enginuity / PULSECOM®

OC3 TO DS1 MULTIPLEXER
O3-12D1DN

RECOGNIZED COMPONENT

ETL LISTED
c US
Intertek
4003815

**CONFORMS TO
UL STD 60950-1
CERTIFIED TO
CSA STD C22.2
60950-1**

U.S. Patents 6,868,219; 7,359,410; 7,379,481; 8,027,337; 8,345,672

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Figure 1: O3-12D1DN Unit

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1. INTRODUCTION

This practice describes the O3-12D1DN OC3 to DS1 Multiplexer, shown in Figure 1. Installation instructions and engineering references are included.

A. Reason for Reissue

This practice has been reissued to document new features available through the Craft Port menus and to correct the maximum characters allowed in the Target Identifier, TID.

B. Description

The O3-12D1DN converts 12 DS1 signals into an OC3 optical signal. By using standard, non-proprietary, virtual tributary (VT1.5) and synchronous transport signal (STS-1) mapping, the O3-12D1DN provides fiber-to-fiber compatibility with synchronous optical network (SONET) multiplexers as well as far-end O3-12D1DN units.

The O3-12D1DN provides alarm indication signal – customer installation (AIS-CI) and remote alarm indication – customer installation (RAI-CI) alarming plus network/supplemental performance report messages (NPRM/SPRM) per American National Standards Institute (ANSI) T1.403. When an O3-12D1DN is provisioned as a central office (CO) unit, it can remotely provision and retrieve alarm and performance history from a far-end O3-12D1DN provisioned as a remote terminal (RT) unit.

Compared to the O3-12D1D, the O3-12D1DN provides an Ethernet Network Monitoring and Analysis (NMA) port that permits simultaneous transaction language-1 (TL1) sessions with CO- and Remote-side units from the central office when a pair of O3-12D1DN units is operated in a bookend configuration.

O3-12D1DN units are not shipped with optical transceivers installed. Ordering codes for the O3-12D1DN board as well as for the available optical transceivers are shown in Table 1.

NOTE

Throughout the remainder of this practice, "O3-12D1DN" will refer to the unit with its transceiver installed, unless otherwise noted.

Table 1 — O3-12D1DN Board and OC3 Transceiver Ordering Codes

Ordering Code	CLEI™ Code	Wave-length	Link Loss Budget	Range* (mi/km)	Maximum Output Level	Maximum Input Level	Number of Fibers	Type of Fiber
A. Board (Without Transceiver)								
O3-12D1DN	SOOMAEZA	–	–	–	–	–	–	–
B. Available Optical Transceivers								
SFP-OC3-1310-19	SOOTAGTM	1310 nm	19 dB	24.85/40	−8 dBm	−7 dBm	2	Single Mode
SFP-OC3-1550-29	SOOTAGUM	1550 nm	29 dB	49.70/80	0 dBm	0 dBm		
SFP-OC3-SF13-13	SOOMAB8A	1310 nm	13 dB	9.32/15	−8 dBm	0 dBm	1	
SFP-OC3-SF15-13	SOOMAB9A	1550 nm						

*Range shown is maximum distance. Loss across the installed fiber facility should be compared to the Link Loss Budget for more accurate assessment of the distance the SFP can support.

C. Features

The O3-12D1DN provides the following features:

- Supports +/-24 VDC and +/-48 VDC input voltage

- GR-3108-CORE Class 3 climate hardening, including −40° to +70°C operation

- Plug-in replacement for an O3-4D1 Series unit to triple capacity in existing mountings

- Supports Bookend (Universal) and by virtue of VT1.5 OC3 mapping, Single-ended (Integrated) network topologies

- SONET data communications channel (DCC) TL1 support

- AIS-CI and RAI-CI alarming per ANSI T1.403

- NPRM and SPRM reporting per ANSI T1.403

- Ability for an O3-12D1DN "CO" unit to remotely provision and retrieve alarm and performance history from a far-end O3-12D1DN "Remote" unit, and vice versa

- Front-panel Ethernet management (MGMT) port for NMA TL1 access

- Alarm generation if the receive optical signal level falls below the minimum specified small form-factor pluggable (SFP) operating level so that technicians are aware performance might be impaired

- Type 400 network channel terminating equipment (NCTE) mechanics — ideal for placement at subscriber sites

- True SONET mapping — Within the first STS-1:
  — VT Group #1 carries DS1 #1, #2, #3, and #4, in that order
  — VT Group #2 carries DS1 #5, #6, #7, and #8, in that order
 — VT Group #3 carries DS1 #9, #10, #11, and #12, in that order

- Suitable for use with OSP wire pairs when installed as Type 3 equipment; Type 5 [equipment with integrated primary protection (EIPP) as described in GR-1089-CORE and this practice]; and Type 2 or 4 equipment

- 0 to 655 feet as well as 0, 7.5, and 15 dB DS1 port line build-out (LBO) provisioning

- Support for in-band, ESF data link, and craft port loopback commands

- DS1 superframe (SF), ESF, and unframed operation support

- **Instant Default** feature that permits restoring all settings to their default state without the need to use the craft port

- Utilizes Enginuity/Pulsecom "**Optionless SONET**" technology to eliminate OC3 provisioning

- Designed to accept OC3 single-fiber (bidirectional), 1310 nm, 1550 nm, and coarse wave division multiplexing (CWDM) SFP transceivers

- Standard female 50-pin AMP™ CHAMP™ front-panel DS1 connector (ANSI T1.403 Type RJ48H, interface code 04DU9)

- Standard DB-9 RS-232 craft port front-panel jack (9600 baud, 8-bit bytes, no parity, and one stop bit) to access performance information and advanced provisioning capabilities

- Craft port readout of incoming optical level

- Alarm indication signal and DC contact closures to aid end-to-end sectionalization

- Simple front-panel indicators for OC3, DS1, and UNIT operating status as well as an RJ45 green LED for Ethernet activity

- Fiber attenuators not required to perform an optical loopback with a fiber jumper when using the SFP-OC3-1310-19 transceiver.

2. APPLICATIONS

Figure 2 shows typical O3-12D1DN multiplexer (mux) Bookend and Single-ended applications.
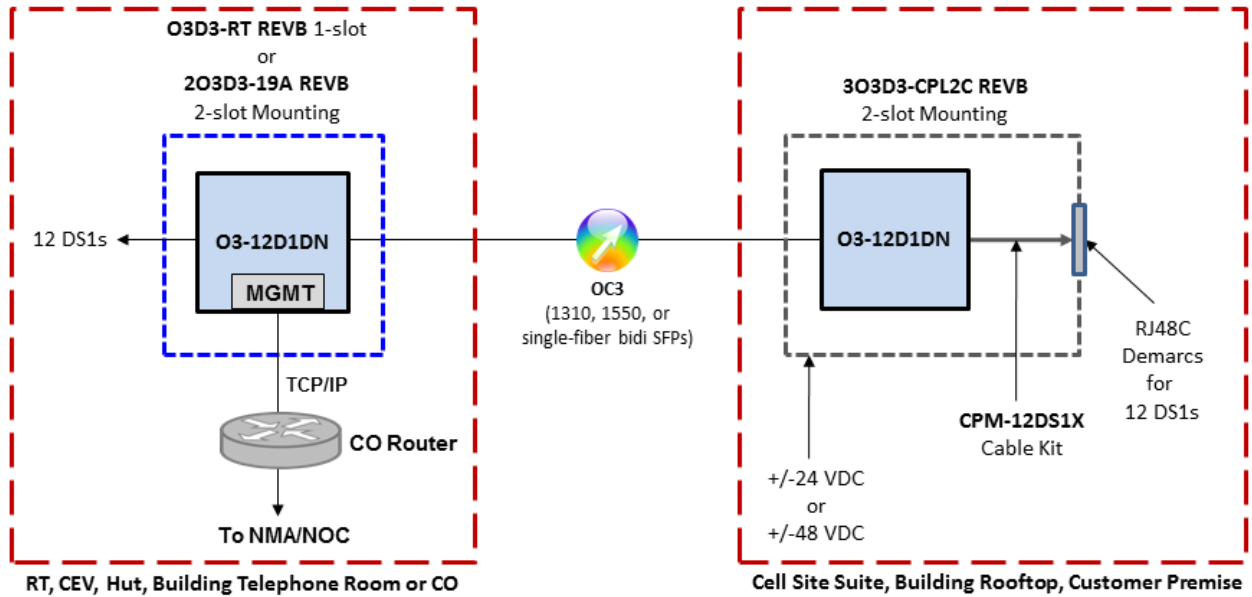
A. Bookend Example
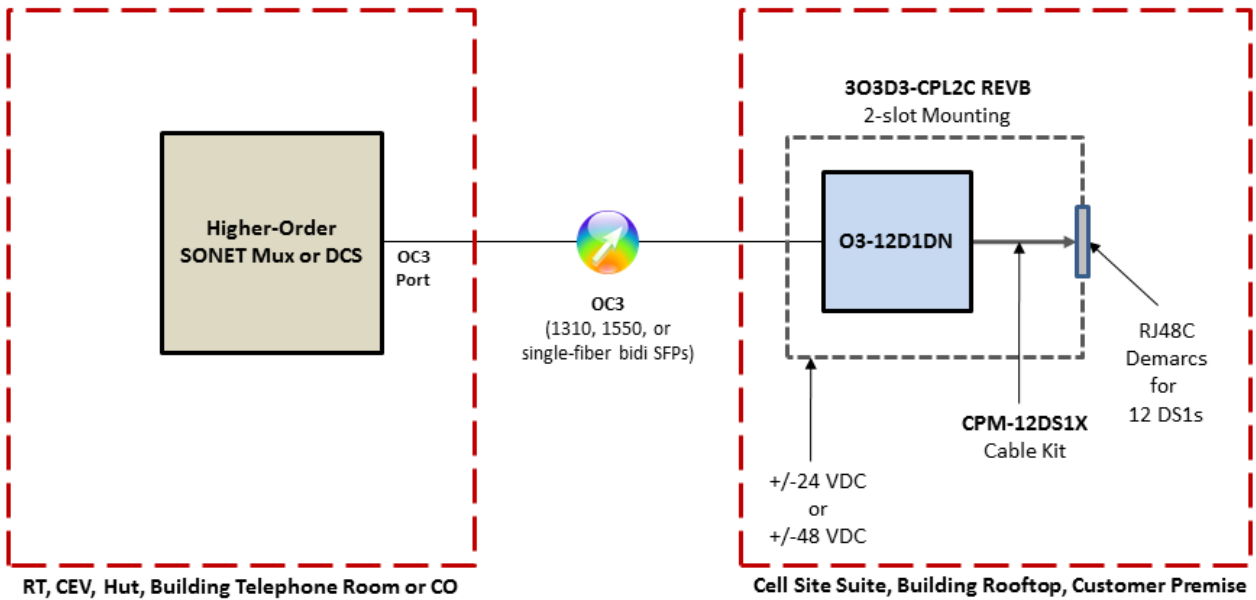
B. Single-ended Example

