPD)	In severe ATM traffic congestion, the traffic manager discards packets arriving from any connection, regardless of whether or not the traffic on the connection is exceeding its bandwidth. The traffic manager discards all remaining cells in the packet, even if the severe congestion clears in the meantime.
Peak cell rate (PCR)	A traffic parameter measured in cells per second that specifies the maximum number of cells that can be transmitted on an ATM network. PCR defines the shortest period between two cells.
Performance management	Consists of a set of functions to evaluate and report on the behavior of telecommunication equipment and the effectiveness of the network and/or network elements (NEs).
Permanent virtual circuit (PVC)	A logical dedicated circuit between two user ports in a point-to-point configuration.

Physical feeder port Corresponds to the physical termination of the optical feeder. The physical feeder port concept allows the addressing of SONET physical medium, section, and line layer entities. An *AnyMedia* shelf has two physical feeder ports when using one AFMO in simplex mode and four physical feeder ports when using two AFMOs in duplex mode.

Physical layer convergence protocol (PLCP) The IEEE 802.6 standard that defines the physical layer that adapts the actual capabilities of the underlying physical network to provide the services required by the ATM layer.

Private (automatic) branch exchange (PBX/ PABX) A customer-site telephone switch.

Privileged user User login allows access to all TL1 commands and GSI capabilities.

Protected pack A circuit pack for which there is a backup. Protection may be one-to one, or it may be one-to-more-than-one (1:n).

Protection switching A reliability feature that causes service to switch to the backup equipment during faults or testing.

PSD of ADSL transmission The actual ADSL transmit power level. This value may be lower than the provisioned PSDM.

PSDM of ADSL transmission A provisionable value representing the maximum allowed ADSL transmit power level. The ADSL transceiver may choose a lower power level based on line conditions.

Pulse code modulation (PCM) Modulation in which an analog signal is sampled and the sample is quantized and coded. Standard North American sampling is 8,000 times per second with 8 bits representing each sample pulse, giving a transmission rate of 64 kbps.

Q

Quality of service (QoS) An indicator of the performance of a transmission system on the Internet and other networks. QoS is measured in transmission rate, error rates, latency, and other characteristics.

R

Real-time variable bit rate (rt-VBR) A service category with strict cell transfer and delay variation demands and cell loss requirements.

Remote login Login into the *AnyMedia* Access System via IAO LAN, ROC, or External System LAN (over TCP/IP DCN) from OSs, EM, or GSI.

Reports-only user - broadband User login that allows access to GET messages for retrieving system information and autonomous reports. Reports-only users do not have access to any SNMP messages that create, change or remove service or to any security messages that affect other users.

Reports-only user - narrowband — User login that allows access to a limited set of TL1 messages, for retrieving system information and autonomous messages. Reports-only users do not have access to any TL1 messages that create, change or remove service to any security messages that affect other users.

RFI on ADSL line — ADSL frame synchronization has been lost at the ATU-R for at least 1.5 seconds.

Right-of-way — Permission to have access to specified local network and to use a specific portion of it.

Ring — A closed-loop, common bus network topology.

Router — A LAN/WAN device that operates at layers 1 (physical), 2 (data link), and 3 (network) of the OSIRM. Distinguished from a bridge by its capability to switch and route data based upon network protocols such as IP.

S

Sealing current — 5 mA current used (historically) to prevent oxidation buildup on tip/ring pairs.

Security management — Consists of a set of functions that protect telecommunications networks and systems from unauthorized access by persons, acts, or influences, and to track and report access attempts.

SET — The simple network management protocol (SNMP) operation used by the OS to change the value of specified information such as a MIB variable.

Shelf daisy-chain — Connecting *AnyMedia FAST* shelves to daisy-chain AFMs together for ADSL services only.

Shelf overbooking factor — Overbooking means allocating bandwidth to connections on a port, where their total bandwidth allocation is greater than bandwidth minus CAC Reserve. Booking can exceed bandwidth and also the bandwidth of the port, but traffic throughput can never exceed bandwidth.

Shelf PCR — The amount of bandwidth allocated by provisioning to a shelf.

Shelf VP — A feeder VP for which the ATM xDSL subsystem supports VC cross-connects.

