OCU 45 User Manual
Part Number 1200664L1,2,3,4
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ADTRAN

Trademarks

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To the Holder of the Manual

The contents of this manual are current as of the date of publication. ADTRAN reserves the right to change the contents without prior notice.

In no event will ADTRAN be liable for any special, incidental, or consequential damages or for commercial losses even if ADTRAN has been advised thereof as a result of issue of this publication.

NOTE   *Notes provide additional useful information.*

CAUTION   *Cautions signify information that could prevent service interruption.*

WARNING   *Warnings provide information that could prevent damage to the equipment or endangerment to human life.*

Safety Instructions

When using your telephone equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.

2. Avoid using a telephone (other than a cordless-type) during an electrical storm. There is a remote risk of shock from lightning.

3. Do not use the telephone to report a gas leak in the vicinity of the leak.

4. Use only the power cord, power supply, and/or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

Save These Important Safety Instructions

Federal Communications Commission Radio Frequency Interference Statement

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

NOTE *Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.*

WARNING *Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

Industry Canada Compliance Information

Notice: The Industry Canada label applied to the product (identified by the Industry Canada logo or the "IC:" in front of the certification/registration number) signifies that the Industry Canada technical specifications were met.

Notice: The Ringer Equivalence Number (REN) for this terminal equipment is supplied in the documentation or on the product labeling/markings. The REN assigned to each terminal device indicates the maximum number of terminals that can be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the RENs of all the devices should not exceed five (5).

Canadian Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioelectriques applicables aux appareils numériques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numériques," NMB-003 edictee par le ministre des Communications.

Warranty and Customer Service

ADTRAN will repair and return this product within 10 years from the date of shipment if it does not meet its published specifications or fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the numbers listed at the end of this section.

LIMITED PRODUCT WARRANTY

ADTRAN warrants that for 10 years from the date of shipment to Customer, all products manufactured by ADTRAN will be free from defects in materials and workmanship. ADTRAN also warrants that products will conform to the applicable specifications and drawings for such products, as contained in the Product Manual or in ADTRAN's internal specifications and drawings for such products (which may or may not be reflected in the Product Manual). This warranty only applies if Customer gives ADTRAN written notice of defects during the warranty period. Upon such notice, ADTRAN will, at its option, either repair or replace the defective item. If ADTRAN is unable, in a reasonable time, to repair or replace any equipment to a condition as warranted, Customer is entitled to a full refund of the purchase price upon return of the equipment to ADTRAN. This warranty applies only to the original purchaser and is not transferable without ADTRAN's express written permission. This warranty becomes null and void if Customer modifies or alters the equipment in any way, other than as specifically authorized by ADTRAN.

EXCEPT FOR THE LIMITED WARRANTY DESCRIBED ABOVE, THE FOREGOING CONSTITUTES THE SOLE AND EXCLUSIVE REMEDY OF THE CUSTOMER AND THE EXCLUSIVE LIABILITY OF ADTRAN AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES (EXPRESSED OR IMPLIED). ADTRAN SPECIFICALLY DISCLAIMS ALL OTHER

WARRANTIES, INCLUDING (WITHOUT LIMITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.   SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THIS EXCLUSION MAY NOT APPLY TO CUSTOMER.

In no event will ADTRAN or its suppliers be liable to the Customer for any incidental, special, punitive, exemplary or consequential damages experienced by either the Customer or a third party (including, but not limited to, loss of data or information, loss of profits, or loss of use). ADTRAN is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid for the item. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to the Customer.

Customer Service, Product Support Information, and Training

ADTRAN will repair and return this product if within 10 years from the date of shipment the product does not meet its published specification or the product fails while in service.

A return material authorization (RMA) is required prior to returning equipment to ADTRAN. For service, RMA requests, training, or more information, use the contact information given below.

Repair and Return

If you determine that a repair is needed, please contact our Customer and Product Service (CAPS) department to have an RMA number issued. CAPS should also be contacted to obtain information regarding equipment currently in house or possible fees associated with repair.