Figure 2: O3-12D1DN Typical Applications
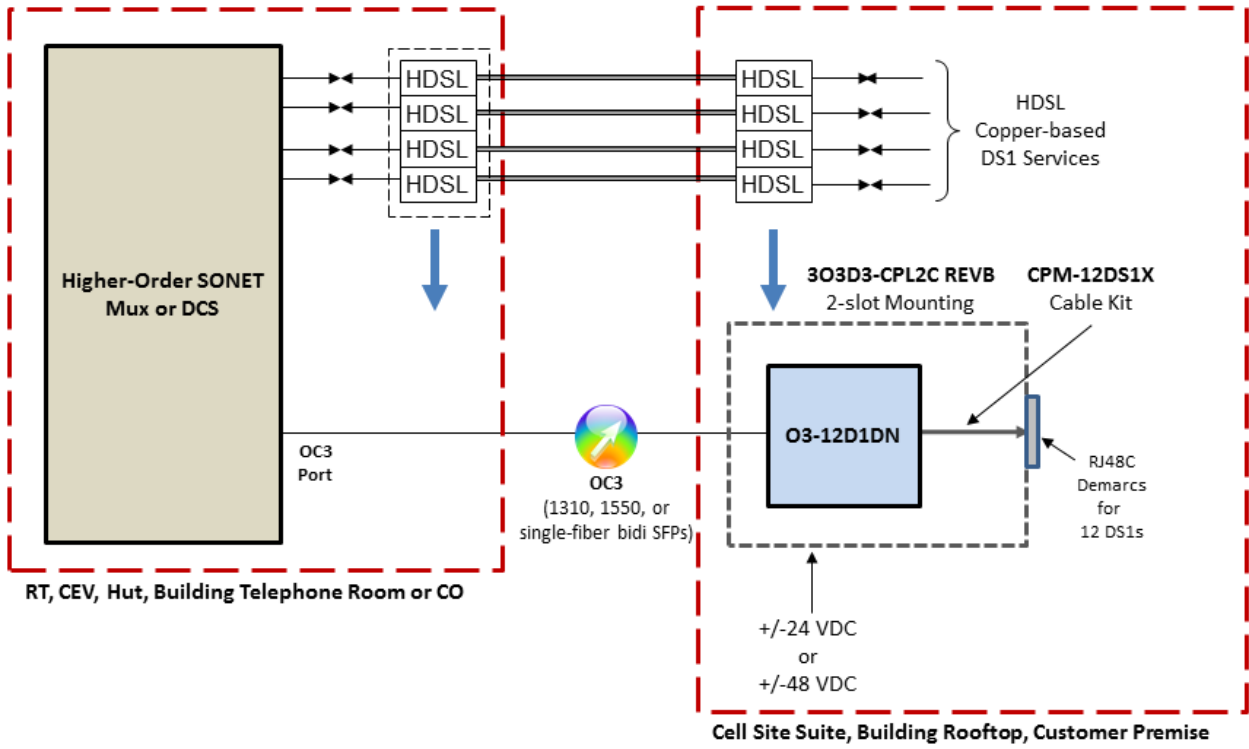
C. Migrating from Copper to Fiber-Fed DS1s Example

Figure 2: O3-12D1DN Typical Applications (Continued)

3. FUNCTIONAL DESCRIPTION

Up to 12 DS1 circuits are combined into a single OC3 signal by using VT1.5 and STS-1 mapping. Within the first STS-1, VT Group #1 carries DS1 #1, #2, #3, and #4, in that order; VT Group #2 carries DS1 #5, #6, #7, and #8, in that order; and VT Group #3 carries DS1 #9, #10, #11, and #12, in that order. The DS1 payload is not modified. Figure 3 shows a functional block diagram.

A. OC3 Circuitry

The optical interface for the 155 Mbps data stream conforms to the SONET structure defined in GR-253-CORE.

Figure 3: O3-12D1DN Functional Block Diagram

B. DS1 Circuitry

Each DS1 is provisioned for alternate mark inversion (AMI) or B8ZS line coding. Superframe, extended superframe, or unframed formats are supported. Each DS1 pulse template meets ANSI T1.102.

Each DS1 port is provisioned for digital signal cross-connect (DSX-1) type interface (short haul), with line build-outs appropriate to service line lengths from 0 to 655 feet as well as 0, 7.5, or 15 dB.
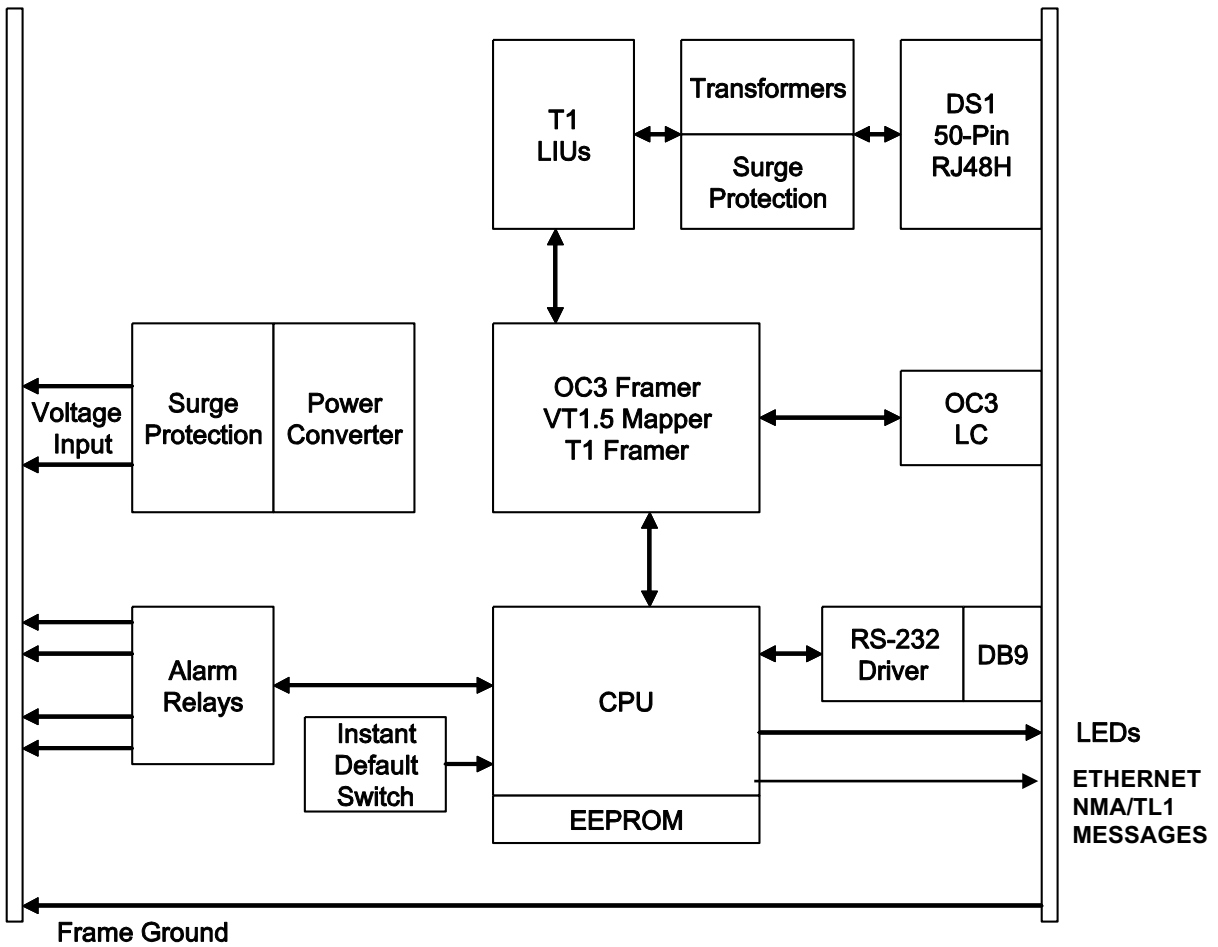
The O3-12D1DN detects loss of signal, AIS, RAI, and line code violations for each DS1 on the drop side. High levels of bipolar violations (BPVs) are tracked in the craft port as code violations – line level (CV-L).

The unit is factory-set to enable a 60-minute loopback timeout for the 12 DS1 lines. The craft port can be used to selectively inhibit loopback as well as loopback timeout on a per-DS1 basis. See Section 5, CRAFT PORT, for additional DS1 loopback information.

C. Local Alarms

Table 2 and Table 3 provide alarm information for a universal configuration. For alarm conditions in TL1 between the O3-12D1DN and a higher-order multiplexer, see Enginuity/Pulsecom Practice Section 1707. Also refer to Section 5F, Alarm Messages.

Table 2 — O3-12D1DN Alarm Contact Definitions

Lead	Pin	Alarm Indication
T R	7 13	Contact closure between these leads indicates OC3 alarm
T1 R1	41 47	Contact closure between these leads indicates DS1 alarm
NOTE: Simultaneous T/R and T1/R1 contact closures indicate internal unit failure or loss of OC3/DS1 power.		

