



M40 Internet Router

PIC Guide

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This guide provides an overview and description of the Physical Interface Cards (PICs) supported by the Juniper Networks M40 Internet router. The PICs are described alphabetically. Table 1 lists the PICs supported by the M40 Internet router.

PICs provide the physical connection to various network media types. The PICs are mounted on Flexible PIC Concentrators (FPCs), which are inserted into a slot in a router. A PIC occupies a single slot on an FPC. PICs receive incoming packets from the network and transmit outgoing packets to the network. During this process, each PIC performs framing and high-speed signaling for its media type. Before transmitting outgoing data packets, the PICs encapsulate the packets received from the FPCs. Each PIC is equipped with a media-specific ASIC that performs control functions tailored to the PIC's media type. For complete information about installing PICs and transceivers, see the *PIC and Transceiver Installation Instructions* located at <http://www.juniper.net/techpubs/>.

Blank PICs resemble other PICs, but do not provide any physical connection or activity. When a slot is not occupied by a PIC, you must insert a blank PIC to fill the empty slot and ensure proper cooling of the system.



NOTE: A single FPC slot has a maximum throughput of 3.2 Gbps. Inserting a combination of PICs with an aggregate higher than that is supported, but constitutes oversubscription.

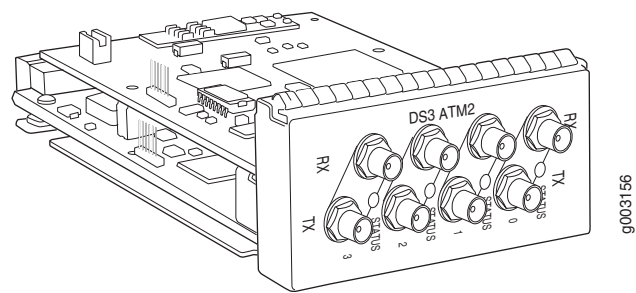
Blank PICs resemble other PICs, but do not provide any physical connection or activity. When a slot is not occupied by a PIC, you must insert a blank PIC to fill the empty slot and ensure proper cooling of the system.

Table 1: PICs Supported in the M40 Internet Router

| PIC Family and Type | Ports | First JUNOS Support | PIC Slots Required | Page |
|----------------------------|--------------|----------------------------|---------------------------|-------------|
| ATM2 IQ | | | | |
| ATM2 IQ DS3 | 4 | 6.1 | 1 slot | 5 |
| ATM2 IQ E3 | 4 | 6.1 | 1 slot | 7 |
| ATM2 IQ OC3 | 2 | 5.5 | 1 slot | 9 |
| ATM2 IQ OC12 | 1 | 5.5 | 1 slot | 12 |
| Channelized | | | | |
| Channelized OC12 | 1 | 4.0 | 1 slot | 19 |
| Multichannel DS3 | 2 | 5.1 | 1 slot | 43 |
| Channelized IQ | | | | |
| Channelized DS3 IQ | 4 | 5.6 | 1 slot | 15 |
| Channelized E1 IQ | 10 | 5.6 | 1 slot | 17 |
| Channelized OC12 IQ | 1 | 5.6 | 1 slot | 21 |
| Channelized STM1 IQ | 1 | 5.7 | 1 slot | 23 |
| DS3, E1, and T1 | | | | |
| DS3 | 4 | 3.1 | 1 slot | 25 |
| E1 | 4 | 4.1 | 1 slot | 27 |
| T1 | 4 | 4.1 | 1 slot | 55 |
| E3 IQ | | | | |
| E3 IQ | 4 | 6.1 | 1 slot | 29 |
| Ethernet | | | | |
| Fast Ethernet | 4 | 4.1 | 1 slot | 35 |
| Fast Ethernet | 8 | 5.2 | 1 slot | 35 |
| Fast Ethernet | 12 | 5.1 | 1 slot | 35 |
| Gigabit Ethernet with SFP | 1 | 6.3 | 1 slot | 38 |
| Ethernet IQ | | | | |
| Gigabit Ethernet IQ | 1 | 6.0 | 1 slot | 40 |
| IP Services | | | | |
| ES | 0 | 5.2 | 1 slot | 33 |
| Link Services | 0 | 5.6 | 1 slot | 42 |
| Tunnel Services | 0 | 3.3 | 1 slot | 57 |
| Serial | | | | |
| EIA-530 | 2 | 5.6 | 1 slot | 31 |
| SONET/SDH | | | | |
| SONET/SDH OC3c/STM1 | 4 | 3.1 | 1 slot | 45 |

| PIC Family and Type | Ports | First JUNOS Support | PIC Slots Required | Page |
|--------------------------------|--------------|----------------------------|---------------------------|-------------|
| SONET/SDH OC12c/STM4 | 1 | 3.1 | 1 slot | 48 |
| SONET/SDH OC48c/STM16 with SFP | 1 | 6.1 | Entire FPC slot | 51 |

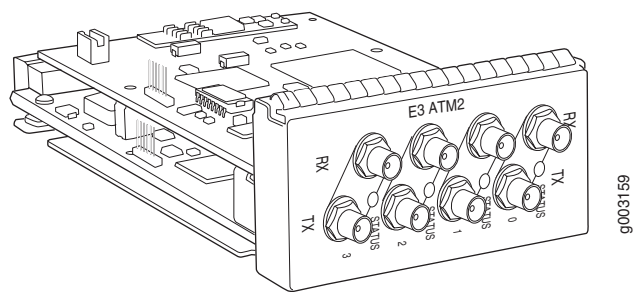
ATM2 IQ DS3 PIC



| | |
|-------------------|--|
| Software release | ■ JUNOS 6.1 and later |
| Description | <div>■ Four DS3 ports</div> <div>■ Power requirement: 0.41 A @ 48 V (20.0 W)</div> <div>■ Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface.</div> <div>■ ATM standards compliant</div> |
| Hardware features | <div>■ 16-MB SDRAM memory for ATM segmentation and reassembly (SAR)</div> <div>■ ATM switch ID</div> <div>■ Configurable framing options:<div>■ C-bit with ATM direct mapping</div><div>■ C-bit with Physical Layer Convergence Protocol (PLCP) framing (default)</div><div>■ M23 ATM direct mapping</div><div>■ M23 with PLCP framing</div></div> <div>■ Internal and loop timing</div> |

| | |
|-----------------------------------|--|
| Software features | <ul style="list-style-type: none"> ■ Per-virtual circuit (VC) and per-virtual path (VP) traffic shaping ■ Unspecified bit rate (UBR) traffic shaping ■ Fine-grained variable bit rate (VBR) traffic shaping ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ ATM Inverse Address Resolution Protocol (ARP), which enables routers to automatically learn the IP address of the router on the far end of an ATM permanent virtual circuit (PVC) ■ Simple Network Management Protocol (SNMP): <ul style="list-style-type: none"> ■ Management Information Base (MIB) 2 (RFC 1213) ■ ATM MIB (RFC 1695) ■ SONET MIB ■ AAL5 encapsulations: <ul style="list-style-type: none"> ■ ATM-VC-MUX ■ ATM-NLPID ■ ATM-Cisco-LLPID ■ ATM-SNAP ■ ATM-CCC-VC-MUX |
| Cables and connectors | <ul style="list-style-type: none"> ■ 10 ft (3.05 m) posilock SMB to BNC (provided) ■ Four pairs of Rx and Tx coaxial cables |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Far-end block error (FEBE) ■ Frame error ■ Idle code ■ Idle received ■ Local and remote loopback ■ Loss of signal (LOS) ■ Out of frame (OOF) ■ Path parity error ■ Yellow alarm |

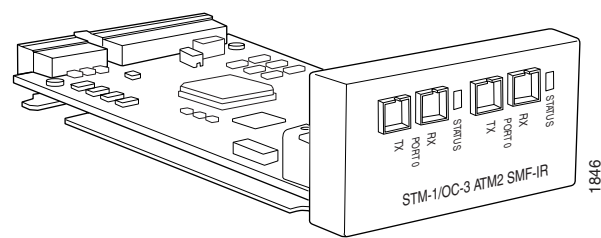
ATM2 IQ E3 PIC



| | |
|-------------------|--|
| Software release | <ul style="list-style-type: none">JUNOS 6.1 and later |
| Description | <ul style="list-style-type: none">Four E3 portsPower requirement: 0.41 A @ 48 V (20 W)Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface.ATM standards compliant |
| Hardware features | <ul style="list-style-type: none">16-MB SDRAM memory for ATM segmentation and reassembly (SAR)ATM switch IDConfigurable framing options:<ul style="list-style-type: none">G.751 direct mappingG.751 with PLCP encapsulation (default)G.832 ATM direct mappingInternal and loop timing |

| | |
|-----------------------------------|--|
| Software features | <ul style="list-style-type: none"> ■ Per-virtual circuit (VC) and per-virtual path (VP) traffic shaping ■ Unspecified bit rate (UBR) traffic shaping ■ Fine-grained variable bit rate (VBR) traffic shaping ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ ATM Inverse Address Resolution Protocol (ARP), which enables routers to automatically learn the IP address of the router on the far end of an ATM permanent virtual circuit (PVC) ■ Simple Network Management Protocol (SNMP): <ul style="list-style-type: none"> ■ Management Information Base (MIB) 2 (RFC 1213) ■ ATM MIB (RFC 1695) ■ SONET MIB ■ AAL5 encapsulations: <ul style="list-style-type: none"> ■ ATM-VC-MUX ■ ATM-NLPID ■ ATM-Cisco-LLPID ■ ATM-SNAP ■ ATM-CCC-VC-MUX |
| Cables and connectors | <ul style="list-style-type: none"> ■ 10 ft (3.05 m) posilock SMB to BNC (provided) ■ Four pairs of Rx and Tx coaxial cables |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Frame error ■ Line code violation ■ Local and remote loopback ■ Loss of signal (LOS) ■ Out of frame (OOF) ■ Yellow alarm |

