

# Module Specifications

# B

This appendix provides information about line modules, SRP modules, and I/O modules. All line modules, with the exception of the IPsec Service and Tunnel Service module, combine with I/O modules to provide particular capabilities and connections. In this appendix, the term module assembly is used to describe the combination of a line module and an I/O module.

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## Module Assemblies and Model Compatibility

Table B-1 provides a description of the module assemblies.

**Table B-1** Module assemblies available for ERX edge routers

Module Assembly Name	Module Assembly Description	Type	Model Compatibility	SRP Module Compatibility
CE1	Channelized E1	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
cOC3/STM1 F0	OC3/STM channelized to DS3, DS1, E1, and DS0 (single mode and multimode)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+

**Table B-1** Module assemblies available for ERX edge routers (continued)

<b>Module Assembly Name</b>	<b>Module Assembly Description</b>	<b>Type</b>	<b>Model Compatibility</b>	<b>SRP Module Compatibility</b>
cOC12/STM4 F0	OC12/STM4 channelized to DS3, DS1, E1, and DS0 (single mode and multimode; with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
CT1	Channelized T1	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
CT3	Channelized T3 (3 ports)	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
CT3/T3 12	Channelized and unchannelized T3 (12 ports)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
E3 ATM	Unchannelized E3 for ATM	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
E3 FRAME (3 ports)	Unchannelized E3 for Frame (3 ports)	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
E3 FRAME (12 ports)	Unchannelized E3 for Frame (12 ports)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
FE-2	Fast Ethernet (2 ports)	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
FE-8	Fast Ethernet (8 ports)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
Gigabit Ethernet	Gigabit Ethernet (1000 Base-SX, 1000 Base-LH, 1000 Base-ZX)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
HSSI	High Speed Serial Interface	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
IPSec Service	IPSec Tunnel Service	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+

**Table B-1** Module assemblies available for ERX edge routers (continued)

Module Assembly Name	Module Assembly Description	Type	Model Compatibility	SRP Module Compatibility
OC3/STM1 ATM	Unchannelized, concatenated OC3/STM1 for ATM  (4 ports, single mode and multimode, with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
OC3/STM1 POS	Unchannelized, concatenated OC3/STM1 for POS  (4 ports, single mode and multimode, with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
OC12/STM4 ATM	Unchannelized, concatenated OC12/STM4 for ATM  (single mode and multimode; with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
OC12/STM4 POS	Unchannelized, concatenated OC12/STM4 for POS  (single mode and multimode; with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
OC12/STM4 4xOC3/STM1	OC12/STM4 channelized to OC3/STM1 (single mode and multimode with and without APS/MSP redundancy)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
OC48/STM16	Unchannelized, concatenated OC48/STM16 for POS	ASIC	ERX-1440	SRP-40G+
SRP-5G+	Switch route processor (5 Gbps)	N/A	ERX-705 system	SRP-5G+
SRP-10G	Switch route processor (10 Gbps)	N/A	ERX-700 system ERX-1410 system	SRP-10G
SRP-40G+	Switch route processor (40 Gbps)	N/A	ERX-1440 system	SRP-40G+

**Table B-1** Module assemblies available for ERX edge routers (continued)

Module Assembly Name	Module Assembly Description	Type	Model Compatibility	SRP Module Compatibility
T3 ATM (3 ports)	Unchannelized T3 for ATM (3 ports)	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
T3 ATM (4 ports)	Unchannelized T3 for ATM (4 ports)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
T3 FRAME (3 ports)	Unchannelized T3 for Frame (3 ports)	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G
T3 FRAME (12 ports)	Unchannelized T3 for Frame (12 ports)	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
TSM	Tunnel Service for IP Tunnels, L2F Tunnels and LNS Termination	ASIC	ERX-700 series ERX-1400 series	SRP-5G+ SRP-10G SRP-40G+
X.21/V.35	X.21/V.35 synchronous serial interface	Non-ASIC	ERX-700 series ERX-1410 system	SRP-5G+ SRP-10G

## Performance Specifications

Table B-2 provides details about the performance of the line module assemblies.