Table 3 — O3-12D1DN Alarm Behavior

Alarm Stimulus Applied	Unit LED State	OC3		DS1		Craft Port Message	Alarm Messages	
		LED State	Alarm Contacts	LED State	Alarm Contacts		Sent Toward OC3 (FE)	Dropped at DS1 (NE)
Loss of Power	OFF	OFF	CLOSED	OFF	CLOSED	–	–	–
Missing OC3 Transceiver	RED	OFF	CLOSED	OFF	CLOSED	MISSING OPTICS	–	AIS
OC3-LOS	GREEN	RED	CLOSED	YELLOW	OPEN	OC3-LOS	RDI-L RDI-P RDI-V DS1-RAI[3]	AIS[1]
OC3 Low RX PWR	GREEN	YELLOW	OPEN	GREEN	OPEN	OC3: RX PWR	–	–
DS1-LOS from NE	GREEN	GREEN	OPEN	RED	CLOSED	DS1-LOS	AIS (AIS-CI disabled)[2] AIS-CI (AIS-CI enabled)[2]	–
DS1-LOF from NE	GREEN	GREEN	OPEN	RED	CLOSED	DS1-LOF (NE)	OOF	–
DS1-AIS from NE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-AIS (NE)	AIS (AIS-CI disabled) AIS-CI (AIS-CI enabled)	–
DS1-RAI from NE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-RAI (NE)	RAI (RAI-CI disabled) RAI-CI (RAI-CI enabled)	–
DS1-LOF from FE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-LOF (FE)	RAI[3]	OOF
DS1-AIS from FE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-AIS (FE)	RAI[3]	AIS
DS1-AIS-CI from FE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-AIS (FE)	RAI[3]	AIS-CI
DS1-RAI from FE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-RAI (FE)	–	RAI
DS1-RAI-CI from FE	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1-RAI (FE)	–	RAI-CI

Table 3 — O3-12D1DN Alarm Behavior (Continued)

Alarm Stimulus Applied	Unit LED State	OC3		DS1		Craft Port Message	Alarm Messages	
		LED State	Alarm Contacts	LED State	Alarm Contacts		Sent Toward OC3 (FE)	Dropped at DS1 (NE)
DS1-Excessive BPVs	GREEN	GREEN	OPEN	YELLOW	OPEN	DS1 Excessive BPVs	–	–
SFP Equipment Alarm	YELLOW	GREEN	OPEN	GREEN	OPEN	Temperature Too High	–	–

NOTE 1: Using the craft port, the response to an OC3-LOS can be provisioned from the OC3 configuration menu to either send AIS toward the DS1 drop or to turn off the DS1 transmitter.

NOTE 2: Using the craft port, the response to a DS1-LOS from the near end can be provisioned from the DS1 configuration menu to either send AIS toward the OC3 or to implement a terminal loopback in which the received DS1 data is looped back toward the OC3. If the AIS option is selected, AIS-CI will be sent only when the O3-12D1DN is provisioned as a Remote unit and the AIS-CI option is enabled from the DS1 configuration menu.

NOTE 3: When the O3-12D1DN is deployed at the network interface, the customer equipment will originate RAI back toward the network under this condition; RAI-CI will not be generated by the O3-12D1DN.

NOTE 4: AIS = Alarm Indication Signal. AIS-CI = Alarm Indication Signal-Customer Installation. FE = Far End. LED = Light Emitting Diode. LOF = Loss of Frame. LOS = Loss of Signal. NE = Near End. OOF = Out of Frame. RAI = Remote Alarm Indication. RAI-CI = Remote Alarm Indication-Customer Installation. RDI = Remote Defect Indication. RDI-L = Remote Defect Indication-Line. RDI-P = Remote Defect Indication-Path. RDI-V = Remote Defect Indication -Virtual Tributary.

4. INSTALLATION

The O3-12D1DN complies with Part 15 of the Federal Communications Commission (FCC) rules when used in the recommended mountings and installed as described in this manual. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and

2) This device must accept any interference received, including interference that may cause undesired operation.

DANGER

The O3-12D1DN employs Class 1 laser products. To avoid injury, do not look directly into the optical transceiver or into the fiber cable. Note that the light is invisible; the optical signal cannot be detected by the eye.

Per GR-1089-CORE June 2006, Section 9.8, the battery return (BR) of this unit does not have any internal connection to the unit's frame and, therefore, may be used in either DC-C (common bonding and grounding systems) or DC-I (isolated bonding and grounding systems). The chassis ground wire must be at least as large as the wire used for the BR.

For Type 5 (EIPP) applications, the O3-12D1DN is to be installed in an electronic equipment cabinet (EEC) and have its DS1 ports connected with cabling that does not exceed 1 meter (3.3 feet) in length to Bourns 303M-09H3GH 5-pin or equivalent protectors inserted in an approved 5-pin protector block. Bourns 303M-09H3GH or equivalent protectors are also to be used in Type 3 applications in accordance with local procedures. The Bourns protectors, protector block, and cabling are not supplied with the O3-12D1DN. When installed in an EEC in this fashion, the following GR-1089-CORE Warning applies:

EIPP WARNING

The equipment (O3-12D1DN, 303M-09H3GH 5-pin or equivalent primary protectors, 5-pin protector block, and interconnecting cable) may be located in an EEC as long as the installation does not employ separate (additional) primary protectors for the same OSP cable used to provide connections to the O3-12D1DN DS1s. EIPP installations such as these, which include integrated primary protection, are not suitable for central office and network locations that contain <u>other</u> primary protection for the same OSP cable [such as controlled environment vaults (CEVs) or huts]. For the purposes of determining placement and location of fuse links or fuse cable, the equipment shall be treated as a fuse-less protector, regardless of capability to provide fusing. Note that the Warning above applies to EIPP applications; in other applications, the O3-12D1DN may be installed in COs, huts, CEVs, customer-premises equipment (CPE), and similar locations as Type 2, 3, or 4 equipment.

WARNINGS

1. *This unit includes components that are susceptible to damage from static electricity. DO NOT handle units without protection from electrostatic discharge.*

2. *When not in use, optical connectors **must** be covered by dust caps to keep airborne particles off connecting surfaces and to preserve optimum performance.*

3. ***Always** clean fiber plugs with an approved fiber-cleaning product, following appropriate procedures, before plugging the fiber into the O3-12D1DN.*

4. *O3-12D1DN units can be equipped with long-range transceivers which produce a higher optical output than the receiver can tolerate. This capability is intended for applications where long lengths of fiber will attenuate the signal. If a long-range transceiver is used in an application with short fibers, a 15 dB attenuator should be installed on the transmit port to prevent bit errors and possible damage to the receiver.*

5. *When connecting the O3-12D1DN optical output to test equipment, verify that the maximum input level specification of the test equipment is not exceeded by the O3-12D1DN output. Even intermediate-range optics can produce levels too high for some test equipment, so attenuators might be required. In general, when connecting the O3-12D1DN to test equipment, Enginuity/Pulsecom recommends a 5 dB attenuator when intermediate-range optics are installed in the O3-12D1DN and a 15 dB attenuator when long-range optics are installed in the O3-12D1DN. Check the specifications of the test equipment to determine if this precaution is adequate or necessary.*

A. Tower Recommendations

When deployed at locations like cell sites or broadcast towers that are particularly susceptible to lightning strikes, Enginuity/Pulsecom recommends the use of 5-pin primary protectors with 5-ohm heat coils, such as Bourns part number 303M-09H3GH or equivalent, for added lightning protection.

NOTES

1. *While the O3-12D1DN meets GR-1089-CORE OSP criteria, equipment at cell or broadcast towers may be exposed to lightning surges that exceed those characterized by GR-1089-CORE tests. In these applications, the recommended 5-ohm heat coil works with circuitry in the O3-12D1DN to provide protection from surges with substantially higher energy.*

2. *Long copper circuits that parallel power lines may experience inductive currents that can cause heat coils to fuse open. This situation is not an issue in the recommended cell site or broadcast tower applications since the copper pair drop circuit is normally less than 100 feet.*

B. Controls and Indicators

Front Panel and Printed Circuit Board

The front panel of the O3-12D1DN provides connection to the OC3 and DS1 signals as well as the craft and management ports. LEDs show OC3, DS1, and UNIT status; the RJ45 jack's green LED indicates Ethernet activity. Front-panel connectors and indicators are shown in Figure 1 and described in Table 4. The most recent issue of UL 60950-1 requires surfaces that could reach approximately 70°C be marked with a visible warning. Therefore, because the O3-12D1DN can operate in ambient temperatures that reach 70°C, a faceplate warning symbol has been included. Note that O3-12D1DN faceplate temperatures will remain very similar to the faceplate temperatures of earlier-generation units; this is a *labeling requirement* change for new units only.

The front-panel DS1 connector has 12 transmit pairs and 12 receive pairs. These DS1 pinouts are listed in Table 5.

If needed, use the supplied RJ45 adapter for connection to routers that do not have medium dependent interface crossover (MDIX) capability.

The following options are available from Enginuity/Pulsecom:

- Dual Cable Assembly — If desired, order AMP-MBL/U50Sxxx, where xxx is the cable length in feet. This cable has a male bail-lock connector at one end and is unterminated (stub) at the other end. See Practice Section 1635 for installation instructions.

- Bulkhead Cable Kit — If desired, order the CPM-12DS1X cable kit for use in the 3O3D3-CPL2C wall-mounted enclosure or for use with BP-19 or BP-23 rack-mounted bulkhead plates and the 2O3D3-19A rack-mounted shelf. Each kit provides 12 bulkhead-mounted RJ48C DS1 jacks and a cable that connects these jacks to the O3-12D1DN faceplate connector. See Practice Section 1634 for installation instructions.

The front-panel DB-9 communications interface is an asynchronous VT-100 serial port. This craft port operates at 9600 baud with 8 bits of data, no parity, no flow control, and 1 stop bit. Refer to Section 5 for detailed craft port instructions.

Backplane pinouts for alarm contacts, power, and ground (GND) are listed in Table 6.

Printed Circuit Board

When the local DS1 provisioning needs to be restored to the factory defaults, the instant default feature can be used. Note that the initial position of switch S2-1 is not important; the O3-12D1DN detects a *change* in the position of S2-1 during power-up as an instruction to restore parameters to their default values. Switch positions S2-2, S2-3, and S2-4 are not used. See Figure 4.

C. Select and Install Mounting

Table 7 provides a list of the mountings that should be used with the O3-12D1DN. For applications requiring loss-of-power immunity, use redundant power such as that available with the 2O3D3-19A REVB.

Use standard hardware to securely attach the mounting to the rack, door, wall, or backboard. See the appropriate Enginuity/Pulsecom Practice Section for detailed mounting instructions.