ATM2 IQ OC3 PIC



| | |
|-------------------|--|
| Software release | <ul style="list-style-type: none">JUNOS 5.5 and later |
| Description | <ul style="list-style-type: none">Two OC3 portsPower requirement: 0.41 A @ 48 V (20 W)Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface.Conforms to ANSI T1.105-1991 and T1E1.2/93-020R1ATM and SONET/SDH standards compliantAlarm and event counting and detectionCompatible with well-known ATM switchesATM switch ID, which displays the switch IP address and local interface name of the adjacent Fore ATM switches |
| Hardware features | <ul style="list-style-type: none">Single 3010 SAR for segmentation and reassembly into 53 byte ATM cellsHigh-performance parsing of SONET/SDH framesASIC-based packet segmentation and reassembly (SAR) management and output port queuing64 MB SDRAM memory for ATM SARPacket buffering, Layer 2 parsing |

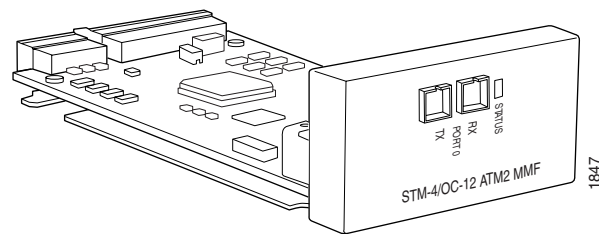
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|------------------------------|--|
| Software features | <ul style="list-style-type: none"> ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) for leveraging ATM access networks ■ User-configurable virtual circuit (VC) and virtual path (VP) support ■ Support for idle cell or unassigned cell transmission ■ OAM fault management processes Alarm Indication Signal (AIS), Remote Defect Indicator (RDI) cells, and loop cells ■ Point-to-point and point-to-multipoint mode Layer 2 counters per VC and per VP ■ Local and remote loopback ■ ATM Inverse Address Resolution Protocol (ARP), which enables routers to automatically learn the IP address of the router on the far end of an ATM permanent virtual circuit (PVC) ■ Simple Network Management Protocol (SNMP): <ul style="list-style-type: none"> ■ Management Information Base (MIB) 2 (RFC 1213) ■ ATM MIB (RFC 1695) ■ SONET MIB ■ Unspecified bit rate (UBR), non-real-time variable bit rate (VBR), and constant bit rate (CBR) traffic shaping ■ Per-VC or per-VP traffic shaping ■ Support for F4 OAM cells ■ Support for 16 bit VCI range |
| Cables and connectors | <ul style="list-style-type: none"> ■ Duplex SC/PC connector (RX and TX) ■ Optical interface support—see Table 2 |

| | |
|-----------------------------------|---|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS-L, AIS-P) ■ Bit error rate signal degrade (BERR-SD), Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity errors B1, B2, B3 ■ Errored seconds (ES-S, ES-L, ES-P), Far-end bit errors REI-L, REI-P (CV-LFE, CV-PFE), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Loss of cell delineation (LOC), Loss of frame (LOF), Loss of pointer (LOP-P), Loss of signal (LOS) ■ Payload mismatch (PLM-P), Payload unequipped (UNEQ-P) ■ Remote defect indication (RDI-L, RDI-P) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |

Table 2: Optical Interface Support for ATM2 OC3 IQ PICs

| Parameter | Intermediate Reach (IR) | Multimode |
|------------------------|--------------------------------|-----------------------|
| Optical interface | Single-mode | Multimode |
| Transceiver type | Fixed | Fixed |
| Standard | Telcordia GR-253 | Multivendor agreement |
| Maximum distance | 9.3 miles/15 km | 1.2 miles/2 km |
| Transmitter wavelength | 1260 through 1360 nm | 1270 through 1380 nm |
| Average launch power | –15 through –8 dBm | –20 through –14 dBm |
| Receiver saturation | –8 dBm | –14 dBm |
| Receiver sensitivity | –28 dBm | –30 dBm |

ATM2 IQ OC12 PIC



| | |
|--------------------------|---|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 5.5 and later |
| Description | <ul style="list-style-type: none"> ■ One OC12 port ■ Power requirement: 0.41 A @ 48 V (20 W) ■ Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface. ■ Conforms to ANSI T1.105-1991 and T1E1.2/93-020R1 ■ ATM and SONET/SDH standards compliant ■ Alarm and event counting and detection ■ Compatible with well-known ATM switches ■ ATM switch ID, which displays the switch IP address and local interface name of the adjacent Fore ATM switches |
| Hardware features | <ul style="list-style-type: none"> ■ One 3010 SAR for segmentation and reassembly into 53-byte ATM cells ■ High-performance parsing of SONET/SDH frames ■ ASIC-based packet segmentation and reassembly (SAR) management and output port queuing ■ 64 MB SDRAM memory for ATM SAR ■ Packet buffering, Layer 2 parsing |

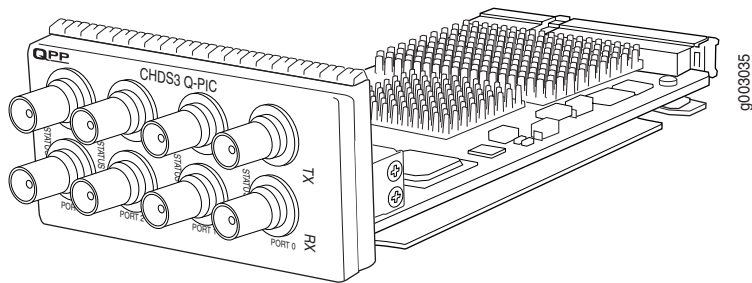
| | |
|------------------------------|--|
| Software features | <ul style="list-style-type: none"> ■ Multiprotocol Label Switching (MPLS) circuit cross-connect for leveraging ATM access networks ■ User-configurable virtual circuit (VC) and virtual path (VP) support ■ Support for idle cell or unassigned cell transmission ■ OAM Fault Management processes Alarm Indication Signal (AIS), Remote Defect Indicator (RDI), and loop cells ■ Point-to-point and point-to-multipoint mode Layer 2 counters per VC and per VP ■ Local and remote loopback ■ ATM Inverse ARP, which enables routers to automatically learn the IP address of the router on the far end of an ATM PVC ■ Simple Network Management Protocol (SNMP): <ul style="list-style-type: none"> ■ Management Information Base (MIB) 2 (RFC 1213) ■ ATM MIB (RFC 1695) ■ SONET MIB ■ Unspecified bit rate (UBR), non-real-time variable bit rate (VBR), and constant bit rate (CBR) traffic shaping ■ Per-VC or per-VP traffic shaping ■ Support for F4 OAM cells ■ Support for 16 bit VCI range |
| Cables and connectors | <ul style="list-style-type: none"> ■ Duplex SC/PC connector (Rx and Tx) ■ Optical interface support—see Table 3 |

| | |
|-----------------------------------|---|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS-L, AIS-P) ■ Bit error rate signal degrade (BERR-SD), Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity errors B1, B2, B3 ■ Errored seconds (ES-S, ES-L, ES-P), Far-end bit errors REI-L, REI-P (CV-LFE, CV-PFE), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Loss of cell delineation (LOC), Loss of frame (LOF), Loss of pointer (LOP-P), Loss of signal (LOS) ■ Payload mismatch (PLM-P), Payload unequipped (UNEQ-P) ■ Remote defect indication (RDI-L, RDI-P) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |

Table 3: Optical Interface Support for ATM2 OC12/STM4 IQ PICs

| Parameter | Intermediate Reach (IR) Transceiver | Multimode Transceiver |
|------------------------|--|------------------------------|
| Optical interface | Single-mode | Multimode |
| Transceiver type | Fixed | Fixed |
| Standard | Telcordia GR-253 | Multivendor agreement |
| Maximum distance | 9.3 miles/15 km | 546.8 yards/500 m |
| Transmitter wavelength | 1274 through 1356 nm | 1270 through 1380 nm |
| Average launch power | -15 through -8 dBm | -20 through -14 dBm |
| Receiver saturation | -8 dBm | -14 dBm |
| Receiver sensitivity | -28 dBm | -26 dBm |

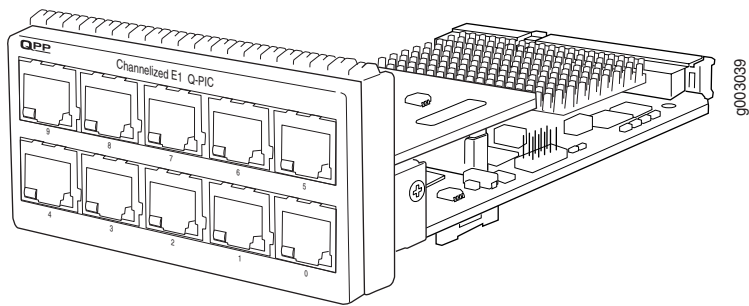
Channelized DS3 IQ PIC



| | |
|-----------------------|---|
| Software release | <ul style="list-style-type: none">JUNOS 5.6 and later |
| Description | <ul style="list-style-type: none">Four DS3 portsPower requirement: 0.32 A @ 48 V (15.6 W)Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface.Channelization: DS3, DS0 |
| Hardware features | <ul style="list-style-type: none">Data Service Unit (DSU) functionalitySubrate and scrambling:<ul style="list-style-type: none">Digital Link/Quick EagleKentroxLarscomAdtranVerilinkB3ZS line encodingM13 or C-bit parityFull Bit Error Rate Testing (BERT)Local and remote loopback testing |
| Software features | <ul style="list-style-type: none">Quality of Service (QoS) per channel: Weighted Round Robin (WRR), Random Early Detection (RED), Weighted Random Early Detection (WRED)Simple Network Management Protocol (SNMP): DS1 MIB, DS3 MIBDynamic, arbitrary channel configurationEncapsulations:<ul style="list-style-type: none">High-level Data Link Control (HDLC)Frame RelayMultiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC)Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none">Standard DS3 BNC coaxial cable interfaces |

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|-----------------------------------|--|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Excessive zeros (EXZ) ■ Far-end Block Error (FEBE) ■ Frame error ■ Idle code, Idle received ■ Line code violation (LCV) ■ Loss of signal (LoS) ■ Out of frame (OoF) ■ Parity bit (P-bit) disagreements ■ Path parity error ■ Yellow alarm bit (X-bits) disagreements |
| Instrumentation (counters) | <ul style="list-style-type: none"> ■ Layer 2 per-queue and per-channel packet and byte counters |

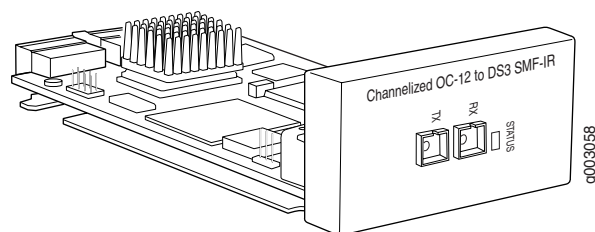
Channelized E1 IQ PIC



| | |
|-----------------------|---|
| Software release | <ul style="list-style-type: none">JUNOS 5.6 and later |
| Description | <ul style="list-style-type: none">Ten E1 portsPower requirement: 0.15 A @ 48 V (7.2 W)Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface.Channelization: E1, DS0 |
| Hardware features | <ul style="list-style-type: none">Data Service Unit (DSU) functionalityPorts configurable as clear channel E1 interfaces with 2.048 Mbps connectivitySupports unframed E1 G.703 and G.704 framing modesSupports HDB3 line codingCRC4 configurableLocal and remote loopback testing |
| Software features | <ul style="list-style-type: none">Quality of Service (QoS) per channel: Weighted Round Robin (WRR), Random Early Drop (RED), Weighted Random Early Drop (WRED)Simple Network Management Protocol (SNMP): E1 MIB, DS0 MIBDynamic, arbitrary channel configurationFull Bit Error Rate Testing (BERT)Encapsulations:<ul style="list-style-type: none">High-level Data Link Control (HDLC)Frame RelayMultiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC)Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none">120 ohm RJ-48C |

| | |
|-----------------------------------|---|
| LEDs | One bicolor per E1 port: <ul style="list-style-type: none">■ Off—Port not enabled■ Green—Physical E1 link is up; individual subchannels can be down■ Red—Physical E1 link is down |
| Alarms, errors, and events | <ul style="list-style-type: none">■ Alarm indication signal (AIS)■ Loss of frame (LOF)■ Out of frame (OOF)■ Failed signal rate (FSR) |
| Instrumentation (counters) | <ul style="list-style-type: none">■ Layer 2 per-queue and per-channel packet and byte counters |

Channelized OC12 PIC



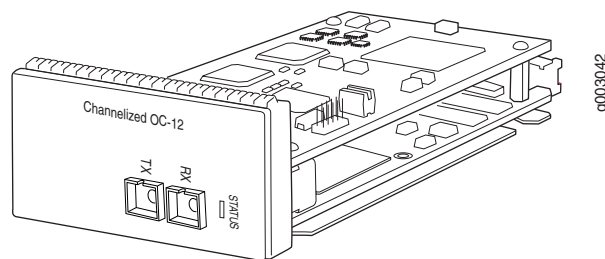
| | |
|------------------------------|---|
| Software release | <ul style="list-style-type: none"> JUNOS 4.0 and later |
| Description | <ul style="list-style-type: none"> One OC12 port Power requirement: 0.23 A @ 48 V (10.8 W) 12 DS3 channels Supports IP version 4 (IPv4) unicast and multicast as well as MPLS, Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), and Border Gateway Protocol (BGP) |
| Hardware features | <ul style="list-style-type: none"> ASIC-based, high-performance throughput on all ports Integrated DSU functionality with subrate and scrambling support for each DS3 channel Class-of-service support for each DS3 channel Dual-router SONET automatic protection switching (APS) Rate policing on input for each DS3 channel Rate shaping output for each DS3 channel Packet buffering, Layer 2 parsing |
| Software features | <ul style="list-style-type: none"> M13/C-bit parity encoding Full instrumentation per DS3 channel DS3 diagnostics and loopback control DS3 alarm and event counting and detection DS3 Far-end Alarm and Control (FEAC) channel support Encapsulations: <ul style="list-style-type: none"> High-level Data Link Control (HDLC) Frame Relay Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC) Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none"> Duplex SC/PC connector (RX and TX); single-mode fiber |

| | |
|-----------------------------------|--|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm Indication Signal (AIS-L, AIS-P) ■ BERT functionality (you can configure one DS3 channel in BERT mode and configure the remaining channels to transmit and receive normal traffic) ■ Bit Error Rate Signal Degrade (BERR-SD), Bit Error Rate Signal Fail (BERR-SF) ■ Bit Interleaved Parity Errors B1, B2, B3 (CV-S, CV-L, CV-P) ■ Equipment failure (Does not affect service) ■ Errored Seconds (ES-S, ES-L, ES-P), Far-end Bit Errors REI-L, REI-P (CV-LFE, CV-PFE), Far-end Block Error (FEBE), Far-end Errored Seconds (ES-LFE, ES-PFE), Far-end Severely Errored Seconds (SES-LFE, SES-PFE), Far-end Unavailable Seconds (UAS-LFE, UAS-PFE) ■ Frame error ■ Idle code, Idle received ■ Loss of Frame (LoF), Loss of Pointer (LoP-P), Loss of Signal (LoS) ■ Out of Frame (OoF) ■ Payload Mismatch (PLM-P), Payload Unequipped (UNEQ-P) ■ Parity bit (P-bit) disagreements ■ Path parity error ■ Remote Defect Indication (RDI-L, RDI-P) ■ Severely Errored Framing (SEF), Severely Errored Framing Seconds (SEFS-S), Severely Errored Seconds (SES-S, SES-L, SES-P), Unavailable Seconds (UAS-L, UAS-P) ■ Yellow alarm bit (X-bit) disagreements |

Table 4: Optical Interface Support for Channelized OC12 PICs

| Optical Parameter | Single-Mode Intermediate Reach |
|--------------------------|---------------------------------------|
| Optical interface | Single-mode transmitter |
| Standard | Telcordia GR-253 compliant |
| Maximum distance | Single-mode cable: 9.3 miles/15 km |
| Wavelength | 1274 through 1356 nm |
| Average launch power | –15 through –8 dBm |
| Receiver saturation | –8 dBm |
| Receiver sensitivity | –28 dBm |