CAPS Department   (256) 963-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN Customer and Product Service
901 Explorer Blvd. (East Tower)
Huntsville, Alabama 35806

RMA # _____

Pre-Sales Inquiries and Applications Support

Your reseller should serve as the first point of contact for support. If additional pre-sales support is needed, the ADTRAN Support web site provides a variety of support services such as a searchable knowledge base, latest product documentation, application briefs, case studies, and a link to submit a question to an Applications Engineer. All of this, and more, is available at:

http://support.adtran.com

When needed, further pre-sales assistance is available by calling our Applications Engineering Department.

Applications Engineering   (800) 615-1176

Post-Sale Support

Your reseller should serve as the first point of contact for support. If additional support is needed, the ADTRAN Support web site provides a variety of support services such as a searchable knowledge base, updated firmware releases, latest product documentation, service request ticket generation and trouble-shooting tools. All of this, and more, is available at:

http://support.adtran.com

When needed, further post-sales assistance is available by calling our Technical Support Center. Please have your unit serial number available when you call.

Technical Support   (888) 4ADTRAN

Installation and Maintenance Support

The ADTRAN Custom Extended Services (ACES) program offers multiple types and levels of installation and maintenance services which allow you to choose the kind of assistance you need. This support is available at:

http://www.adtran.com/aces

For questions, call the ACES Help Desk.

ACES Help Desk   (888) 874-ACES (2237)

Training

The Enterprise Network (EN) Technical Training Department offers training on our most popular products. These courses include overviews on product features and functions while covering applications of ADTRAN's product lines. ADTRAN provides a variety of training options, including customized training and courses taught at our facilities or at your site. For more information about training, please contact your Territory Manager or the Enterprise Training Coordinator.

Training Phone   (800) 615-1176, ext. 7500
Training Fax   (256) 963-6700
Training Email   training@adtran.com

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Figures

Tables

Chapter 1   General

UNIT OVERVIEW

The ADTRAN OCU 45 offers transport of DS3/E3/STS-1 services over
fiber up to distances of 40 km in the single-mode version and 2 km in the
multi-mode version. Measuring only one rack unit high, the OCU 45 can be
used stand-alone, wallmounted, or mounted in 19- or 23-inch racks using an
optional mounting tray. This compact device gives NSPs a convenient way
to extend DS3/E3/STS-1 services from their point of presence to their cus-
tomer and provides Enterprise users a powerful tool for extending DS3/E3/
STS-1 services over fiber in a campus environment.

Configuration of the OCU 45 is accomplished through two switches on the
front of the unit which configure the metallic interface to DS3, E3, or STS-1
and set the metallic line length to short or long. The OCU 45 has both nor-
mally-open and normally-closed alarm relay contacts with a front panel
RESET.

Diagnostics include metallic and optical loopbacks, initiated via a front
panel switch. Three LEDs are located on the front panel to monitor the sta-
tus of both the metallic and optical interfaces.

The OCU 45 is powered from a -48V source. An optional AC to -48 VDC
converter is available to allow the unit to be AC powered.

FRONT PANEL FEATURES

The OCU 45 front panel provides switches and LEDs to offer easy configuration and troubleshooting (see Figure 1-1). The three switches set the configuration for the electrical interface, electrical line length, and loopback test options. The LEDs indicate the status of the power supply, the electrical interface type and line length, loopback diagnostics, and electrical and optical interface status. A brief description of the LEDs is as follows:

- The **POWER** LED shows that the unit is receiving power.

- The **INTERFACE** LED indicates the current electrical interface configuration.

- The **LINE LENGTH** LEDs indicate the current electrical line length configuration.

- The **TEST** LEDs indicate that there is an active loopback at the electrical or optical interface, or that the unit is in normal operation.

- The **ELECTRIC** LEDs indicate the current status of the electrical interface.