Table 4 — O3-12D1DN Connectors, Indicators and Switches

Connector	Function
DS1	50-position, female, AMP CHAMP, RJ48H connector with twelve DS1 interfaces (see NOTE 1).
RX	OC3 input (receive) LC optical connector.
TX	OC3 output (transmit) LC optical connector.
MGMT	RJ45 Ethernet management port for access to NMA TL1 messages.
CRAFT RS-232	DB-9 female port for access to PC running HyperTerminal or other VT-100 emulation program.
Indicator	**Function**
UNIT	Lights green to show normal unit operation. Lights red to show unit/configuration failure or no SFP optical module installed. Lights yellow to show an equipment temperature alarm or MGMT port failure.
OC3	Lights green to show that the OC3 signal is connected and operating properly. Flashes green to show that the OC3 loopback has been activated. Lights red to show loss of signal, loss of framing, loss of pointer, or out of frame; also shows SFP optical module failure. Lights yellow to show far-end trouble for the associated OC3, a non-OC3 transceiver installed, an optical receive level below the SFP minimum, or an unrecognized OC3 transceiver (see NOTE 2). Turns OFF to show no SFP optical module installed.
DS1	Lights green to show that all enabled DS1s are operating properly. Flashes green to show that one or more DS1 loopbacks have been activated. Lights red to show a loss of signal on one or more enabled DS1s. Lights yellow to show a DS1 Alarm Indication Signal [AIS (unframed all ones)] or Remote Alarm Indication (RAI) has been detected or if BPVs exceed 10^{-4} on any of the DS1s. Turns OFF to show all DS1 ports are set to disabled.
RJ45 LED	Lights green (on MGMT connector) to show Ethernet activity.
Switch	**Function**
S2-1	Factory default switch. See Figure 4.
NOTE 1: Use Enginuity/Pulsecom bail-lock to unterminated cable (AMP-MBL/U50Sxxx, where xxx = cable length in feet) OR use Enginuity/Pulsecom bulkhead cable kit (CPM-12DS1X) in 3O3D3-CPL2C installations, or in 2O3D3-19A installations with BP-19/BP-23 rack-mounted bulkhead plates.	
NOTE 2: The unit will attempt to operate with an unrecognized OC3 transceiver; however; since the transceiver temperature and distance ranges are not known, this unrecognized part should be replaced as soon as possible with a transceiver listed in Table 1.	

Table 5 — Front-Panel DS1 Connector Pin Assignments

	Pin	Signal	Pin	Signal
	1	Ring1 DS1-1	26	Tip1 DS1-1
	2	Ring1 DS1-2	27	Tip1 DS1-2
	3	Ring1 DS1-3	28	Tip1 DS1-3
	4	Ring1 DS1-4	29	Tip1 DS1-4
	5	Ring1 DS1-5	30	Tip1 DS1-5
	6	Ring1 DS1-6	31	Tip1 DS1-6
	7	Ring1 DS1-7	32	Tip1 DS1-7
	8	Ring1 DS1-8	33	Tip1 DS1-8
	9	Ring1 DS1-9	34	Tip1 DS1-9
	10	Ring1 DS1-10	35	Tip1 DS1-10
	11	Ring1 DS1-11	36	Tip1 DS1-11
	12	Ring1 DS1-12	37	Tip1 DS1-12
	13	Shield	38	Shield
	14	Ring DS1-1	39	Tip DS1-1
	15	Ring DS1-2	40	Tip DS1-2
	16	Ring DS1-3	41	Tip DS1-3
	17	Ring DS1-4	42	Tip DS1-4
	18	Ring DS1-5	43	Tip DS1-5
	19	Ring DS1-6	44	Tip DS1-6
	20	Ring DS1-7	45	Tip DS1-7
	21	Ring DS1-8	46	Tip DS1-8
	22	Ring DS1-9	47	Tip DS1-9
	23	Ring DS1-10	48	Tip DS1-10
	24	Ring DS1-11	49	Tip DS1-11
	25	Ring DS1-12	50	Tip DS1-12

The left cell of the table contains a connector pinout diagram:

1, 3, 5, 7, 9, 11 — RING1
13 — SHIELD
15, 17, 19, 21, 23, 25 — RING
26, 28, 30, 32, 34, 36 — TIP1
38 — SHIELD
40, 42, 44, 46, 48, 50 — TIP

ANSI T1.403 Type RJ48H
Interface Code 04DU9

NOTE: Tip/Ring = Signals received from the OC3 fiber link (DS1 TX).
Tip1/Ring1 = Signals transmitted into the OC3 fiber link (DS1 RX).

Table 6 — Backplane Pin Assignments

	Pin	Function	Description
CARD-EDGE CONNECTOR (diagram, REAR VIEW)	55	–	–
	53	–	–
	51	–	–
	49	–	–
R1 — DS1 ALARM OR POWER FAILURE	47	DS1 Alarm Contact	Dry Contact
	45	–	–
	43	–	–
T1	41	DS1 Alarm Contact	Dry Contact
	39	–	–
	37	–	–
NEGATIVE SUPPLY INPUT	35	Negative Supply Input	IN
	33	–	–
	31	–	–
	29	–	–
CHASSIS GND	27	Chassis GND	IN
	25	–	–
	23	–	–
	21	–	–
	19	–	–
POSITIVE SUPPLY INPUT	17	Positive Supply Input	IN
	15	–	–
R — OC3 ALARM OR POWER FAILURE	13	OC3 Alarm Contact	Dry Contact
	11	–	–
	9	–	–
T	7	OC3 Alarm Contact	Dry Contact
	5	–	–
	3	–	–
CHASSIS GND	1	Chassis GND	IN
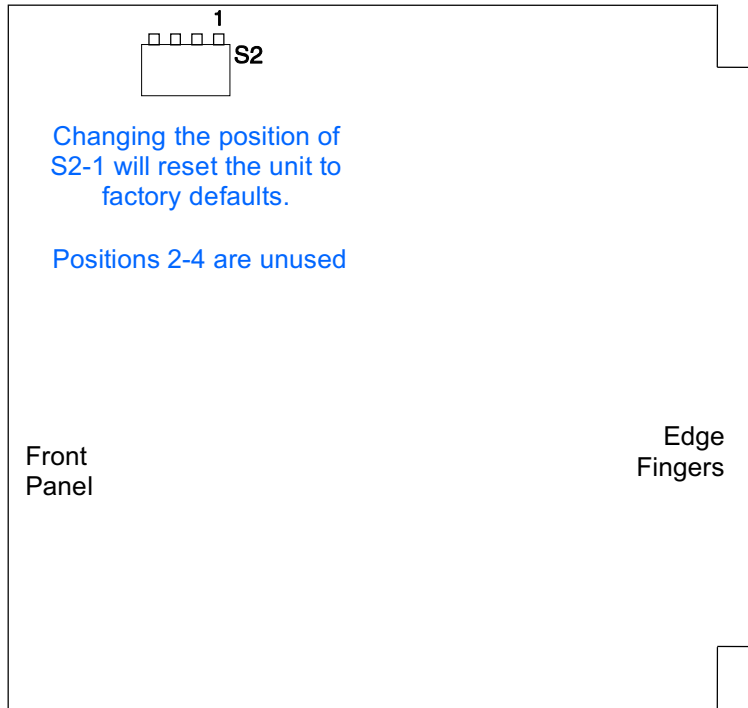
Figure 4: Instant Default Switch on the O3-12D1DN

Table 7 — Recommended Mountings for O3-12D1DN Modules

Model	CLEI Code	CPR	Description	Practice No.
2O3D3-19A REVB	SOM2300C	204577	Two O3-12D1DN positions; rack or backboard mounting; for CO, CEV, hut, and CPE applications; 24 VDC or −48 VDC input.	1672
O3D3-RT REVB	SOM1200G	201617	One O3-12D1DN position; rack, door, or backboard mounting; for cabinet and CPE applications; 24 VDC or −48 VDC input.	1690
3O3D3-CPL2C REVB	SOM7J10A	209695	Two O3-12D1DN positions in a locking, hinged, wall-mounted or KTU rack-mounted enclosure; provision for DS1 bulkhead connections with a bulkhead cable kit (ordered separately); −48 VDC or 24 VDC input for cell site and CPE applications; FRC 358C.	1678
NOTE: When using redundant power inputs, DC voltages should be the same (i.e., do **not** use a −48V supply with a +24V supply).				

D. Make Power and Alarm Connections

Each O3-12D1DN module uses two DC contact closures to identify failures.

Follow the steps in Procedure 1 to make power and alarm connections.

Procedure 1. Making Power and Optional Alarm Connections

STEP	ACTION
1	Connect frame ground according to the appropriate mounting practice listed in Table 7.
2	Ensure that power is OFF.
3	Connect the power supply and ground to the proper mounting terminals as described in the appropriate practice.
4	Wire local alarms as described in the appropriate practice.
5	If using the 2O3D3-19A REVB or 3O3D3-CPL2C REVB, ensure that SW1 SWITCH TO PROTECT is set to the OFF position.
6	Turn power ON.

E. Install Transceiver and Module

Follow the steps in Procedure 2 to install the O3-12D1DN transceiver and module.

Procedure 2. Installing the O3-12D1DN Transceiver and Module

STEP	ACTION
1	Reset the unit to factory defaults by changing the position of S2-1. Note that the initial position of switch S2-1 is not important. The O3-12D1DN detects a *change* in the position of S2-1 during power-up as an instruction to restore parameters to their default values. See Figure 4.
2	Carefully plug the desired SFP transceiver (see Table 1) into its front-panel socket. Ensure that it snaps into place.
3	Plug the O3-12D1DN module into the desired mounting.
4	Verify that the front-panel UNIT indicator is green. • If the UNIT indicator does not turn on, verify that power is connected to the mounting and that a good 1.5A fuse is properly installed for the mounting slot in use. • If the UNIT indicator is red, verify that the laser transceiver is properly latched into its socket. If the LED remains red, the O3-12D1DN module is defective and should be replaced.

F. Make OC3 Connections

O3-12D1DN modules have LC optical connectors. Follow the steps in <u>Procedure 3</u> to make OC3 connections.

DANGER

Units employ Class 1 laser products. To avoid injury, do not look directly into the optical transceiver or into the fiber cable. Note that the light is invisible; the optical signal cannot be detected by the eye.