Channelized OC12 IQ PIC



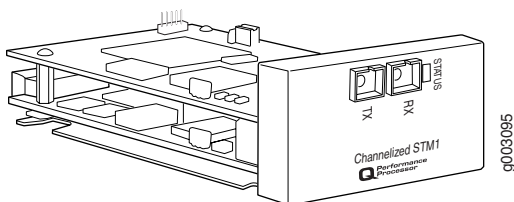
| | |
|------------------------------|---|
| Software release | <ul style="list-style-type: none"> JUNOS 5.6 and later |
| Description | <ul style="list-style-type: none"> One OC12 port Power requirement: 0.23 A @ 48 V (10.8 W) Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface. Channelization: OC3, DS3, DS1, DS0 |
| Hardware features | <ul style="list-style-type: none"> Subrate and scrambling: <ul style="list-style-type: none"> Digital Link/Quick Eagle Kentrox Larscom Adtran Verilink Packet buffering, Layer 2 parsing M13/C-bit parity encoding DS3 far-end alarm and control (FEAC) channel support Local and remote loopback testing |
| Software features | <ul style="list-style-type: none"> Quality of Service (QoS) per channel: Weighted Round Robin (WRR), Random Early Drop (RED), Weighted Random Early Drop (WRED) Simple Network Management Protocol (SNMP): OC3 MIB, DS3 MIB, T1 MIB Dynamic, arbitrary channel configuration Full Bit Error Rate Testing (BERT) Encapsulations: <ul style="list-style-type: none"> High-level Data Link Control (HDLC) Frame Relay Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC) Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none"> Duplex SC/PC connector (Rx and Tx); single-mode fiber Optical interface support — see Table 5 |

| | |
|-----------------------------------|---|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS-L, AIS-P) ■ Bit error rate signal degrade (BERR-SD), Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity errors B1, B2, B3 (CV-S, CV-L, CV-P) ■ Errored seconds (ES-S, ES-L, ES-P), Far-end bit errors REI-L, REI-P (CV-LFE, CV-PFE), Far-end block error (FEBE), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Frame error ■ Idle code, Idle received ■ Loss of frame (LOF), Loss of pointer (LOP-P), Loss of Ssignal (LOS) ■ Out of Frame (OOF) ■ Payload mismatch (PLM-P), Payload unequipped (UNEQ-P) ■ Parity bit (P-bit) disagreements ■ Path parity error ■ Remote defect indication (RDI-L, RDI-P) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) ■ Yellow alarm bit (X-bit) disagreements |
| Instrumentation (counters) | <ul style="list-style-type: none"> ■ Layer 2 per-queue and per-channel packet and byte counters |

Table 5: Optical Interface Support for Channelized OC12 IQ PICs

| Parameter | Intermediate Reach (IR) |
|------------------------|--------------------------------|
| Optical interface | Single-mode |
| Standard | Telcordia GR-253 |
| Maximum distance | 9.3 miles/15 km |
| Transmitter wavelength | 1274 through 1356 nm |
| Average launch power | -15 through -8 dBm |
| Receiver saturation | -8 dBm |
| Receiver sensitivity | -28 dBm |

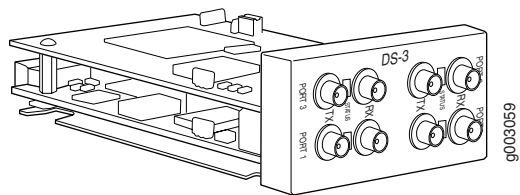
Channelized STM1 IQ PIC



| | |
|------------------------------|---|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 5.7 and later |
| Description | <ul style="list-style-type: none"> ■ One STM1 port ■ Power requirement: 0.39 A @ 48 V (18.6 W) ■ Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface. ■ Channelization: STM1c, fractional E1, framed and unframed DS0 |
| Hardware features | <ul style="list-style-type: none"> ■ Packet buffering, Layer 2 parsing ■ Local and remote loopback testing |
| Software features | <ul style="list-style-type: none"> ■ Quality of Service (QoS) per channel: Weighted Round Robin (WRR), Random Early Drop (RED), Weighted Random Early Drop (WRED) ■ Simple Network Management Protocol (SNMP): SONET/SDH MIB, T1/E1 MIB ■ Dynamic, arbitrary channel configuration ■ Full Bit Error Rate Testing (BERT) patterns at E1 and DS0 levels ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ MPLS translational cross-connect (TCC) ■ Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none"> ■ Duplex SC/PC connector (Rx and Tx); single-mode intermediate-reach fiber |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |

| | |
|-----------------------------------|--|
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS-L, AIS-P) ■ Bit error rate signal degrade (BERR-SD), Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity errors B1, B2, B3 (CV-S, CV-L, CV-P) ■ Errored beconds (ES-S, ES-L, ES-P), Far-end bit errors REI-L, REI-P (CV-LFE, CV-PFE), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Loss of frame (LOF), Loss of pointer (LOP-P), Loss of signal (LOS) ■ Payload mismatch (PLM-P), Payload unequipped (UNEQ-P) ■ Remote defect indication (RDI-L, RDI-P) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |
| Instrumentation (counters) | <ul style="list-style-type: none"> ■ Layer 2 per-queue and per-channel packet and byte counters |

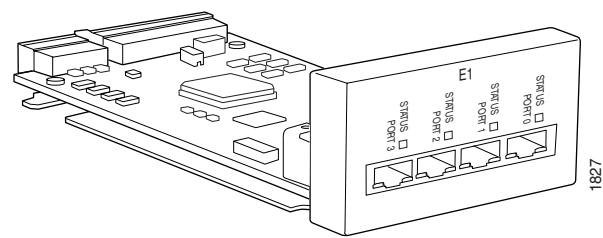
DS3 PIC



| | |
|-------------------|--|
| Software release | <ul style="list-style-type: none">JUNOS 3.1 and later |
| Description | <ul style="list-style-type: none">Four DS3 portsPower requirement: 0.47 A @ 48 V (22.5 W)Integrated DSU interoperability with leading DSU vendors |
| Hardware features | <ul style="list-style-type: none">High-performance throughput on each port at speeds up to 44.736 Mbps, full duplexC-bit framingB3ZS line encodingSubrate and scrambling:<ul style="list-style-type: none">Digital LinkKentroxLarscomPer-port rate policing on inputPer-port rate shaping on outputPacket buffering, Layer 2 parsing |
| Software features | <ul style="list-style-type: none">DS3 functionality:<ul style="list-style-type: none">C-bit framingB3ZS line encodingDS3 diagnostics and loopback controlDS3 alarm and event counting and detectionPer-packet counts and byte countsLocal and remote loopback testing, as well as BERT testing per DS3DS3 far-end alarm and control (FEAC) channel supportEncapsulations:<ul style="list-style-type: none">High-level Data Link Control (HDLC)Frame RelayMultiprotocol Label Switching (MPLS) circuit cross-connect (CCC)Point-to-Point Protocol (PPP) |

| | |
|-----------------------------------|---|
| Cables and connectors | <ul style="list-style-type: none"> ■ Custom 10-ft (3.05-m) posilock SMB to BNC male cable, separate Rx and Tx (provided) |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Bit error rate test (BERT) functionality on PIC (you can configure one DS3 channel in BERT mode and configure the remaining channels to transmit and receive normal traffic) ■ Equipment failure (Does not affect service) ■ Far-end block error (FEBE) ■ Frame error ■ Idle code, Idle received ■ Local and remote loopback ■ Loss of signal (LOS) ■ Out of frame (OOF) ■ Parity bit (P-bit) disagreements ■ Path parity error ■ Yellow alarm bit (X-bit) disagreements |