**Table B-2** Performance specifications for module assemblies

Name	Capability	Redundancy Support	Power Use
CE1	E1 HDLC Framing	1:N redundancy	40 W
cOC3/STM1 F0 (single mode and multimode)	OC3/STM1 DS3 T1, E1 DS0 HDLC Framing	1:N redundancy	130 W
cOC12/STM4 F0 (single mode and multimode, multimode with and without APS/MSP redundancy)	OC12/STM4 OC3/STM1 DS3 T1, E1 DS0 HDLC Framing	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	150 W

**Table B-2** Performance specifications for module assemblies (continued)

Name	Capability	Redundancy Support	Power Use
CT1	DS1, DS0 HDLC Framing	1:N redundancy	40 W
CT3	DS3, DS1, DS0 HDLC Framing	1:N redundancy	60 W
CT3/T3 12 (channelized and unchannelized T3 mode)	DS3, DS1, DS0 HDLC Framing	1:N redundancy	130 W
E3 ATM	ATM/AAL5	1:N redundancy	60 W
E3 FRAME (3 ports)	E3 HDLC Framing	1:N redundancy	60 W
E3 FRAME (12 ports)	E3 HDLC Framing	N/A 1:N redundancy	135 W
FE-2	Ethernet (IEEE 802.3) 10/100BASE-T	N/A	60 W
FE-8	Ethernet (IEEE 802.3) 10/100BASE-T	N/A	130 W
Gigabit Ethernet	Ethernet (IEEE 802.3z) 1000 BASE-SX 1000 BASE-LH 1000 BASE-ZX	Redundant port	130 W
HSSI	Up to 44.736 MHz data rate HDLC	N/A	60 W
IPSec Service	IPSec Tunnels	Multiple IPSec Service modules provide redundancy	130 W
OC3/STM1 ATM (single mode and multimode, with and without APS/MSP redundancy)	OC3/STM-1, ATM:AAL5	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	130 W
OC3/STM1 POS (single mode and multimode, with and without APS/MSP redundancy)	OC3/STM-1, HDLC Framing	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	120 W
OC12/STM4 ATM (single mode and multimode)	OC12/STM-4, ATM:AAL-5	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	130 W
OC12/STM4 POS (single mode and multimode)	OC12/STM-4 HDLC Framing	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	120 W

**Table B-2** Performance specifications for module assemblies (continued)

Name	Capability	Redundancy Support	Power Use
OC12/STM4 4xOC3/STM1 (single mode and multimode)	OC3/STM1 HDLC Framing	<ul style="list-style-type: none"> <li>1:N redundancy</li> <li>APS/MSP redundancy</li> </ul>	130 W
OC48/STM16 POS	OC48/STM-16 HDLC Framing	N/A	200 W
SRP-5G+ (5 Gbps)	Ethernet (IEEE 802.3) 10/100BASE-T RS-232	1:1 redundancy	125 W
SRP-10G (10 Gbps)	Ethernet (IEEE 802.3) 10/100BASE-T RS-232	1:1 redundancy	125 W
SRP-40G+ (40 Gbps)	Ethernet (IEEE 802.3) 10/100BASE-T RS-232	1:1 redundancy	210 W
T3 ATM (3 ports)	ATM/AAL5	1:N redundancy	60 W
T3 ATM (4 ports)	ATM/AAL5	1:N redundancy	130 W
T3 FRAME (3 ports)	DS3 Subrate DS3 HDLC Framing	1:N redundancy	60 W
T3 FRAME (12 ports)	DS3 Subrate DS3 HDLC Framing	1:N redundancy	135 W
TSM	IP Tunnels LNS Termination	Multiple TSMs provide redundancy	130 W
X.21/V.35	HDLC	N/A	60 W

## Connection Information

Table B-3 shows the names of the line modules and I/O modules that you can combine to form the different module assemblies. This table also provides cabling specifications for the I/O modules.