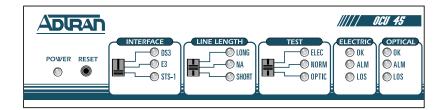- The **OPTICAL** LEDs indicate the current status of the optical interface.

Figure 1-1. OCU 45 Front Panel

REAR PANEL FEATURES

The OCU 45 rear panel provides electrical and optical interface connections, normally-open and normally-closed alarm relay contacts, and a 48V power connection (see Figure 1-2).

The electrical interface connector is provided using dual 75 Ohm BNC female connectors (one for transmit and one for receive). The optical interface of the OCU 45 consists of a standard SC or ST receptacle using two fibers, one for each direction of transmission.

External alarm contacts for critical and non-critical alarms are provided on the rear panel of the OCU 45 using a standard 4-pin terminal block containing normally open, normally closed, common, and ground connections. The DC power supply connector is a standard 3-pin terminal block containing -48V, RETURN, and GROUND. For more information on the above connections, please refer to *Installation* on page 17.
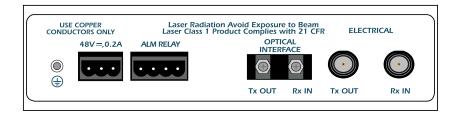

Figure 1-2. OCU 45 Rear Panel

Chapter 2   # Installation

UNPACK AND INSPECT THE UNIT

Carefully inspect the OCU 45 for any damage that may have occurred in shipment. If damage is suspected, file a claim immediately with the carrier and contact ADTRAN Technical Support (see *Customer Service, Product Support Information, and Training* on page 8 for contact information). Keep the original shipping container to use for future shipment or verification of damage during shipment.

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the OCU 45:

* OCU 45 unit
* 4-position terminal lug connector (alarm)
* 3-position terminal lug connector (power)
* Documentation CD

POWERING THE UNIT

The OCU 45 contains a three-position modular terminal lug connector for supplying DC power to the unit. The modular terminal lug connector allows the user to easily connect and disconnect DC power when replacing rackmount units.

To establish DC power, use 12 to 26 AWG wire to connect the modular connector as follows:

1. Connect the wire lugs on the modular connector which corresponds to the positive (+) and negative (-) terminals on the rear panel to a -48V DC, 0.5A source.
2. Connect the remaining wire lug to the frame ground.

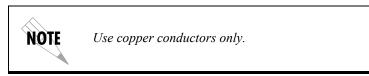3. Once the modular connector is wired, push it firmly into the rear panel
    power connector.

NOTE   *Use copper conductors only.*

Table 2-1 and Figure 2-1 illustrate the DC power connector and give
definitions for the three connector symbols.

Table 2-1. DC Connector Symbol Definitions

Symbol	Definition
+	Positive side of DC power source (usually ground)
-	Negative side of DC power source (usually -48V)
⏚	Frame Ground

Figure 2-1. DC Power Connector

The following UL requirements must be met during installation of the
OCU 45:

1. The unit must be connected to a reliably grounded -48 VDC source
    which is electrically isolated from the AC source.
2. The branch circuit overcurrent protection should be a fuse or circuit
    breaker rated -48V, 10A.
3. The unit should be installed in accordance with the requirements of
    NEC NFPA 70.
4. A readily-accessible disconnect device that is suitably approved and
    rated should be incorporated in the fixed wiring.

OPTICAL INTERFACE PORT

The OCU 45 optical interface port consists of a single-mode, long-haul or multi-mode, short-haul transceiver module comprised of a transmitter and receiver. The optical interface port supports angled or straight SC or ST type optical connectors and operates in the 1280 nm to 1335 nm wavelength range (1310 nm nominal). The total output power is 8 mW with a 50 mm aperture at 10 cm distance, as defined by IEC. The optical interface uses two fibers, one for each direction of transmission. The long-range optical budget for the optical transceiver (single-mode) is 28 dB, calculated as follows:

Worst case optical transmit power   = -5 dBm
Worst case optical receiver sensitivity   = -10 dBm to -34 dBm

Calculations:

(34 - 5) dB = 29 dB - 1 dB (optical path penalty) = 28 dB

For the multi-mode optical transceiver, the short-range optical budget is 14 dB and can be calculated using the following equations:

Worst case optical transmit power   = -16 dBm
Worst case optical receiver sensitivity   = -14 dBm to -31 dBm

Calculations:

(31 - 16) dB = 15 dB - 1 dB (optical path penalty) = 14 dB

The optical interface complies with IEC Class 1 laser safety requirements (under normal operating conditions). The OCU 45 contains an integrated automatic shutdown circuit that disables the laser when it detects transmitter failures giving it an FDA Class 1 laser safety rating. The FITS rating of the internal shutdown circuit is less than 500 FITS.

A removable process plug to cover the optical interface is provided with the OCU 45 unit.

LED AND SWITCH DESCRIPTIONS

The OCU 45 has switches to configure the desired electrical interface, electrical line length, and loopback tests. The LEDs indicate the status of the power supply, the electrical interface line type and length, loopback diagnostics, and electrical and optical interface status. A full description of the switches and LEDs follows Figure 2-2.
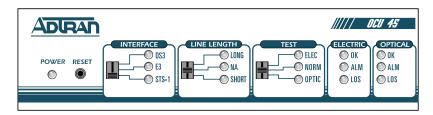

Figure 2-2. OCU 45 Front Panel

Power Supply

The **POWER** LED is active when the unit is on and receiving full power.

Interface Switch and LEDs

The **INTERFACE** LEDs reflect the electrical interface switch setting. The OCU 45 supports DS3, E3, and STS-1 operation.

Line Length Switch and LEDs

The **LINE LENGTH** LEDs reflect the electrical line length switch setting. The line length is the length of coaxial cable between the OCU 45 and the DS3/E3/STS-1 equipment, and is set as follows:

	DS3 / STS-1	**E3**
0 - 225 feet	SHORT	N/A
226 - 450 feet	LONG	N/A

Test Switch and LEDs

The **TEST** LEDs reflect the loopback diagnostic switch setting. Two diagnostic loopbacks are provided: electrical and optical loopback tests. Set to NORM for no loopback testing
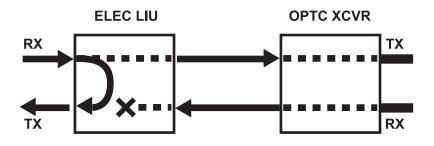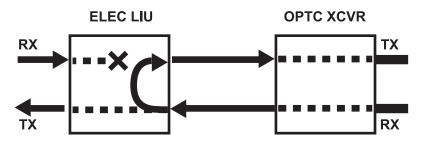

Figure 2-3. Electrical Loopback

Figure 2-4. Optical Loopback

Chapter 3   Troubleshooting and Maintenance

Troubleshooting guidelines and maintenance information are provided in this chapter.

TROUBLESHOOTING

Power

Condition: POWER LED is not illuminated.

• If locally powered, verify the power cable installation.

Electric LOS

Condition: ELECTRIC LOS LED is illuminated.

1. Verify that the cable from the network demarcation is connected to the dual BNC connectors (labeled **ELECTRICAL**) located on the back panel of the OCU 45.
2. If all connections seem intact, check the DS3/STS-1 device on the other end of the circuit.

Electric Alarm

Condition: ELECTRIC ALARM LED is illuminated.

1. Line coding violations (LCVs) are being received on the electrical interface. Check the electrical interface configuration, and verify the current setting is correct.
2. If the current electrical interface configuration setting is correct, check the DS3/STS-1 device connected to the OCU 45.

3. Alternately, an electric alarm could mean that all 1s are being received on the electrical interface, indicating an AIS alarm being transmitted from the DS3/STS-1 device.

Optical LOS

Condition: OPTICAL LOS LED is illuminated.

1. Verify that the fiber is fully seated in the optical connector interface of the OCU 45 unit.

Optical Alarm

Condition: OPTICAL ALARM LED is illuminated.