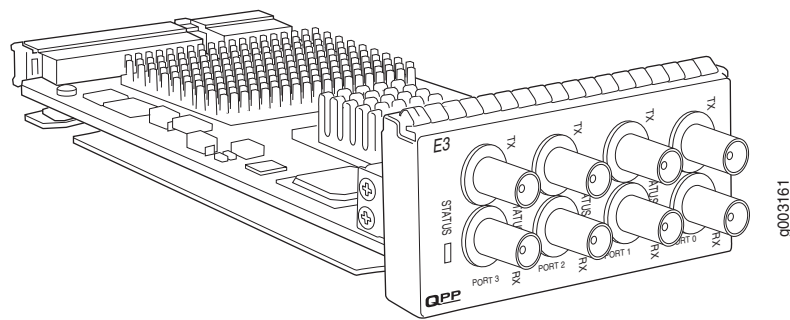
E1 PIC



| | |
|-------------------|--|
| Software release | <ul style="list-style-type: none">JUNOS 4.1 and later |
| Description | <ul style="list-style-type: none">Four E1 or coaxial portsPower requirement: 0.08 A @ 48 V (3.74 W)Two versions:<ul style="list-style-type: none">4-port, 120-ohm, RJ-484-port, 75-ohm, coaxialOnboard DSU functionality for E1 connectivity |
| Hardware features | <ul style="list-style-type: none">High-performance throughput on each port at speeds up to 2.048 Mbps, full duplexMaximum transmission units (MTUs) of up to 4500 bytesPer-interface diagnostics and loopback controlPer-interface shaping on outputPer-interface alarm and event counting and detectionHDB3 line coding4-bit CRC for G.704 framed modePer-port loop timingBalanced and unbalanced modesPacket buffering, Layer 2 parsing |

| | |
|-----------------------------------|---|
| Software features | <ul style="list-style-type: none"> ■ Integrated support for G.703 unframed mode and G.704 framed mode with CRC; this feature is user-configurable <p>NOTE: The G.704 implementation supports speeds slower than 2.048 Mbps; multiple channels within a single E1 interface are not supported.</p> <ul style="list-style-type: none"> ■ Configurable clock source: Internal or loop ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ Point-to-Point Protocol (PPP) |
| Cables and connectors | <p>Two versions:</p> <ul style="list-style-type: none"> ■ Four RJ-48 connectors (one per port) ■ Four coaxial connectors ■ Custom 10-ft (3.05-m) posilock to BNC male cable, separate Rx and Tx |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Bipolar violations ■ Excessive zeros ■ Far-end block errors (FEBE, E-bit errors) ■ Loss of frame (LOF), Loss of signal (LOS) ■ Local and remote loopback diagnostics ■ Yellow alarm bit (X-bit) disagreements |

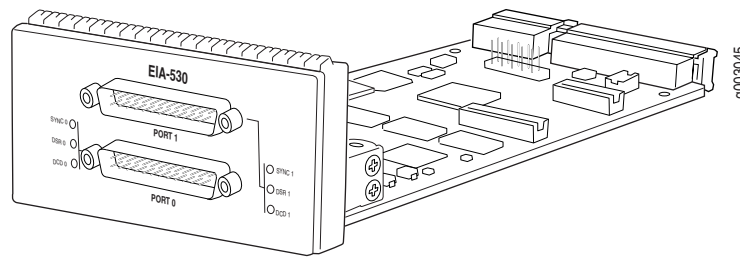
E3 IQ PIC



| | |
|--------------------------|---|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 6.1 and later |
| Description | <ul style="list-style-type: none"> ■ Four E3 ports ■ Power requirement: 0.38 A @ 48 V (18 W) ■ Intelligent queuing (IQ) PICs support fine-grained queuing per logical interface. |
| Hardware features | <ul style="list-style-type: none"> ■ Clear-channel (34.368-Mbps) and subrate E3 ■ Unframed or ITU G.751 framing ■ Data Service Unit (DSU) functionality ■ Subrate and scrambling: <ul style="list-style-type: none"> ■ Digital Link/Quick Eagle ■ Kentrox ■ HDB3 line encoding ■ Full Bit Error Rate Testing (BERT) ■ Local and remote loopback testing |

| | |
|-----------------------------------|--|
| Software features | <ul style="list-style-type: none"> ■ Quality of Service (QoS) per port: Weighted Round Robin (WRR), Random Early Drop (RED), Weighted Random Early Drop (WRED) ■ Simple Network Management Protocol (SNMP): E3 MIB, QoS MIB ■ Input policing and output shaping ■ Provider-side rate limiting ■ Full data link connection identifier (DLCI) range with sparse channel numbering ■ Per-DLCI queues with weighted deficit round robin and strict priority ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ MPLS translational cross-connect (TCC) ■ Point-to-Point Protocol (PPP) ■ JUNOS release 7.0 or later is recommended to configure graceful Routing Engine switchover (GRES). |
| Cables and connectors | <ul style="list-style-type: none"> ■ Standard E3 BNC coaxial cable interfaces |
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ Alarm indication signal (AIS) ■ Equipment failure (does not affect service) ■ Frame error ■ Line code violation ■ Loss of signal (LOS) ■ Out of frame (OOF) ■ Yellow alarm bit (A-bit) disagreements |
| Instrumentation (counters) | <ul style="list-style-type: none"> ■ Layer 2 per-queue packet and byte counters |

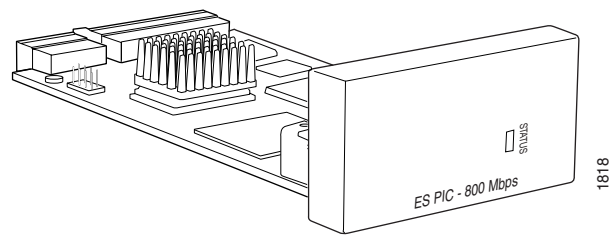
EIA-530 PIC



| | |
|--------------------------|--|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 5.6 and later |
| Description | <ul style="list-style-type: none"> ■ Two EIA-530, X.21 or V.35 serial ports ■ Power requirement: 0.07 A @ 48 V (3.4 W) |
| Hardware features | <ul style="list-style-type: none"> ■ Configured as Data Terminal Equipment (DTE) ports ■ Resynchronization signal ■ Receives clock rates up to 16 Mbps ■ Local, Data Communications Equipment (DCE) local, and DTE remote loopbacks |
| Software features | <ul style="list-style-type: none"> ■ Supports four queues per port ■ Random Early Drop (RED) ■ Transmitter Signal Element Timing is looped from the timing received on the Transmitted Signal Element DCE. EIA-530 ports support the ability to invert the Transmit Data Element. The EIA-530 ports support the following rates: <ul style="list-style-type: none"> ■ 2.048 Mbps ■ 2.341 Mbps ■ 2.731 Mbps ■ 3.277 Mbps ■ 4.09 Mbps ■ 5.461 Mbps ■ 8.192 Mbps ■ 16.384 Mbps ■ V.35 ports support up to 2.048 Mbps ■ X.21 ports support up to 10 Mbps ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC) ■ Point-to-Point Protocol (PPP) |

| | |
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| Cables and connectors | <ul style="list-style-type: none"> ■ Two DB-25 male connectors (one per port, included with PIC) ■ V.35 requires an EIA-530 to V.35 cable and connects to a V.35 DTE 34-pin Winchester type male cable (one per port) ■ X.21 requires an EIA-530 to X.21 cable and connects to a X.21 DTE DB-15 male cable |
| LEDs | <p>Three bicolor per port:</p> <ul style="list-style-type: none"> ■ Data Set Ready (DSR): <ul style="list-style-type: none"> ■ Green—DSR is detected or ignored ■ Red—DSR expected but not present ■ Data Carrier Detect (DCD): <ul style="list-style-type: none"> ■ Green—DCD is detected or ignored ■ Red—DCD expected but not present ■ Resynchronization <ul style="list-style-type: none"> ■ Green—Keepalives are being received ■ Red—Data Terminal Ready (DTR) toggled from low to high (resynchronization pulses are being sent) |
| Instrumentation (counters) | <ul style="list-style-type: none"> ■ Per-port packet and byte counters ■ Resynchronization counters: <ul style="list-style-type: none"> ■ Number of resynchronizations initiated ■ Time of last resynchronization |

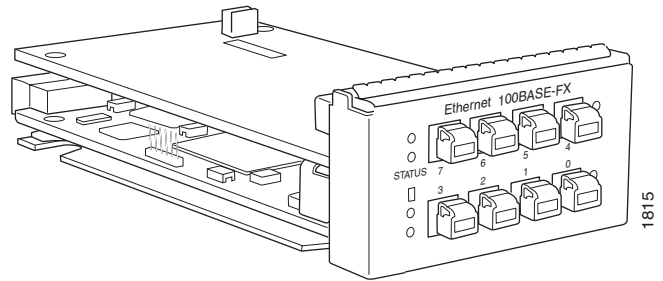
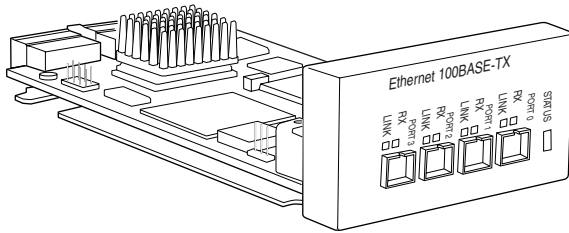
ES PIC