**Table B-3** Connection information for module assemblies

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
CE1	CE1-FULL	CE1-FULL-I/O	20	RJ-48C, 120 ohm	<ul style="list-style-type: none"> <li>• Use shielded cables to maintain EMC compliance.</li> <li>• The transmitted signal complies with ITUT G.703, Physical/electrical characteristics of hierarchical digital interfaces (November 2001) for cable lengths up to 450 m (492 yards).</li> </ul>
CE1T	CE1-FULL	CE1-FULL-I/OT	20	BNC, 75 ohm via a balun panel that connects to the I/O module	<ul style="list-style-type: none"> <li>• Use shielded cables to maintain EMC compliance.</li> <li>• The transmitted signal complies with ITUT G.703, Physical/electrical characteristics of hierarchical digital interfaces (November 2001) for cable lengths up to 450 m (492 yards).</li> </ul>
cOC3/STM1 multimode	COCX/STMX-F0	COC3FO-MM-I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0–9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
cOC3/STM1 single mode intermediate reach	COCX/STMX-F0	COC3FO-SM-I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

<b>Assembly Name and Capability</b>	<b>Line Module Model</b>	<b>I/O Module Model</b>	<b>No. of Ports</b>	<b>Connector Type</b>	<b>Cabling Specifications</b>
cOC3/STM1 single mode long reach	COCX/STMX -F0	ERX-COC3 -4LH-IOA	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9-micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
cOC12/STM4 multimode without APS/MSP redundancy	COCX/STMX -F0	COC12FO- MM-IO	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
cOC12/STM4 multimode with APS/MSP redundancy	COCX/STMX -F0	ERX-COC1 2-MA-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
cOC12/STM4 single mode intermediate reach	COCX/STMX-F0	COC12FO-SM-IO	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
cOC12/STM4 single mode intermediate reach with APS/MSP redundancy	COCX/STMX-F0	ERX-COC12-SA-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
cOC12/STM4 single mode long reach	ERX-COC12-4LH-IOA	COC12FO-SM-IO	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9-micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
CT1	CT1-FULL	CT1-FULL I/O	24	RJ-48C 100 ohm	<ul style="list-style-type: none"> <li>• Use shielded cables to maintain EMC compliance.</li> <li>• The line interface unit supports multiple line build-outs.</li> <li>• Signal strength is software controlled.</li> <li>• The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
CT3	CT3-4	CT3/T3-3_I/O	3	BNC 75 ohm	<ul style="list-style-type: none"> <li>The line interface unit supports two line build-outs: <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>Signal strength is software controlled.</li> <li>The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>
CT3/T3 12 (channelized and unchannelized T3 mode)	CT3_T3-F0	T312-FOF3-I/O	12	BT43 SMB (cable that adapts to 75-ohm BNC is available)	<ul style="list-style-type: none"> <li>The line interface unit supports two line build-outs: <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>Signal strength is software controlled.</li> <li>The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>
E3 ATM	E3-3A	E3-3_I/O	3	BNC 75 ohm	The transmitted signal complies with ITUT G.703, Physical/electrical characteristics of hierarchical digital interfaces (November 2001) for cable lengths from 0–137 m (0–450 feet).
E3 FRAME (3 ports)	E3-3F	E3-3_I/O	3	BNC 75 ohm	The transmitted signal complies with ITUT G.703, Physical/electrical characteristics of hierarchical digital interfaces (November 2001) for cable lengths from 0–137 m (0–450 feet).
E3 FRAME (12 ports)	ERX-UT3E3 OCX-MOD	E3-12-F3-I/O	12	BT43 SMB (cable that adapts to 75-ohm BNC is available)	The transmitted signal complies with ITUT G.703, Physical/electrical characteristics of hierarchical digital interfaces (November 2001) for cable lengths from 0–137 m (0–450 feet).