Procedure 3. Making OC3 Connections

STEP	ACTION
1	<u>Before</u> plugging in the OC3 fiber, verify that the O3-12D1DN front-panel OC3 indicator is red. If the OC3 indicator is off or green, the unit is defective and should be replaced.
2	Remove the protective dust cover from the front-panel OC3 LC jack.
3	Plug in the OC3 fiber cables equipped with LC male connectors until they snap into place. Use proper fiber cable routing practices.
4	If the far-end OC3 connection has already been made, the OC3 indicator should turn green or, if there is a far-end trouble, turn solid yellow. If the OC3 indicator remains red: • Verify that the correct transceiver is properly latched into the OC3 socket. • Verify that fiber cables are in good condition and that fiber connectors are clean. If required, clean the connectors with special lint-free pads in accordance with standard procedures. • Verify that the optical path loss does not exceed the capabilities of the far-end laser. If so, replace the far-end unit with one designed to support longer OC3 fiber links. • If the OC3 indicator remains red, the O3-12D1DN module is defective and should be replaced.

G. Make DS1 Connections

The O3-12D1DN module has a female AMP CHAMP front-panel connector (designed to be used with a bail-lock connector hood) that follows ANSI T1.403 RJ48H wiring standards. Enginuity/Pulsecom recommends using one of the following items (ordered separately):

- CPM-12DS1X — When deployed in 3O3D3-CPL2C enclosures or in 2O3D3-19A shelves with BP-19 or BP-23 rack-mounted bulkhead plates, this bulkhead cable kit provides 12 integrated RJ48C bulkhead connectors and a short cable to link the connectors to the O3-12D1DN front panel (reference Practice Section 1634).

- AMP-MBL/U50Sxxx — A dual cable assembly, xxx feet in length, has one end terminated by a 50-pin male AMP CHAMP connector equipped with a bail-lock hood and the other end unterminated (reference Practice Section 1635).

See Procedure 4, Table 5, and Figure 1.

Procedure 4. Making DS1 Connections

STEP	ACTION
1	Plug in the DS1 cable and engage bail-locks. **NOTE:** If using the AMP-MBL/U50Sxxx cable and if grounding the cable shields at the far end, temporarily remove the connector hood and disconnect the shields. Then reinstall the hood before plugging in and securing the DS1 cable. (See Practice Section 1635.)
2	If the far-end DS1 cable connection has already been made to an active DS1 device, the DS1 LED should turn green or, if there is a far-end trouble, turn solid yellow.* If the DS1 indicator remains red: • Verify that the cable is in good condition. • Verify that the cable length does not exceed 655 feet. • If the cable length is greater than 133 feet, a PC running terminal emulation software such as PuTTY or HyperTerminal, and an RS-232 cable must be used to provision the cable length. Refer to Section 5 of this practice. • Verify that the DS1 equipment at the far end of the DS1 cable is operating properly. • If the DS1 indicator remains red, the O3-12D1DN module is defective and should be replaced.
3	Secure the cable to the shelf or backboard.
*The DS1 must be enabled by using the craft port (Section 5) or through NMA using TL1 commands.	

5. CRAFT PORT

The unit's craft port provides local and remote access to O3-12D1DN operation and provisioning. It also includes the ability to change the default Internet Protocol (IP) Address of the NMA/TL1 Ethernet MGMT port.

A. Access the Craft Port

The O3-12D1DN is equipped with a CRAFT RS-232 port with VT-100 emulation. See Figure 5 for port pin assignments.

Figure 5: RS-232 Craft Port Pin Assignments
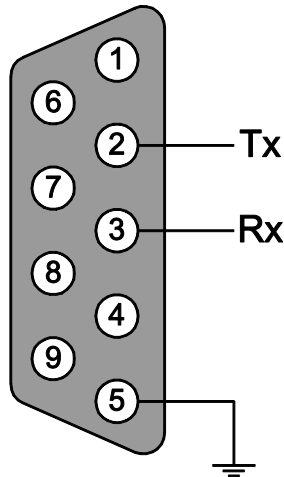
Craft Port System Requirements

The following items are required for craft port access:

- 486 PC or better computer with 24 Mbytes minimum of RAM
- Microsoft® Windows® 95 or higher
- PuTTY, HyperTerminal or compatible VT-100 terminal emulation program
- Windows-compatible mouse pointing device
- An available communication (COM) port
- RS-232 standard communications cable

Running the Craft Port Terminal Emulation Software

Follow the steps in Procedure 5 to run the terminal emulation software on your PC.

Procedure 5. Running Terminal Emulation Software

STEP	ACTION
1	Connect the RS-232 communications cable from an available COM port on the PC to the DB-9 connector on the O3-12D1DN front panel.
2	PuTTY will typically place an icon on the desktop. Double click. If not at Category>Session, navigate to that screen.
3	From the Windows Start menu, choose All Programs > Accessories > Communications > HyperTerminal, PuTTY or equivalent terminal emulation program.
4	Click on "Serial" Connection type.
5	At the *Serial Line* text box, enter "COMx" (where "x" is the appropriate port number, as chosen in Step 1). Speed should be set at 9600.
6	Navigate to *Connection>SSH>Serial* and enter the following parameters: A) "9600" bits per second B) "8" data bits C) "None" parity D) "1" stop bit E) "None" flow control. **NOTE: If flow control is not set properly, terminal emulation software such as PuTTY will drop connections.**
7	Click on "Session" on the left side of the window.
8	Click the "Serial" radial button on the right side of the window. The window will change and the serial line and speed will be shown.
9	Click the "Open" button at the bottom of the window to begin.

Login

If necessary, press the ENTER key to view the Login screen. The system asks for a user name and password for authentication. Follow the steps in Procedure 6.

Procedure 6. Logging In

STEP	ACTION
1	At the 'User Name:' prompt, type **root**. Then press the ENTER key.
2	At the 'Password:' prompt, type **root**. Then press the ENTER key.

NOTE

User Name and Password are preset. Both responses are case-sensitive; use lower-case letters only.

root (admin access) can view and modify all values. After passing authentication, users login to the Main Menu.

B. Reset Unit to Factory Defaults

The simplest way to restore default provisioning is by changing position of switch S2-1 on the printed circuit board of the O3-12D1DN. Restoring default provisioning should have been completed at installation. If that step was not completed, switch S2-1 may be changed now by removing the unit. See Figure 4.

C. Configure Operating Mode

Select instructions for either universal or integrated operation.

For Bookend Operation

Bookend (universal) operation is the factory-default configuration.

For Bookend Operation, one unit must be set for type CO and the other as Remote. Typically the unit on the Network side is configured as CO and the unit closest to the subscriber is configured as Remote.

To configure a unit type, perform the steps in Procedure 7. NOTE: If the unit has been reset to factory defaults as described in the previous section, no action is required to configure the unit type to Remote.

If remote management will be used via the CO unit's Management Port, The Target Identifier (TID) and Peer TID (TID of the far end unit) must set at both units. Perform the steps in Procedure 9.

Procedure 7. Provisioning a Unit Type

STEP	ACTION
1	From the Configuration Manager Menu select Retrieve and Set Unit Provisioning. Press the ENTER key.
2	From the Configure Unit Menu select the appropriate Unit Type (CO or Remote) Select Apply New Settings. Press the ENTER key.
3	Press the q key to return to previous menus.

For Single-ended Operation

The default Unit Type is Remote. NOTE: If the unit has been reset to factory defaults as described in Section 5B, no action is required to configure the unit type to Remote.

Follow the steps in Procedure 8.

Procedure 8. Configuring Single-ended Operation

STEP	ACTION
1	From the Management Port Provisioning Menu select Bookend Mode and set to Disable.
2	Next select Apply New Settings and press the ENTER key. The message "MGMT Configuration is changed" should appear near the bottom of the screen.
3	Press the q key to return to previous menus.

In Single-ended Operation the O3-12D1DN must be set to its default command response of User (found under Configuration Manager>Retrieve and Set DCC>LAPD). The higher order SONET multiplexer must be set to a command response of Network.

Follow the steps in Procedure 9 to set a unique target identifier (TID).

Procedure 9. Setting the Target Identifier for any configuration

STEP	ACTION
1	From the Main Menu, select Configuration Manager. Press the ENTER key.
2	From the Configuration Manager Menu, select Retrieve and Set DCC Provisioning. Press the ENTER key.
3	From the Configure DCC Menu, select TID. Press the ENTER key.
4	From the Configure TID Menu, select TID. Enter up to 19 characters to establish a unique target ID for this O3-12D1DN. Press the ENTER key.
5	Next select Apply New Settings and press the ENTER key. The message "TID is changed" should appear near the bottom of the screen.
6	Press the q key to return to previous menus.
	STEPS 7-9 are applicable for Bookend Mode only.
7	From the MGMT Port Configuration menu select Peer TID. NOTE: This is the TID of the far-end unit. Enter up to 19 characters to establish a unique target ID for this O3-12D1DN. Press the ENTER key.
8	Next select Apply MGMT Settings and press the ENTER key. The message "MGMT Configuration is changed" should appear near the bottom of the screen.
9	Press the q key to return to previous menus.

D. Provisioning

If desired, additional provisioning can be performed at this time via the craft port Configuration Manager Menu. Table 8 shows the most commonly used provisionable features and factory-set default settings.