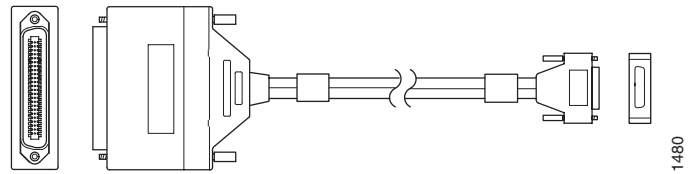
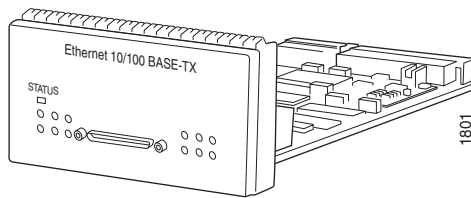
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| Software release | <ul style="list-style-type: none">JUNOS 5.2 and later |
| Description | <ul style="list-style-type: none">High-bandwidth encryption (in accordance with IPSec standards)Power requirement: 0.21 A @ 48 V (10 W)Support for IPSec encryption, decryption, and key calculation acceleration <p>NOTE: The ES PIC does not support reassembly and decryption of encrypted packets that were fragmented in an IPSec tunnel.</p> |
| Hardware features | <ul style="list-style-type: none">Extends the existing security functionality to Internet traffic at high-performance ratesThroughput at 800 Mbps, half duplex1000 IPSec tunnels or 2000 IPSec security association (SA) pairsSupports MTUs of up to 3900 bytes |
| Software features | <p>For a list of the software features available for services PICs, see the <i>JUNOS Services Interfaces Configuration Guide</i>.</p> <ul style="list-style-type: none">Support for IPv4Authentication hash algorithms: MD-5 and SHA-1Encryption algorithms: DES, 3-DES, and NullAutomated key management using Diffie-Hellman key establishmentSupport for pre-shared key managementAuthentication Header and Encapsulating Security Payload (ESP) independently or in bundle modeTunnel mode IPSec encryption and decryption for data trafficTransport mode IPSec encryption and decryption for control trafficStatic and dynamic security associations (SA) supportedSA lifetime configurable in seconds and kilobytesJUNOS release 7.0 or later is recommended to configure graceful Routing Engine switchover (GRES). |

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| LEDs | <p>One tricolor:</p> <ul style="list-style-type: none">■ Off—Not enabled■ Green—Online with no alarms or failures■ Amber—Online with alarms for remote failures■ Red—Active with a local alarm; router has detected a failure |
| Instrumentation (counters) | <ul style="list-style-type: none">■ Input and output bytes per tunnel■ Total authentication failures■ Total anti-reply failures■ Total encryption ASIC errors per PIC |

Fast Ethernet PICs



Left: 4-Port Fast Ethernet; Right: 8-Port Fast Ethernet



Left: 12-Port Fast Ethernet; Right: VHD CI to RJ-21 Cable

Software release

- 4-port: JUNOS 4.1 and later
- 8-port: JUNOS 5.2 and later
- 12-port: JUNOS 5.1 and later

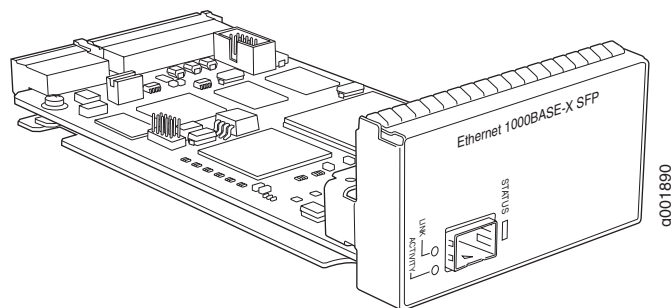
| | |
|------------------------------|---|
| Description | <ul style="list-style-type: none"> ■ 4 or 12 100Base-TX ports; 8 100Base-FX ports ■ Power requirement: <ul style="list-style-type: none"> ■ 4-port: 0.14 A @ 48 V (6.8 W) ■ 8-port: 0.26 A @ 48 V (12.5 W) ■ 12-port: 0.23 A @ 48 V (11 W) |
| Hardware features | <ul style="list-style-type: none"> ■ High-performance throughput on each port at speeds up to 100 Mbps ■ Source and destination Media Access Control (MAC) address filtering ■ RMON EtherStats packet buffering ■ 802.3 Ethernet standard compliant ■ 4-port PICs support MTUs of up to 9192 bytes; 8-port and 12-port PICs support MTUs of up to 1532 bytes ■ 4-port PICs support 1024 802.1Q VLANs per port; 8-port and 12-port PICs support 16 802.1Q VLANs per port |
| Software features | <ul style="list-style-type: none"> ■ Auto sensing full-duplex and half-duplex modes ■ Virtual Router Redundancy Protocol (VRRP) ■ 802.1Q virtual LANs (VLANs) ■ Circuit cross-connect (CCC) VLAN |
| Cables and connectors | <p>4-port PIC:</p> <ul style="list-style-type: none"> ■ Connector: Two-pair, category 5 unshielded twisted-pair connectivity through an RJ-45 connector ■ Pinout: MDI noncrossover <p>8-port PIC:</p> <ul style="list-style-type: none"> ■ Connector: MT-RJ female ■ FX optical interface—see Table 6 <p>12-port PIC:</p> <ul style="list-style-type: none"> ■ Connector: One very High Density Connector Interface (VHDCI) to RJ-21 cable that connects to an RJ-45 patch panel |

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| LEDs | <p>Status LEDs, one bicolor:</p> <ul style="list-style-type: none"> ■ Off—PIC ports not enabled ■ Green—PIC is operating normally ■ Red—PIC has an error or failure <p>4-port PIC—One pair of port LEDs:</p> <ul style="list-style-type: none"> ■ Link LED—If green, the port is online; if there is no light, the port is down ■ RX LED—If flashing green, the port is receiving data; if there is no light, the port might be on, but is not receiving data <p>8-port PIC—one pair of LEDs per port:</p> <ul style="list-style-type: none"> ■ Link LED—If green, the port is online; if there is no light, the port is down <p>NOTE: The Link LED remains lit on the 8-port PIC when the port is down.</p> <ul style="list-style-type: none"> ■ RX LED—If flashing green, the port is receiving data; if there is no light, the port might be on, but is not receiving data <p>12-port PIC—one LED per port:</p> <ul style="list-style-type: none"> ■ Green—100-Mbps link established ■ Flashing green—100-Mbps activity ■ Yellow—10-Mbps link established ■ Flashing yellow—10-Mbps activity ■ Off—No link present <p>NOTE: The port LEDs remains lit on the 12-port PIC when the ports are down.</p> |
|-------------|--|

Table 6: Optical Interface Support for Fast Ethernet PICs

| Parameter | FX Interface for 8-Port |
|----------------------|--------------------------------------|
| Optical interface | Multimode |
| Maximum distance | 62.5/125 MMF cable: 1.24 miles /2 km |
| Wavelength | 1,270 to 1,380 nm |
| Average launch power | –20 to –14 dBm |
| Receiver saturation | –14 dBm |
| Receiver sensitivity | –34 dBm |

Gigabit Ethernet PIC with SFP



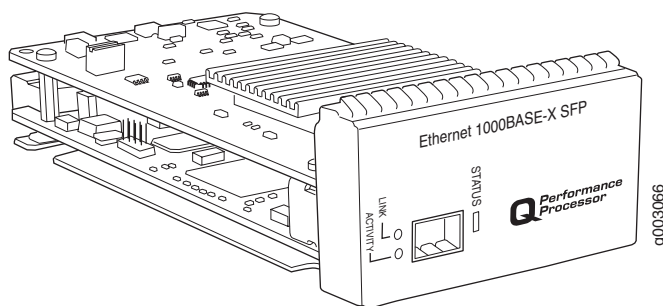
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|--------------------------|--|
| Software release | <ul style="list-style-type: none">■ JUNOS 6.3 and later |
| Description | <ul style="list-style-type: none">■ One Gigabit Ethernet port■ Power requirement: 0.25 A @ 48 V (11.9 W)■ Supports large Ethernet frame sizes for more efficient throughput across the intra-POP network |
| Hardware features | <ul style="list-style-type: none">■ High-performance throughput on each port at speeds up to 1 Gbps■ Autonegotiation between Gigabit Ethernet circuit partners■ Full-duplex mode■ Maximum transmission units (MTUs) of up to 9192 bytes |
| Software features | <ul style="list-style-type: none">■ Virtual Router Redundancy Protocol (VRRP) support■ 802.1Q virtual LANs (VLANs) support■ 960 destination MAC filters per port■ 64 source MAC filters per VLAN PIC■ 1024 source MAC filters per port■ Flexible Ethernet encapsulation■ Multiple tag protocol identifiers (TPID) support■ Source MAC learning■ MAC accounting and policing—Dynamic local address learning of source MAC addresses |

| | |
|------------------------------|--|
| Cables and connectors | <ul style="list-style-type: none"> ■ You can install any transceiver supported by the PIC. For information about installing and removing transceivers, see the <i>PIC and Transceiver Installation Instructions</i>. ■ SX, LX, and LH SFP transceivers: <ul style="list-style-type: none"> ■ Duplex LC/PC connector (Rx and Tx) ■ Optical interface support—see Table 7 ■ 1000Base-T SFP transceivers: <ul style="list-style-type: none"> ■ Connector: Four-pair, category 5 shielded twisted-pair connectivity through an RJ-45 connector ■ Pinout: MDI crossover ■ Length: 328 ft/100 m <p>NOTE: Do not install SONET/SDH OC48c/STM16 SFPs in the Gigabit Ethernet port. The port will not recognize the SFP.</p> |
| LEDs | <p>Status LEDs, one bicolor:</p> <ul style="list-style-type: none"> ■ Off—PIC is not enabled ■ Green—PIC is operating normally ■ Red—PIC has an error or failure <p>Port LEDs, one pair per port:</p> <ul style="list-style-type: none"> ■ Link—If green, the port is online; if there is no light, the port is down ■ Activity—If flashing green, the port is receiving data; if there is no light, the port might be on, but is not receiving data |