Simple network management protocol (SNMP) — Used by the OS and the GCT for the AnyMedia *FAST* shelf broadband product for accessing the MIB objects.

Single-pair high speed digital subscriber line (SHDSL) A physical layer technology used to transport digital bit stream over one pair of nonloaded existing copper distribution cable. SHDSL provides equal transmission bit rates for both the upstream and downstream directions ranging from 192 to 2304 kbps. SHDSL is based on use of the TC-PAM line coding scheme. TC-PAM is a baseband line coding scheme that does not allow the option to share the copper loop from a baseband POTS signal.

Single-point grounding The circuit and frame (earth) grounds are tied together at a single specific point of the central office. This does not allow the battery return to use the building ground as a path. Single-point grounding is also called floating point, isolated ground plane, or isolated bonding network. (See multi-point grounding.)

Site ID A unique provisioned name given to an *AnyMedia* shelf. This name is identified by the *Navis AnyMedia* EMS as the NE name.

SNR margin of ADSL line The increase in noise, relative to the current received noise power, that can occur with a BER of 10^{-7} still being met.

Software upgrade Installing newer system software.

Standby A backup circuit pack or system entity that may be activated during a equipment failure or testing.

Sustainable cell rate (SCR) The average cell transmission rate in ATM, measured in cells per second and converted internally to bits per second. Usually, SCR is a fraction of the peak cell rate.

Switch consolidation Grouping telecommunications lines (increasing density) for better efficiency, ease of maintenance, reduced cost, space, etc.

Symmetric digital subscriber line (SDSL) A physical layer technology used to transport digital bit stream over one pair of nonloaded existing copper distribution cable. SDSL provides equal transmission bit rates for both the upstream and downstream directions ranging from 144 to 2320 kbps. SDSL is based on use of the 2B1Q line coding scheme. 2B1Q-SDSL is a baseband line coding scheme that does not allow the option to share the copper loop from a baseband POTS signal.

Synchronous optical network (SONET) A United States high-speed, fiber-optic transport standard for a fiber-optic digital hierarchy (speeds range from 51.84 Mbps to 2.4 Gbps).

T

T1 A four-wire repeater system; commonly used to refer to a DS1 signal.

T1 carrier The TDM digital T1 hierarchy used in North America and Japan with 24 voice channels constituting a single 1.544-Mbps T1 trunk.

Tagged cell	A lower-priority cell, i.e., a cell whose CLP bit is set to 1. A cell may be tagged by the system (because it violates the traffic contract on its connection) or by its source.
TDR testing	A type of wideband metallic drop test in which a test head sends a narrow-width pulse over a subscriber loop and looks for any returned pulses that were reflected back from the loop.
Test operations system	Any of a number of testing systems used to perform channel and drop testing, such as the Tollgrade LoopCare (formerly MLT) system and PGTC-compatible test systems for channel testing.
Threshold crossing alert	A threshold is a value assigned by the system user to a certain desired level (e.g., errored seconds); when the level is exceeded, a threshold crossing alert is issued.
Tier 2 NMS	A generic term for a network management system that can manage multiple kinds of network elements as a connected network. Tier 3 refers to element managers and Tier 1 refers to customer service support systems.
Time domain reflectometry (TDR) testing	A type of wideband metallic drop test in which a test head sends a narrow-width pulse over a subscriber loop and looks for any returned pulses that were reflected back from the loop.
TL1 system interface (TL1SI)	Any ASCII terminal connected to a port via an EIA-232E/574 format that uses TL1 commands to turn up a system and perform maintenance, provisioning, and other system operations.
TL1SI view	A window available in the GSI by launching a TL1SI view window though the GSI of the *AnyMedia* Management Interface.
Token	A marker that indicates the station's right to transmit that can be held by a station on a token ring or bus.
Traditional DLC subsystem	That part of the *AnyMedia* Access System which supports traditional DLC services.
Transmission control protocol/Internet protocol (TCP/IP)	The combination of a network and transport protocol developed by ARPANET for internetworking IP-based networks.
TRAP	The simple network management protocol (SNMP) operation used by a network element (NE) to send an autonomous report.
Twisted pair (TP)	The basic transmission medium consisting of 22 to 26 American wire gauge (AWG) insulated copper wire. TP can be either shielded (STP) or unshielded (UTP).