Table 8 — O3-12D1DN Craft Port Provisioning

Feature	Option and Description	Default
A. Unit Provisioning		
Unit State	In service or out of service.	In Service
Unit Type	Remote or CO: Remote is generally used when the O3-12D1DN is at the subscriber site. CO is used when the O3-12D1DN is located on the central office side of the circuit, even though the O3-12D1DN may be physically installed in an RT cabinet and connected via fiber to a downstream O3-12D1 Series unit at a subscriber site.	Remote
Unrecognized SFP Alarm	Enabled or Inhibited: If Enabled, the O3-12D1DN will generate a minor alarm if an unrecognized SFP is inserted. If Inhibited, the alarm will not be generated.	Enabled
B. DCC Provisioning		
DCC State	Enable or disable.	Enable
TID	The Target Identifier can be manually provisioned (as is typically required in single-ended applications). For normal bookend operation, O3-12D1DN units have a default TID (all capital letters). **NOTE:** Changing a unit from Remote to CO or from CO to Remote causes the TID to be changed to its corresponding default.	PULSECOM2 for Remote-mode units; PULSECOM for CO-mode units
Network Layer	The Area Address may be changed to match that used by the higher order mux in single-ended applications. **CAUTION:** A mismatch of Area Addresses will result in loss of DCC connectivity.	39840F80 000000000 000000000
Data Link Layer LAPD	The Link Access Procedure D-Channel (LAPD) sets the unit for DCC connectivity. Both units in a Bookend operation can't be set the same. In Single-ended applications, the higher order mux must be Network.	USER for Remote-mode units; NETWORK for CO-mode units
C. OC3 Provisioning		
OC3 State	In service or out of service.	In Service
Response to OC3 Loss of Signal	Send AIS to each DS1 or turn off DS1 transmitter.	Send AIS to DS1
OC3 Loopback Timeout	1, 2, 4, 8, 60 minutes, or No TimeOut.	60 minutes

Table 8 — O3-12D1DN Craft Port Provisioning (Continued)

Feature	Option and Description	Default
E. DS1 Provisioning		
Name	Permits assigning a 12-character NMA circuit ID to each DS1.	DS1 # (1–12)
State	Disable, enable (in service), or maintenance (out of service).	Disabled
Framing Format	Superframe (SF), extended superframe (ESF), or unframed.	ESF
Line Coding	Bipolar with 8-zero substitution (B8ZS) or alternate mark inversion (AMI).	B8ZS
Line Build Out	0–133 ft., 134–266 ft., 267–399 ft., 400–533 ft., 534–655 ft., OR 0, 7.5, or 15 dB.	0 to 133 feet
DS1 Loopback	Enable or disable.	Enable*
DS1 Loopback Timeout	1, 2, 4, 8, 60 minutes, or No TimeOut.	60 minutes*
Response to DS1 Loss of Signal	Send AIS to OC3 (i.e., toward the CO when the O3-12D1DN is at the subscriber site) or initiate loopback. **NOTE:** When AIS-CI is enabled and the O3-12D1DN is provisioned as a Remote unit, an AIS-CI will be sent toward the CO for a subscriber DS1 LOS.	Send AIS (or AIS-CI) to OC3
Loopdown on AIS	Yes or no.	No*
	NOTE: Press the n key (next page) to see the following four options.	
AIS-CI Generation	Enable or disable.	Enable*
RAI-CI Generation	Enable or disable.	Enable*
NPRM Generation	Enable or disable.	Enable*
SPRM Generation	Enable or disable.	Enable*
F. Management Port Provisioning		
IP Address**	The Internet Protocol Address of the MGMT Ethernet port. The telnet port number for the CO unit is 23 and for the Remote unit is 24. These port numbers cannot be changed.	192.0.2.1
Netmask**	The Netmask of the MGMT Ethernet port.	255.255.255.0
Gateway**	The Gateway used by the MGMT Ethernet port.	0.0.0.0
Peer TID	The Target Identifier of the far-end unit. **NOTE:** Changing a unit from Remote to CO or from CO to Remote causes the Peer TID to be changed to its corresponding default. This setting does not apply to single-ended configurations.	PULSECOM2 when viewed from the CO-mode unit; PULSECOM when viewed from the Remote-mode unit
Command Echo	Enables or disables command echoing on MGMT TL1 connections (disabled recommended when unit is connected to an automated NMA system).	Disable
Bookend Mode	Enables or disables bookend (unit type CO to Remote) configuration mode. Disable for single-ended mode.	Enable
*This feature functions only when units are provisioned as Remote; feature is **not** applicable to units provisioned as CO. Note that changes to global DS1 settings can affect enabled circuits. **If this setting is changed, any existing TL1 sessions will be terminated. The user will need to start a new session after the parameters have been updated. This setting only applies to bookend configurations.		

E. Performance Monitoring

OC3 and DS1 performance parameters are accumulated and stored over 15-minute and 1-day periods. Parameter history is available at 15-minute periods for the last 96 intervals and at 1-day periods for the last 7 days via the Performance Manager Menu. Current performance monitoring (PM) data can be reset globally or for a specific interface, or PM history can be erased. See Table 9 and Table 10.

Table 9 — OC3 Performance Monitoring

Severity	Parameter	Description	Potential Corrective Action
Minor	CV-S	Coding Violation—Section	Check that fiber connections are clean and secure. Ensure that fiber loss does not exceed the rating of the installed transceiver. If these actions fail to correct the problem, replace the transceiver at each end of the circuit.
	CV-L	Coding Violation—Line	
	CV-P	Coding Violation—Path	
	SEFS-S	Severely Errored Framing Seconds—Section	
	SES-S	Severely Errored Seconds—Section	
	SES-L	Severely Errored Seconds—Line	
	SES-P	Severely Errored Seconds—Path	
	ES-S	Errored Seconds—Section	
	ES-L	Errored Seconds—Line	
	ES-P	Errored Seconds—Path	
	UAS-L	UnAvailable Seconds—Line	
	UAS-P	UnAvailable Seconds—Path	
	FC-L	Failure Count—Line (a count of the number of near-end line failures)	
	FC-P	Failure Count—Path (a count of the number of near-end STS path failure events)	

Table 10 — DS1 Performance Monitoring

Severity	Parameter	Description	Potential Corrective Action
Minor	CV-L	Coding Violation—Line	Verify LBO settings. Verify proper and consistent ESF/SF/Unframed provisioning. Verify proper and consistent AMI/B8ZS provisioning. Check for loose copper cable connections.
	CV-P	Coding Violation—Path	
	SES-L	Severely Errored Seconds—Line	
	SES-P	Severely Errored Seconds—Path	
	ES-L	Errored Seconds—Line	
	ES-P	Errored Seconds—Path	
	UAS-P	UnAvailable Seconds—Path	
	FC-P	Failure Count—Path (a count of the number of near-end path failure events)	
	LOSS-L	Loss of Signal Seconds—Line	
	AISS-P	Alarm Indication Signal Seconds—Path	
	SAS-P	Severely errored frame (SEF) / AIS Seconds—Path	

F. Alarm Messages

Table 11, Table 12, and Table 13 list OC3, DS1, and unit alarm messages that can be generated by the O3-12D1DN and accessed via the Fault Manager Menu.

Table 11 — OC3 Alarm Messages

Severity	Alarm Message	Description	Potential Corrective Action
Major	OC3 LOS	SONET loss of signal indicates inadequate optical input power.	Check that fiber connections are clean and secure. Ensure that fiber loss does not exceed the rating of the installed transceiver. If these actions fail to correct the problem, replace the transceiver at each end of the circuit.
	OC3 LOF	SONET loss of frame indicates that an optical signal is present, but SONET framing has not been detected.	
Minor	OC3 AIS_L	SONET alarm indication signal for line has been detected.	Check and correct operation of the far-end unit.
	OC3 RDI_L	SONET remote defect indication for line has been detected.	
	OC3 PWR	SONET optical receive power level is 'low.'	Check that fiber connections are clean and secure. Ensure that fiber loss does not exceed the rating of the installed transceiver.

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Table 12 — DS1 Alarm Messages

Severity	Alarm Message	Description	Potential Corrective Action
Major	LOS	DS1 loss of signal has been detected.	Check for loose copper cable connections.
	LOF (NE)	DS1 loss of frame has been detected from the electrical side.	Verify LBO settings. Verify proper and consistent ESF/SF/Unframed provisioning. Check for loose copper cable connections.
	LOF (FE)	DS1 loss of frame has been detected from the optical side.	Check and correct operation of the far-end unit.
Minor	AIS (NE)	DS1 'all ones' have been detected coming from the electrical side.	Check and correct operation of the far-end DS1 circuit.
	RAI (FE)	Remote alarm indication has been detected from the optical side.	
	RDI (FE)	Remote defect indication has been detected from the optical side.	Check and correct operation of the far-end unit.
	AIS (FE)	DS1 'all ones' have been detected coming from the optical side.	
	IN LPBK	DS1 is in the loopback state.	No action is required if loopback tests are desired. Use in-band signaling or craft port to discontinue loopback.
	EXCESSIVE BPVs	DS1 is receiving bipolar violations in excess of 10^{-4} rate.	Verify customer DS1 signal integrity.

Table 13 — Unit Alarm Messages

Severity	Alarm Message	Description	Potential Corrective Action
Major	LIU 1 FAILURE	LIU chip that services DS1 lines 1–4 has failed.	Replace O3-12D1DN.
	LIU 2 FAILURE	LIU chip that services DS1 lines 5–8 has failed.	
	LIU 3 FAILURE	LIU chip that services DS1 lines 9–12 has failed.	
	FPGA FAILURE	CPU is unable to communicate with the custom FPGA, which coordinates communications to other devices on the unit.	
	EEPROM FAILURE	Non-volatile storage device for performance monitoring data has failed.	
	EEPROM2 FAILURE	Second non-volatile storage device for performance monitoring data has failed.	
	MSF250 FAILURE	Device that performs the multiplexing operation has failed.	
	MISSING OPTICS	OC3 optics module is missing.	Install an appropriate SFP transceiver from Table 1.
Minor	NON-PULSECOM OPTICS	SFP module installed is not an Enginuity/Pulsecom-approved device.	Replace the transceiver with an appropriate SFP transceiver from Table 1 or inhibit Unrecognized SFP Alarm through the Craft Port. See Table 8.
	NON-CAPABLE OPTICS	The SFP module does not support OC3	Replace the transceiver with an appropriate SFP transceiver from Table 1.
	TEMPERATURE TOO HIGH	Unit temperature is above 95ºC.	Check fan operation at the near-end unit.
	MGMT PORT FAILURE	MGMT port has failed.	Replace O3-12D1DN.

G. Loopbacks

The O3-12D1DN can recognize in-band and ESF data link loopback codes and supports manual loopbacks through the craft port or TL1 messaging.

General Information on Loopbacks

When a DS1 loopback is initiated, an Alarm Indication Signal, AIS, is forwarded to the DS1 Tip1/Ring1 (receive) pair as shown in Figure 6. This provides notification to the DS1 equipment that the signal has been interrupted.