Table 7: Optical Interface Support for Gigabit Ethernet PICs with SFP

| Parameter | 1000Base-SX | 1000Base-LX | 1000Base-LH |
|------------------------|-------------------------------------|--|--------------------------------------|
| Optical interface | Multimode | Single-mode | Single-mode |
| Transceiver type | SFP | SFP | SFP |
| Maximum distance | 62.5/125 MMF cable: 656 ft/200 m | 9/125 SMF cable: 6.2 miles/10 km | 9/125 SMF cable: 43.5 miles/70 km |
| | 50/125 MMF cable: 1640 ft/500 m | 62.5/125 and 50/125 MMF cable: 1804.5 ft/550 m | |
| Transmitter wavelength | 770 through 860 nm | 1270 through 1355 nm | 1355 through 1580 nm |
| Average launch power | −9.5 through 0 dBm | −11.5 through −3 dBm | −3 through +3 dBm |
| Average receive power | −17 through 0 dBm | −19 through −3 dBm | −23 through 1580 dBm |
| Receiver saturation | 0 dBm | −3 dBm | −3 dBm |
| Receiver sensitivity | −17 dBm | −19 dBm | −23 dBm |

Gigabit Ethernet IQ PIC



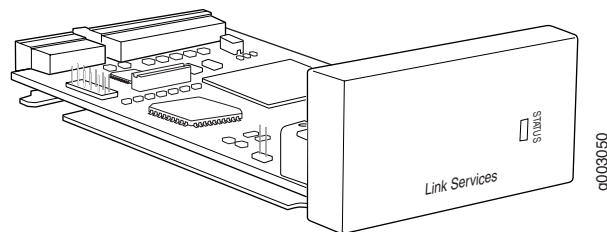
| | |
|--------------------------|--|
| Software release | <ul style="list-style-type: none">■ JUNOS 6.0 and later |
| Description | <ul style="list-style-type: none">■ One Gigabit Ethernet port■ Power requirement: 0.46 A @ 48 V (22 W)■ Intelligent queuing (IQ) PICs support fine-grained queuing per-logical interface. |
| Hardware features | <ul style="list-style-type: none">■ High-performance throughput at speeds up to 1 Gbps■ Full-duplex mode■ Large MTUs of up to 9192 bytes |
| Software features | <ul style="list-style-type: none">■ Quality of Service (QoS) per channel: Weighted Round Robin (WRR), Random Early Drop (RED), Weighted Random Early Drop (WRED)■ Virtual Router Redundancy Protocol (VRRP) support■ 802.1Q Virtual LANs■ VLAN stacking and rewriting■ MAC policing, accounting, and filters■ JUNOS release 7.0 or later is recommended to configure graceful Routing Engine switchover (GRES). |

| | |
|------------------------------|--|
| Cables and connectors | <ul style="list-style-type: none"> ■ The Gigabit Ethernet IQ PICs uses small form factor-pluggables (SFPs) that allow different interfaces to be used on the PIC. For information about installing and removing SFPs, see the <i>M40 Internet Router Hardware Guide</i>. ■ SX, LX, and LH SFPs: <ul style="list-style-type: none"> ■ Duplex LC/PC connector (RX and TX) ■ 1000Base-T SFPs: <ul style="list-style-type: none"> ■ Connector: Four-pair, category 5 shielded twisted pair connectivity through an RJ-45 connector ■ Pinout: MDI crossover ■ Length: 328 ft/100 m |
| LEDs | <ul style="list-style-type: none"> ■ Status LEDs, one tricolor: <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure ■ Port LEDs, one per port: <ul style="list-style-type: none"> ■ Off—Port is down ■ Green—Link is established |

Table 8: Optical Interface Support for Gigabit Ethernet IQ PICs with SFP

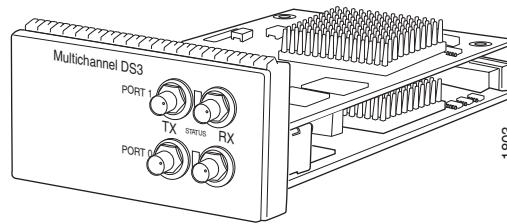
| Parameter | 1000Base-SX | 1000Base-LX | 1000Base-LH |
|------------------------|-------------------------------------|---|--------------------------------------|
| Optical interface | Multimode | Single-mode | Single-mode |
| Transceiver type | SFP | SFP | SFP |
| Standard | IEEE 802.3—1998 | IEEE 802.3—1998 | Multivendor agreement |
| Maximum distance | 62.5/125 MMF cable: 656 ft/200 m | 9/125 SMF cable: 6.2 miles/10 km | 9/125 SMF cable: 43.5 miles/70 km |
| | 50/125 MMF cable: 1640 ft/500 m | 62.5/125 or 50/125 MMF cable: 1804.5 ft/550 m | |
| Transmitter wavelength | 770 through 860 nm | 1270 through 1355 nm | 1480 through 1580 nm |
| Average launch power | −9.5 through 0 dBm | −11.5 through −3 dBm | −3 through +3 dBm |
| Average receive power | −17 through 0 dBm | −19 through −3 dBm | −20 through −3 dBm |
| Receiver saturation | 0 dBm | −3 dBm | −3 dBm |
| Receiver sensitivity | −17 dBm | −19 dBm | −23 dBm |

Link Services PIC



| | |
|--------------------------|---|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 5.6 and later |
| Description | <ul style="list-style-type: none"> ■ Power requirement: 0.17 A @ 48 V (8 W) ■ Three versions: <ul style="list-style-type: none"> ■ 4 multilink bundles, 256 LFI links ■ 32 multilink bundles, 256 LFI links ■ 128 multilink bundles, 256 LFI links ■ Multilink bonding, link fragmentation and interleaving (LFI), and tunneling |
| Hardware features | <ul style="list-style-type: none"> ■ Rate limiting/policing per multilink bundle ■ Byte-wise load balancing across multilink bundles ■ Bonding T1 links enable service ranging from 1.5 Mbps through 12 Mbps ■ Bonding E1 links enable service ranging from 2 Mbps through 16 Mbps ■ Loopback function that encapsulates and de-encapsulates packets |
| Software features | <p>For a list of the software features available for services PICs, see the <i>JUNOS Services Interfaces Configuration Guide</i>.</p> <ul style="list-style-type: none"> ■ Protocol support: <ul style="list-style-type: none"> ■ Multilink PPP (MLPPP) ■ Multilink Frame Relay (MLFR)—FRF.15 and FRF.16 ■ Link fragmentation and interleaving (LFI)—FRF.12 ■ LFI over MLPPP ■ IP-IP unicast tunneling ■ GRE unicast tunneling ■ PIM sparse mode unicast tunneling |
| LEDs | <p>One bicolor:</p> <ul style="list-style-type: none"> ■ Off—PIC is offline ■ Green—PIC is online and at least one configured bundle is operating ■ Amber—PIC is online, but no configured bundles are operating |

Multichannel DS3 PIC

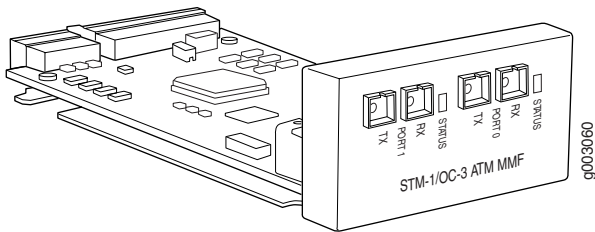


| | |
|------------------------------|---|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 5.1 and later |
| Description | <ul style="list-style-type: none"> ■ Two DS3 ports ■ Power requirement: 0.31 A @ 48 V (14.9 W) ■ Supports up to 128 logical customer channels per DS3 port |
| Hardware features | <ul style="list-style-type: none"> ■ Support for NxT1 by interoperating with the Link Services and Multilink Services PICs, using MLPPP and MLFR protocols ■ Onboard DSU functionality |
| Software features | <ul style="list-style-type: none"> ■ Support for four data-link connection identifiers (DLCIs) per logical customer channel ■ DS3 alarm and event counting ■ DS3 alarm and event detection ■ DS3 diagnostics and loopback control ■ DS3 framing: M13, C-bit ■ T1 framing: super frame (SF) and extended super frame (ESF) ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) ■ Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none"> ■ Custom 10 ft/3.05 m posilock to BNC male cable, separate Rx and Tx |

| | |
|-------------|--|
| LEDs | One tricolor per port: <ul style="list-style-type: none">■ Off—Not enabled■ Green—Online with no alarms or failures■ Amber—Online with alarms for remote failures■ Red—Active with a local alarm; router has detected a failure |
|-------------|--|

| | |
|-----------------------------------|---|
| Alarms, errors, and events | <ul style="list-style-type: none">■ Far-end Block Error (FEBE)■ Parity bit (P-bit) disagreements■ Path priority error■ Alarm Indication Signal (AIS)■ Loss of Signal (LoS)■ Out of Frame (OoF)■ Yellow alarm■ AIS Received■ Simultaneous BERT functionality■ Idle received■ Local and remote loopback |
|-----------------------------------|---|