U

Universal communication channel (UCC) — A DS0 communications path between a COT and an RT of a universal *AnyMedia* Access System. The UCC is used as a LAN extension to allow a remote operations system to provision and monitor the RT via a COT that is connected to the data communications network.

Universal configuration — A remote terminal (RT) connected to a central office terminal (COT) capable of providing an analog interface to a local analog or digital switching system.

Unspecified bit rate (UBR) — An ATM service category where traffic is allocated whatever bandwidth is available at any given time. UBR does not have a pre-connection negotiated bandwidth and there are no guarantees in terms of cell loss rate and delay.

Unstructured data transfer mode (UDT) — One of the two AAL1 modes of data transfer. When using it, the circuit emulation service (CES) acts as a transparent pipe for the DS1 signal, passing all its bits while trying to maintain bit sequence integrity and bit count.

Upstream direction — Transmission direction from customer to ATM data network or telephony switch.

Upstream VP — In a daisy chain, a VP that is passed through to a shelf that is closer to the ATM transport network than the shelf being addressed. “Upstream” here does not refer to the direction of transmission. Upstream VPs are not provisioned in an AFM, but are recorded in it to help prevent errors in provisioning daisy chains.

User security classes — Refers to different user groups, each assigned with certain system access privileges. See Privileged User, General User, and Reports-only User definitions.

User-to-network interface (UNI) — The point at which the user accesses the network.

V

Variable bit rate (VBR) — A service category that supports variable bit rate data traffic with average and peak traffic parameters.

Virtual channel (VC) — A virtual link defined at an ATM interface. The lower of the two levels of cell multiplexing defined for ATM.

Virtual channel connection (VCC) — The sum of all the unidirectional virtual channel links traveled by an ATM payload from its originating point to its user destination.

Virtual circuit (VC) — A voice communications link that appears to the user to be a dedicated point-to-point circuit.

Virtual connection A connection between end-users in which data may be passed over various circuit configurations during a single period of communication. Virtual circuits are generally set up on a per-call basis and are disconnected when the call is terminated.

VF cables Refers generically to the tip/ring pair cables that attach to the faceplates of all APs, including the telephony and ATM xDSL APs.

VF growth Increased demand for voice frequency capacity.

Virtual DS1 feeder Refers to a DS1 feeder link provided by ATM circuit emulation. The term “virtual” is used to emphasize that a physical feeder (i.e., a feeder provided when the IODS1 circuit pack is used) is not being used. A virtual DS1 feeder connection is represented by the fpt AID as opposed to the ds1 AID used for the IODS1 physical feeder.

Virtual channel identifier (VCI) A sixteen-bit field in the ATM cell header that uniquely identifies the virtual channel link with which the cell is associated. This identifier is of local significance only. It provides the lower of two levels of multiplexing.

Virtual path identifier (VPI) In ATM, a field within the cell header that is used to switch virtual paths, defined as groups of virtual channels (VCs).

Voice frequency data enhancement (VFDE) The feature of the *AnyMedia FAST* shelf that enhances the GR-303 interface to improve modem performance. Also see *ClearReach* feature.

Voice over DSL (VoDSL) An application requiring a gateway that converts the voice signal from a digital switch to ATM format for transport toward the customer premises. Special CPE is required at the customer premises to provide the voice service.

Volatile data storage Data storage (e.g., RAM, that will lose information when power is lost).

Virtual path (VP) A virtual link defined at an ATM interface. The higher of the two levels of multiplexing defined for ATM. Used to transport an aggregation of virtual channels (VCs) between network locations in a manner somewhat analogous to a DS3 transporting multiple DS1s.

Virtual path identifier (VPI) An eight-bit field in the ATM cell header that uniquely identifies the virtual path link with which the cell is associated. This identifier is of local significance, across an ATM interface. It distinguishes the data of one virtual path from the data of another, thus providing the higher of two levels of multiplexing.

W

Wide area network (WAN) A network that operates over a large region and commonly uses carrier facilities and services.

Wire center consolidation Grouping a number of central offices into one center.

X

xDSL Refers to a variety of DSL services, such as HDSL, HDSL2, SDSL, SHDSL, and ADSL.

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