The O3-12D1DN provides a feature intended to simplify loopback testing with a T1 test set. A DS1 at a Remote unit may be provisioned for "loopdown on AIS=YES". This feature will deactivate a loopback when an AIS is received from the OC-3. Example: The test set is connected to the CO side of the T1, the in-band loop up code is sent to the Remote T1, and the Remote T1 loops back. When testing is complete and the test set is removed from the circuit, the loss of signal will result in an AIS sent toward the remote unit which will trigger a loopdown condition on the Remote T1.
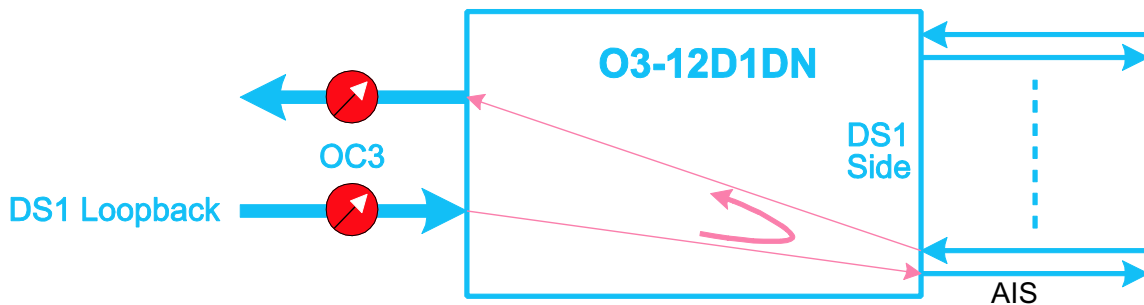
Figure 6: DS1 Remote Loopbacks

In-band and Data Link Loopbacks

The O3-12D1DN can recognize in-band and ESF data link loopback codes as shown Table 14.

To respond to in-band and/or data link DS1 loopbacks, the O3-12D1DN must be provisioned as a Remote (CPE-side) unit (default), have its loopbacks enabled (also default), and be provisioned for either ESF (default) or SF operation. When provisioned for ESF operation, the O3-12D1DN will respond to either in-band or ESF data link (out-of-band) loopback codes; when provisioned for SF operation, the unit will only respond to in-band loopback codes. See Table 14. If provisioned as a CO-side unit, the O3-12D1DN automatically disables all in-band and data link loopback detection.

Table 14 — Loopback Requests

A. SF Configuration	
In-Band Loopback Code	**Binary**
Activate (Network)	11000 (2 in 5)
Deactivate (Network)	11100 (3 in 5)
AIS (Deactivate)*	All Ones
B. ESF Configuration	
In-Band Loopback Code	**Binary**
Activate (Network)	11000 (2 in 5)
Deactivate (Network)	11100 (3 in 5)
AIS (Deactivate)*	All Ones
ESF Data Link Loopback Code	**Binary**
Activate (Line)	00001110 11111111

Deactivate (Line)	00111000 11111111
Universal Deactivate	00100100 11111111
AIS (Deactivate)*	All Ones
*When unit is provisioned for "Loopdown on AIS=YES"	

Manual Loopbacks

Manual loopbacks are available on both the CO and Remote units via the craft port Maintenance Manager Menu. There are three types of T1 manual loopback available:

- Fiber DS1 to Fiber DS1 Loopback (Network toward optical interface)
- Copper DS1 to Copper DS1 Loopback (Customer toward DS1 interface)
- Bilateral Loopback (toward optical and DS1 interfaces)

There is one type of OC3 manual loopback available for use via the craft port. This OC3 Payload loopback can be accessed via the Maintenance Manager Menu.

H. Reset Unit Operation

The O3-12D1DN may be rebooted from the Maintenance Manager Menu. Reset Unit causes the O3-12D1DN to reset similarly to unseating and reseating the unit. This will interrupt service. No provisioning is lost or changed.

I. Status

The Status Menu displays a consolidated view of the status of the O3-12D1DN, including alarm conditions, loopbacks, and the service state of the DS1 interfaces.

Figures 7A and 7B describe the Status Menu information.

As an example, Figure 8 shows both the CO Unit Status Menu and the Remote Unit Status Menu when a Customer Loopback is initiated at the Remote end.

J. Event Log

The Event Log Menu displays a log of events that have occurred on the O3-12D1DN in the past 31 days. The log can be scrolled forward and backward. The view may also be limited to events occurring on a particular interface.

O3-12D1DN
CO

Indicates which side of the unit the customer is connected to.

Indicates which side of the unit the network provider is connected to.

Indicates type of unit setting.

CUST   O3-12D1DN   NTWK

Indicates T1 signals going in towards the unit.

Indicates OC-3 Receive into the CO unit.

<-------- 1 -------->
<-------- 2 -------->
3
4
5
6
7
8
9
10
11
12

Indicates T1 signals going out towards the line.

No dash lines or arrows indicates the T1 is disabled.

Indicates OC-3 Transmit out from the CO unit.

Figure 7A: Status Menu - CO Unit

O3-12D1DN
Remote

Indicates which side of the unit the network provider is connected to.

Indicates which side of the unit the customer is connected to.

Indicates type of unit setting.

NTWK   O3-12D1DN   CUST

Indicates T1 signals going in towards the unit.

Indicates OC-3 Receive into the Remote unit.

<-------- 1 -------->
<-------- 2 -------->
3
4
5
6
7
8
9
10
11
12

Indicates T1 signals going out towards the customer.

No dash lines or arrows indicates the T1 is disabled.

Indicates OC-3 Transmit out from the Remote unit.

Figure 7B: Status Menu - Remote Unit

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O3-12D1DN
CO

CUST   O3-12D1DN   NTWK

<--------   1   ---AIS-->
                2   Result: A T1 alarm
                3   indication signal (AIS) is
---------->   4   shown on the outgoing T1.
                5
                6
                7
<-----------   8
                9
                10
                11
                12

O3-12D1DN
Remote

NTWK   O3-12D1DN   CUST

                                     Operation: Loopback
                                     initiated toward the
<--AIS---   1   --CUST LPBK-->   customer
                2
------------>   3
                4
                5
                6   Result: A T1 alarm
                7   indication signal (AIS) is
<------------   8   shown on the incoming T1.
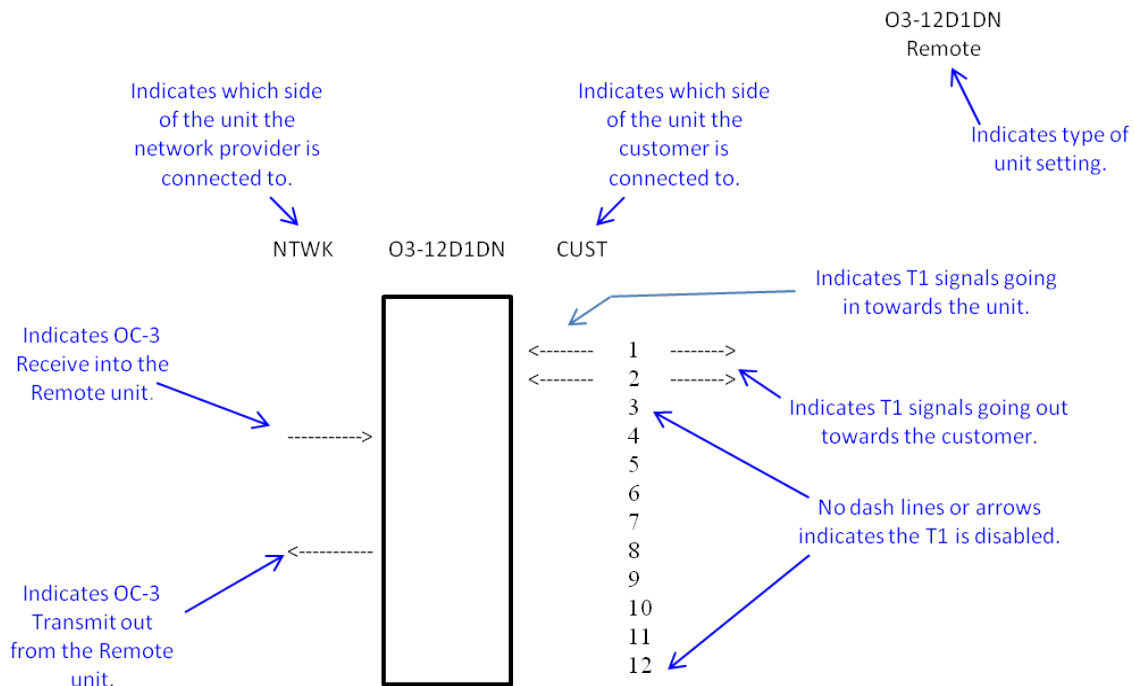   9
                10
                11
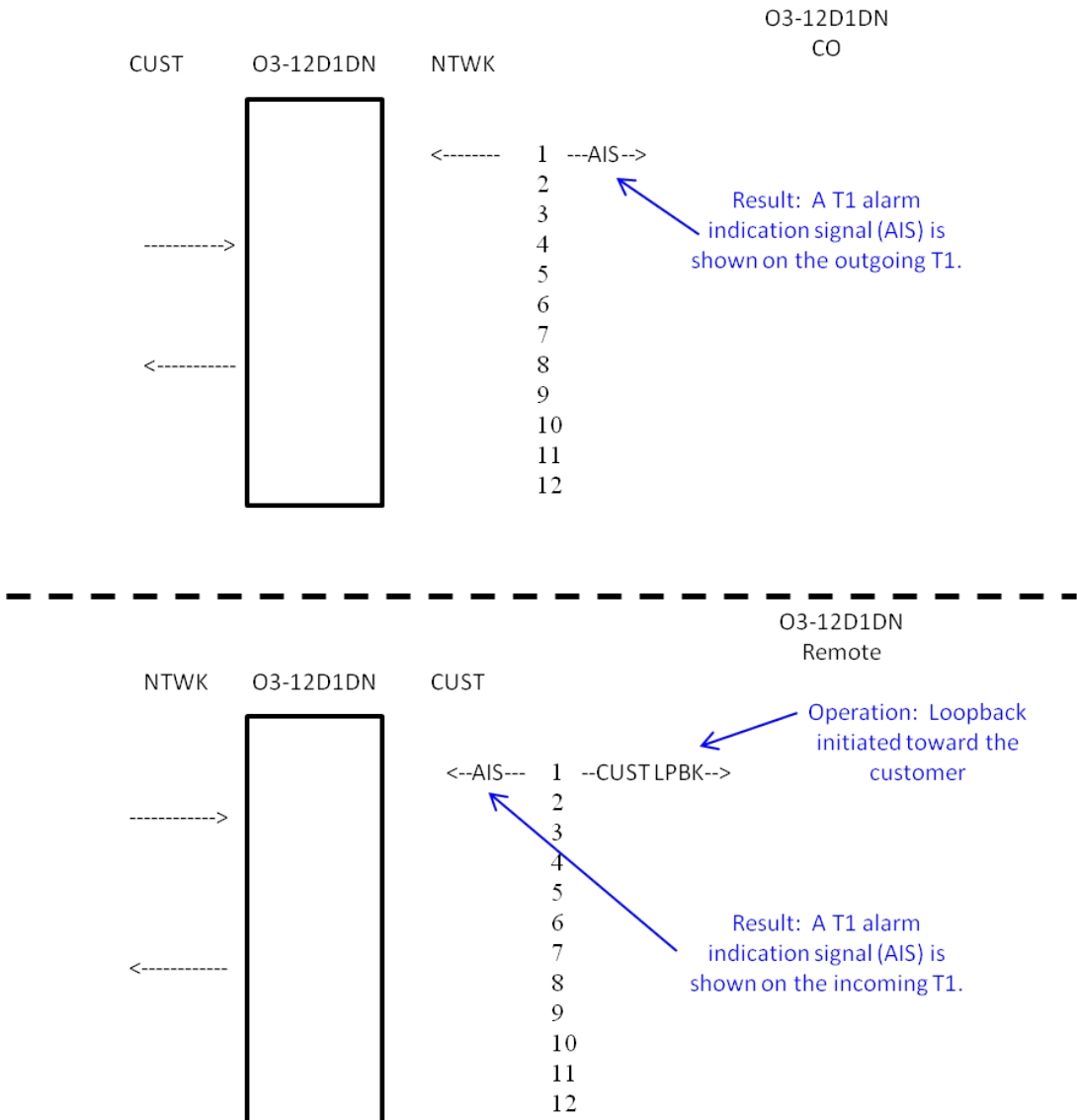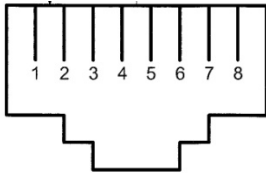   12