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
FE-2	10/100_ FE-2	10/100_FE- 2_I/O	2	RJ-45	<ul style="list-style-type: none"> <li>For 10-Mbps operation, use CAT 3, 4, or 5 UTP cable.</li> <li>For 100-Mbps operation, use only CAT 5 UTP cable.</li> <li>The transmitted signal complies with IEEE 802.3/802.3u for cable lengths up to 100 m (328 feet).</li> </ul>
FE-8	GE/FE-8	FE-8_I/O	8	RJ-45	<ul style="list-style-type: none"> <li>For 10-Mbps operation, use CAT 3, 4, or 5 UTP cable.</li> <li>For 100-Mbps operation, use only CAT 5 UTP cable.</li> <li>The transmitted signal complies with IEEE 802.3/802.3u for cable lengths up to 100 m (328 feet).</li> </ul>
GE 1000 Base-LH	GE/FE-8	ERX-GIGE SFP-IOA with RX-10KM-SFP	1 active 1 redundant	LC full duplex (SFP)	<ul style="list-style-type: none"> <li>Tx power <ul style="list-style-type: none"> <li>› min: -9.5 dBm</li> <li>› max: -3 dBm</li> </ul> </li> <li>Center wavelength: 1300 nm</li> <li>Rx input power <ul style="list-style-type: none"> <li>› min: -20 dBm</li> <li>› max: -3 dBm</li> </ul> </li> <li>Rated for 10 km (6.2 miles) over 10-micron core cable</li> </ul>
GE 1000 Base-SX	GE/FE-8	ERX-GIGE SFP-IOA with RX-550M-SFP	1 active 1 redundant	LC full duplex (SFP)	<ul style="list-style-type: none"> <li>Tx power <ul style="list-style-type: none"> <li>› min: -9.5 dBm</li> <li>› max: -4 dBm</li> </ul> </li> <li>Center wavelength: 850 nm</li> <li>Rx input power <ul style="list-style-type: none"> <li>› min: -17 dBm</li> <li>› max: -3 dBm</li> </ul> </li> <li>Rated for 275 m (300 yards) over 62.5-micron core cable</li> <li>Rated for 550 m (601 yards) over 50-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
GE 1000 Base-ZX	GE/FE-8	ERX-GIGE SFP-IOA with RX-70KM -SFP	1 active 1 redundant	LC full duplex (SFP)	<ul style="list-style-type: none"> <li>Tx power               <ul style="list-style-type: none"> <li>› min: -3 dBm</li> <li>› max: 2 dBm</li> </ul> </li> <li>Center wavelength: 1550 nm</li> <li>Rx input power               <ul style="list-style-type: none"> <li>› min: -23 dBm</li> <li>› max: -3 dBm</li> </ul> </li> <li>Rated for 70 km (43.4 miles) over 10-micron core cable</li> </ul>
HSSI	HSSI-3F	HSSI-3-I/O	3	Standard HSSI connector: 2-row, 50-pin, receptacle header with rails and latch blocks	<ul style="list-style-type: none"> <li>50 feet (15.24 m) maximum cable length</li> </ul>
IPSec Service	ERX-IPSEC-MOD	No I/O module	N/A	N/A	N/A
OC3/STM1 ATM multimode without APS/MSP redundancy	OC3/OC12-ATM	OC3-4MM_I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
OC3/STM1 ATM multimode with APS/MSP redundancy	OC3/OC12-ATM	4XOC3 APS I/O MULTI MODE	4 active 4 redundant	LC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -29 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC3/STM1 ATM single mode, intermediate reach without APS/MSP redundancy	OC3/OC12-ATM	OC3-4SM_I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC3/STM1 ATM single mode, intermediate reach with APS/MSP redundancy	OC3/OC12-ATM	4XOC3 APS I/O SINGLE MODE	4 active 4 redundant	LC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -29 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC3/STM1 ATM single mode, long reach	OC3/OC12-ATM	OC3-4LH-I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC3/STM1 POS multimode without APS/MSP redundancy	OC3/OC12-POS	OC3-4MM_I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC3/STM1 POS multimode with APS/MSP redundancy	OC3/OC12-POS	4XOC3 APS I/O MULTI MODE	4 active 4 redundant	LC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0–9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
OC3/STM1 POS single mode, intermediate reach without APS/MSP redundancy	OC3/OC12-POS	OC3-4SM_ I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC3/STM1 POS single mode, intermediate reach with APS/MSP redundancy	OC3/OC12-POS	4xOC3 APS I/O SINGLE MODE	4 active 4 redundant	LC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC3/STM1 POS single mode, long reach	OC3/OC12-POS	OC3-4LH-I/O	4	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9 micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC12/STM4 ATM multimode without APS/MSP redundancy	OC3/OC12-ATM	OC12-MM_I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
OC12/STM4 ATM multimode with APS/MSP redundancy	OC3/OC12-ATM	ERX-OC12 MM-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:                             <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:                             <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC12/STM4 ATM single mode, intermediate reach without APS/MSP redundancy	OC3/OC12-ATM	OC12-SM_I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC12/STM4 ATM single mode, intermediate reach with APS/MSP redundancy	OC3/OC12-ATM	ERX-OC12 SM-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC12/STM4 ATM single mode, long reach without APS/MSP redundancy	OC3/OC12-ATM	OC12-LH_I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9 micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC12/STM4 ATM single mode, long reach with APS/MSP redundancy	OC3/OC12-ATM	ERX-OC12 LH-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9 micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC12/STM4 POS multimode without APS/MSP redundancy	OC3/OC12-POS	OC12-MM_I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
OC12/STM4 POS multimode with APS/MSP redundancy	OC3/OC12-POS	ERX-OC12 MM-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5-micron core cable with an optical loss of 0-9 dB or 50-micron core cable with an optical loss of 7 dB</li> </ul>
OC12/STM4 POS single mode, intermediate reach without APS/MSP redundancy	OC3/OC12-POS	OC12-SM_I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC12/STM4 POS single mode, intermediate reach with APS/MSP redundancy	OC3/OC12-POS	ERX-OC12 SM-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC12/STM4 POS single mode, long reach without APS/MSP redundancy	OC3/OC12-POS	OC12-LH-I/O	1	SC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC12/STM4 POS single mode, long reach with APS/MSP redundancy	OC3/OC12-POS	ERX-OC12 LH-A-IOA	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC12/STM4 4xOC3/STM1 multimode without APS/MSP redundancy	OC3/OC12-POS	OC12 4xOC3 MULTI MODE	1	SC full duplex	<ul style="list-style-type: none"> <li>Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>Center wavelength: 1310 nm</li> <li>Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>Rated for 2 km (1.2 miles) over 62.5 micron core cable with an optical loss of 0-9 dB or 50 micron core cable with an optical loss of 7 dB</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC12/STM4 4xOC3/STM1 multimode with APS/MSP redundancy	OC3/OC12- POS	OC12 4xOC3 MULTI MODE	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -19 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -30 dBm</li> <li>› max: -14 dBm</li> </ul> </li> <li>• Rated for 2 km (1.2 miles) over 62.5 micron core cable with an optical loss of 0-9 dB or 50 micron core cable with an optical loss of 7 dB</li> </ul>
OC12/STM4 4xOC3/STM1 single mode intermediate reach without APS/MSP redundancy	OC3/OC12- POS	OC12 4xOC3 SINGLE MODE	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
OC12/STM4 4xOC3/STM1 single mode intermediate reach with APS/MSP redundancy	OC3/OC12- POS	OC12 4xOC3 APS SINGLE MODE	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -15 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -31 dBm</li> <li>› max: -8 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
OC12/STM4 4xOC3/STM1 single mode long reach without APS/MSP redundancy	OC3/OC12- POS	OC12 4xOC3 APS LONG HAUL	1	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9 micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC12/STM4 4xOC3/STM1 single mode long reach with APS/MSP redundancy	OC3/OC12- POS	OC12 4xOC3 APS LONG HAUL	1 active 1 redundant	SC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -34 dBm</li> <li>› max: -7 dBm</li> </ul> </li> <li>• Fiber type: 9 micron core</li> <li>• Rated for 40 km (24.8 miles) of 9-micron core cable</li> </ul>
OC48/STM16 POS single mode, intermediate reach	ERX-OC48S T16-MOD	ERX-OC48 ST16-IOA	1	LC full duplex	<ul style="list-style-type: none"> <li>• Tx power:               <ul style="list-style-type: none"> <li>› min: -5.0 dBm</li> <li>› max: 0 dBm</li> </ul> </li> <li>• Center wavelength: 1310 nm</li> <li>• Rx input power:               <ul style="list-style-type: none"> <li>› min: -18 dBm</li> <li>› max: -0 dBm</li> </ul> </li> <li>• Rated for 15 km (9.3 miles) of 9-micron core cable</li> </ul>
SRP (5 Gbps)	ERX-5ECC- SRP	SRP_I/O	7	<ul style="list-style-type: none"> <li>• Terminal blocks</li> <li>• BNC</li> <li>• Wire wrap posts</li> <li>• RJ-45</li> <li>• RS-232 (DB-9)</li> </ul>	Use shielded cables to connect the external clock sources to the clock source input ports.