1. Line coding violations are being received from the far end OCU 45.
2. Alternately, an optical alarm can indicate that all 1s are being received on the optical interface from the far end device.
3. Verify that the far end OCU 45 is functioning properly.

Alarm Relay Conditions

Condition: ALARM RELAYS are indicating an active alarm.

1. The unit is currently experiencing an **OPTICAL** or **ELECTRICAL** loss of signal.
2. The electrical interface is currently not transmitting data.
3. The electrical interface setting is not configured properly (i.e., the interface setting and the data being received are different data rates).

Power On - Self Check Failure

Condition: Only the POWER LED is illuminated.

• The unit has failed its internal self check. Return the unit to the ADTRAN Customer and Product Service (CAPS) Department as instructed in *Customer Service, Product Support Information, and Training* on page 8.

MAINTENANCE

The OCU 45 requires no routine maintenance. No repairs should be performed by the customer. Repair services can be obtained by returning the unit to the ADTRAN Customer and Product Service (CAPS) department as instructed in *Customer Service, Product Support Information, and Training* on page 8.

Chapter 4   Specifications

OPTICAL INTERFACE - SINGLE-MODE

Connector	Standard SC receptacle using two fibers (one for each direction of transmission)
Transmitter	Class 1 Laser
Operating Wavelength	1310 nm
Cable Type	9/125 µm single-mode
Transmission Code	Manchester
Distance	Up to 40 km
Transmitter Output	-5 dBm
Receiver Sensitivity	-10 dBm to -34 dBm

NOTE   *The single-mode optical interface complies with IEC 60825-1 and FDA 21CFR 1040.10 and 1040.11.*

OPTICAL INTERFACE - MULTI-MODE

Connector	Standard ST receptacle using two fibers (one for each direction of transmission)
Transmitter	ELED
Operating Wavelength	1310 nm
Cable Type	62.5/125 µm multi-mode
Transmission Code	Manchester
Distance	Up to 2 km
Transmitter Output	-16 dBm
Receiver Sensitivity	-14 dBm to -31 dBm

NOTE   *The single-mode optical interface complies with IEC 60825-1 and FDA 21CFR 1040.10 and 1040.11.*

DS3 INTERFACE

Line Interface	Dual 75 Ohm BNC female connectors
Line Rate	44.736 Mbps
Line Code	B3ZS
Framing Format	M13 and C-Bit Parity
Line Buildout	0 to 225 feet (short) 226 to 450 feet (long)

E3 INTERFACE

Line Interface	Dual 75 Ohm BNC female connectors
Line Rate	34.368 Mbps
Line Code	HDB3

STS-1 INTERFACE

Line Interface	Dual 75 Ohm BNC female connectors
Line Rate	51.84 Mbps
Line Code	B3ZS
Framing Format	STS-1
Line Buildout	0 to 225 feet (short) 226 to 450 feet (long)

CONFIGURATION

Metallic Interface	DS3, E3, STS-1
Metallic Line Buildout	Short, Long

DIAGNOSTICS

Built-in selftest
Metallic loopback
Optical loopback

ALARMS

External alarm contacts for critical and non-critical alarms

Normally open and normally closed pinouts

Front panel Reset switch

AGENCY APPROVALS

Emissions	Part 15, Class A
Bellcore	NEBS, Level 3
Safety	UL 1950, CUL

ENVIRONMENT

Operating	0°C to 50°C (32°F to 122°F)
Storage	-20°C to 70° C (-4°F to 158°F)
Relative Humidity	Up to 95 percent, non-condensing

PHYSICAL

Dimensions	1.7 inches H x 6.7 inches W x 9.1 inches D
Weight	2.0 pounds
Power	-48 VDC, 5 Watts

Appendix A   Connector Pin Definitions

POWER CONNECTOR

Pin	Description
1	- 48 RTN
2	- 48
3	Chassis Ground

ALARM RELAY

Pin	Description
1	Normally Closed
2	Normally Open
3	Common
4	Ground

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