Figure 8: Example of Status Menus When Customer Loopback is Initiated

6. MANAGEMENT (MGMT) PORT

This Section is applicable in <u>bookend</u> applications only.

The O3-12D1DN includes an Ethernet management port that supports simultaneous NMA TL1 sessions with CO-side and Remote-side O3-12D1DN units from the CO-side O3-12D1DN when a pair of units is operated in a bookend configuration; refer to Figure 2A. NMA TL1 sessions are also supported by the O3-12D1DN when it is deployed in a single-ended mode and connected to a higher-order multiplexer OC3 drop port as shown in Figure 2B.

An Ethernet crossover adapter is included with each O3-12D1DN. Typically connection to the MGMT port is made using a Cat5 or Cat6 crossover cable. If such a cable is not available, the adapter should be inserted into the MGMT port of the O3-12D1DN and a straight-through cable used. The chart below shows the RJ45 pin assignments for the MGMT port in its as-is form as well as the pin assignments when the adapter is used.

RJ45 view	Pin	Function (as-is)	Function with adapter installed
	1	RX Data +	TX Data +
	2	RX Data —	TX Data —
	3	TX Data +	RX Data +
	4	*No Connection*	*No Connection*
	5	*No Connection*	*No Connection*
	6	TX Data —	RX Data —
	7	*No Connection*	*No Connection*
	8	*No Connection*	*No Connection*

Follow Procedure 10 to configure the Ethernet MGMT port of the O3-12D1DN located in the central office so that it can be connected to the CO router and NMA TL1 sessions with the NOC can be established. During this process:

- The default IP Address of the CO O3-12D1DN MGMT port **will** be changed;
there is no need to change the default IP Address of the Remote O3-12D1DN MGMT port.

- If desired, the Netmask, Gateway, and/or Command Echo default(s) **can** be changed.

**Procedure 10. Setting Up the CO O3-12D1DN Ethernet Management Port
for NMA Access in a Bookend Configuration**

STEP	ACTION
1	After logging into the O3-12D1DN craft port, select Configuration Manager from the Main Menu. Press ENTER.
2	From the Configuration Manager Menu, select Retrieve and Set MGMT Port Provisioning. Press ENTER.
3	Change the CO default **IP Address** of 192.0.2.1: A) From the Mgmt Port Configuration sub-menu, select IP Address. Press ENTER. B) Type the new IP Address. Press ENTER.
4	If it is necessary to change the default **Netmask** of 255.255.255.0: A) From the Mgmt Port Configuration sub-menu, select Netmask. Press ENTER. B) Type the new Netmask. Press ENTER.
5	If it is necessary to change the default **Gateway** of 0.0.0.0: A) From the Mgmt Port Configuration sub-menu, select Gateway. Press ENTER. B) Type the new Gateway. Press ENTER.
6	**CAUTION:** It is recommended that Command Echo remain disabled (default) when the unit is connected to an automated NMA system. If it is necessary to enable **Command Echo**: A) From the Mgmt Port Configuration sub-menu, select Command Echo. Press ENTER. B) Select Enable to turn on Command Echo. Press ENTER.
7	Ensure Bookend mode is set as Enable.
8	**IMPORTANT:** From the Mgmt Port Configuration sub-menu, select Apply Mgmt Settings. Press ENTER to save any changes from Steps 3, 4, 5, or 6.

Next follow Procedure 11 to establish NOC/NMA/TL1 communications. Refer to Practice Section 1707 for the complete list of O3-12D1DN TL1 commands and messages.

Procedure 11. Establishing NOC/NMA/TL1 Communication in a Bookend Configuration

STEP	ACTION
1	Ensure that an intra-office Cat5 or Cat6 Ethernet cable has been plugged into the CO O3-12D1DN MGMT port and that the other end of the cable is plugged into the pre-scribed port on the CO router; this router port must support 100BT. Also see NOTE.
2	From the NOC location, establish a Telnet session with the CO O3-12D1DN as follows: A) Use the command **Telnet IP Address 23** where the **IP Address** is the *new* IP Address entered in Step 3 of Procedure 10; **23** is the Telnet port number for the CO O3-12D1DN and cannot be changed. B) Once connected, type the TL1 command below. [If the default CO TID (PULSECOM) was changed, replace **PULSECOM** with the *new* CO **TID**.] **ACT-USER:PULSECOM:ROOT:1::ROOT#01;** C) After the TL1 session has been established, use the **ED-PID** TL1 command to change the default password; see Enginuity/Pulsecom Practice Section 1707 for details.
3	From the NOC location, establish a Telnet session with the Remote O3-12D1DN as follows: A) Use the command **Telnet IP Address 24** where the **IP Address** is the *new* IP Address entered in Step 3 of Procedure 10; **24** is the Telnet port number for the Remote unit and cannot be changed. B) Once connected, type the TL1 command below. [If the default Remote TID (PULSECOM2) was changed, replace **PULSECOM2** with the *new* Remote **TID**.] **ACT-USER:PULSECOM2:ROOT:1::ROOT#01;** C) After the TL1 session has been established, use the **ED-PID** TL1 command to change the default password; see Practice Section 1707 for details.
NOTE: Telnet sessions can remain active as long as there is NOC connectivity. If the Ethernet cable is unplugged, the unit times out in 15 minutes and the connection must be re-established.		

7. SPECIFICATIONS

Table 15 lists the electrical and physical characteristics of the unit.

Table 15 — O3-12D1DN Specifications

Description	Specification
A. System Characteristics	
Loopback	Remote in-band/out-of-band DS1 loopbacks; Local (manual) loopbacks
B. OC3 Interface	
Optical Bit Rate	155.52 MHz, ± 20 ppm
Optical Wavelength	1310, 1550, 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611 nm
Optical Power Output	See Table 1
Optical Receiver Sensitivity	
Maximum Optical Input Level	
Optical Link Loss Budget	
Optical Receive Monitoring	Loss Of Signal (LOS), Loss Of Frame (LOF), Alarm Indication Signal (AIS), Remote Defect Indication (RDI)
FDA Laser Classification	Class 1
Optical Connectors	Duplex LC snap-in
C. DS1 Interface	
Line Rate	1.544 Mb/s, ± 32 ppm
Line Code	AMI or B8ZS selectable
Line Impedance	100 ohms ± 5%, balanced
Line Rate Tolerance	1.544 Mb/s, ± 130 ppm
Frame Format	SF, ESF, or unframed
Line Build-Out	0 to 655 feet; 0, 7.5 or 15 dB
Alarm Indication Signal	All ones, no framing
D. Front-Panel Connectors	
DS1	50-pin, AMP CHAMP, female bail-lock, RJ48H
OC3 (TX and RX)	LC
CRAFT Port	RS-232, DB-9, female
MGMT Port	RJ45 100BT, female

Table 15 — O3-12D1DN Specifications (Continued)

Description	Specification
E. Power Requirement	
Input Voltage, Absolute	21.0 VDC to 56.7 VDC
Nominal Current a) At –48 VDC b) At +24 VDC or –24 VDC	 295 mA 590 mA
Nominal Power Consumption	14 Watts
F. Environmental	
Temperature Range, Operating (when installed in a Enginuity/Pulsecom 3O3D3-CPL2C or 2O3D3-19A mounting)	–40° to +70°C*
Relative Humidity, Operating	5 to 95%, no condensation
G. Physical	
Shelf Mechanics	Type 400
Size (height × width × depth, excluding edge connector)	5.6 × 1.4 × 5.9 inches
Weight	17 ounces
*When deployed in a 2O3D3-19A REVB chassis, the O3-12D1DN has an operating temperature range of –40° to +75°C.	

8. MAINTENANCE

In case of equipment malfunction, check the front-panel indicators. Reference Table 4.

If an optical connector exhibits transmission loss, clean it carefully using approved fiber-cleaning methods and materials.

9. CUSTOMER SERVICE

Direct questions concerning the operation of the unit to Technical Support. If the unit is defective, limit field repair to replacement of the plug-in module or SFP transceiver. Obtain repair services by returning the defective unit to the Enginuity/Pulsecom Repair Department, 3545 Stern Avenue, St. Charles, IL 60174; email sales@enginuitycom.com.

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