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
SRP (10 Gbps)	SRP-10-ECC	SRP-I/O	7	<ul style="list-style-type: none"> <li>• Terminal blocks</li> <li>• BNC</li> <li>• 75 ohm</li> <li>• Wire wrap posts</li> <li>• RJ-45</li> <li>• RS-232 (DB-9)</li> </ul>	Use shielded cables to connect the external clock sources to the clock source input ports.
SRP (40 Gbps)	ERX-40EC2-SRP	SRP-I/O	7	<ul style="list-style-type: none"> <li>• Terminal blocks</li> <li>• BNC</li> <li>• 75 ohm</li> <li>• Wire wrap posts</li> <li>• RJ-45</li> <li>• RS-232 (DB-9)</li> </ul>	Use shielded cables to connect the external clock sources to the clock source input ports.
T3 ATM (3 ports)	T3-3A	CT3/T3-3 I/O	3	BNC 75 ohm	<ul style="list-style-type: none"> <li>• The line interface unit supports two line build-outs:                             <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>• Signal strength is software controlled.</li> <li>• The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>
T3 ATM (4 ports)	OC3/OC12-A TM	ERX-4T3 ATM-I/O	4	BNC 75 ohm	<ul style="list-style-type: none"> <li>• The line interface unit supports two line build-outs:                             <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>• Signal strength is software controlled.</li> <li>• The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>

**Table B-3** Connection information for module assemblies (continued)

Assembly Name and Capability	Line Module Model	I/O Module Model	No. of Ports	Connector Type	Cabling Specifications
T3 FRAME (3 ports)	T3-3F	CT3/T3-3 I/O	3	BNC 75 ohm	<ul style="list-style-type: none"> <li>• The line interface unit supports two line build-outs:               <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>• Signal strength is software controlled.</li> <li>• The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>
T3 FRAME (12 ports)	CT3-12-F0	T312-F0-F 3--I/O	12	BT43 SMB (cable that adapts to 75-ohm BNC is available)	<ul style="list-style-type: none"> <li>• The line interface unit supports two line build-outs:               <ul style="list-style-type: none"> <li>› 0–68.5 m (0–225 feet)</li> <li>› 69–137 m (226–450 feet)</li> </ul> </li> <li>• Signal strength is software controlled.</li> <li>• The transmitted signal complies with ANSI T1.102-1993 Digital Hierarchy - Electrical Interfaces (1999) for cable lengths up to 201 m (660 feet).</li> </ul>
TSM	TUNNEL-SERVICE	No I/O module	N/A	N/A	N/A
X.21/V.35	ERX-X21-V35-MOD	ERX-X21-V35-IOA	16	200-pin proprietary socket on I/O module  DB15 X.21 or DB34 V.35 at remote end	See Table B-4.

*Cable Lengths for X.21/V.35 Cables*

Serial signals can travel a limited distance without significant degradation. Slower serial signals can travel farther without degradation than faster serial signals. Table B-4 shows the maximum cable lengths you can use to prevent signal degradation at various transmission speeds.

**Table B-4** Maximum cable lengths for X.21/V.35 connections

Transmission Speed (Hz)	Cable Length (Feet)	Cable Length (m)
2400	4,100	1,250
4800	2,050	625
9600	1,025	312
19200	513	156
38400	256	78
56000	102	31
2048000	25	8