SONET/SDH OC3c/STM1 PIC



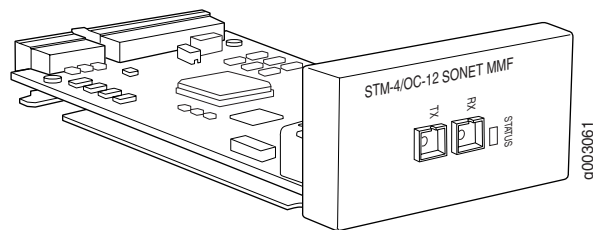
| | |
|-----------------------|--|
| Software release | <ul style="list-style-type: none">JUNOS 4.1 and later |
| Description | <ul style="list-style-type: none">Four OC3 portsPower requirement: 0.49 A @ 48 V (23.7 W) |
| Hardware features | <ul style="list-style-type: none">Multiplexing and demultiplexingRate policing on inputRate shaping on outputPacket buffering, Layer 2 parsing |
| Software features | <ul style="list-style-type: none">SONET/SDH framingLink aggregationAlarm and event counting and detectionDual-router automatic protection switching (APS)Multiprotocol Label Switching (MPLS) fast rerouteEncapsulations:<ul style="list-style-type: none">High-level Data Link Control (HDLC)Frame RelayMultiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC)Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none">Duplex SC/PC connector (Rx and Tx)Optical interface support—see Table 9 <p>NOTE: To extend the life of the laser, when a PIC is not being actively used with any valid links, take the PIC offline until you are ready to establish a link to another device. For information about taking a PIC offline, see the request chassis pic offline command in the <i>JUNOS System Basics and Services Command Reference</i>.</p> |

| | |
|-----------------------------------|--|
| LEDs | One tricolor per port: |
| | <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ SONET alarms: <ul style="list-style-type: none"> ■ Alarm indication signal—line (AIS-L) ■ Alarm indication signal—path (AIS-P) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (LOP-P) ■ Loss of signal (LOS) ■ Far-end bit error: remote error indication—line (REI-L) (CV-LFE) ■ Far-end bit error: remote error indication—path (REI-P) (CV-PFE) ■ Payload mismatch (path label mismatch) (PLM-P) ■ Payload unequipped (unequipped STS at path level) (UNEQ-P) ■ Remote defect indication—line (RDI-L) ■ Remote defect indication—path (RDI-P) ■ SDH alarms: <ul style="list-style-type: none"> ■ Multiplex section alarm indication signal (MS-AIS) ■ Administrative unit alarm indication signal (AU-AIS) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (HP-LOP) ■ Loss of signal (LOS) ■ Multiplex section remote error indication (MS-REI) ■ Higher path label mismatch (HP-PLM) ■ Higher path unequipped (HP-UNEQ) ■ Multiplex section remote defect indication (MS-RDI) ■ Higher path remote defect indication (HP-RDI) ■ Errored seconds (ES-S, ES-L, ES-P), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |

Table 9: Optical Interface Support for SONET/SDH OC3c/STM1 PICs

| Parameter | Intermediate Reach | Multimode |
|------------------------|----------------------------|---------------------------|
| Optical interface | Single-mode | Multimode |
| Transceiver type | Fixed | Fixed |
| Standard | Telcordia GR-253 | Multivendor agreement |
| Maximum distance | SMF cable: 9.3 miles/15 km | MMF cable: 1.2 miles/2 km |
| Transmitter wavelength | 1260 through 1360 nm | 1270 through 1380 nm |
| Average launch power | –15 through –8 dBm | –20 through –14 dBm |
| Receiver saturation | –8 dBm | –14 dBm |
| Receiver sensitivity | –28 dBm | –30 dBm |

SONET/SDH OC12c/STM4 PIC



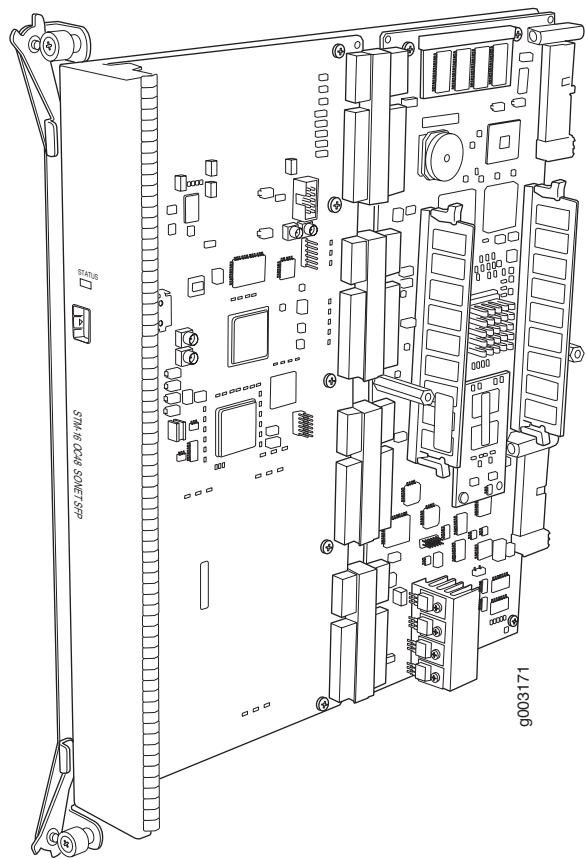
| | |
|------------------------------|--|
| Software release | <ul style="list-style-type: none"> ■ JUNOS 4.1 and later |
| Description | <ul style="list-style-type: none"> ■ One OC12 port ■ Power requirement: 0.23 A @ 48 V (10.8 W) |
| Hardware features | <ul style="list-style-type: none"> ■ Multiplexing and demultiplexing ■ Rate policing on input ■ Rate shaping on output ■ Packet buffering, Layer 2 parsing |
| Software features | <ul style="list-style-type: none"> ■ SONET/SDH framing ■ Link aggregation ■ Alarm and event counting and detection ■ Dual-router automatic protection switching (APS) ■ Multiprotocol Label Switching (MPLS) fast reroute ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC) ■ Point-to-Point Protocol (PPP) |
| Cables and connectors | <ul style="list-style-type: none"> ■ Duplex SC/PC connector (Rx and Tx) ■ Optical interface support—see Table 10 <p>NOTE: To extend the life of the laser, when a PIC is not being actively used with any valid links, take the PIC offline until you are ready to establish a link to another device. For information about taking a PIC offline, see the request chassis pic offline command in the <i>JUNOS System Basics and Services Command Reference</i>.</p> |

| | |
|-----------------------------------|--|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ SONET alarms: <ul style="list-style-type: none"> ■ Alarm indication signal—line (AIS-L) ■ Alarm indication signal—path (AIS-P) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (LOP-P) ■ Loss of signal (LOS) ■ Far-end bit error: remote error indication—line (REI-L) (CV-LFE) ■ Far-end bit error: remote error indication—path (REI-P) (CV-PFE) ■ Payload mismatch (path label mismatch) (PLM-P) ■ Payload unequipped (unequipped STS at path level) (UNEQ-P) ■ Remote defect indication—line (RDI-L) ■ Remote defect indication—path (RDI-P) ■ SDH alarms: <ul style="list-style-type: none"> ■ Multiplex section alarm indication signal (MS-AIS) ■ Administrative unit alarm indication signal (AU-AIS) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (HP-LOP) ■ Loss of signal (LOS) ■ Multiplex section remote error indication (MS-REI) ■ Higher path label mismatch (HP-PLM) ■ Higher path unequipped (HP-UNEQ) ■ Multiplex section remote defect indication (MS-RDI) ■ Higher path remote defect indication (HP-RDI) ■ Errored seconds (ES-S, ES-L, ES-P), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |

Table 10: Optical Interface Support for SONET/SDH OC12c/STM4 PICs

| Parameter | Intermediate Reach | Multimode |
|------------------------|----------------------------|------------------------------|
| Optical interface | Single-mode | Multimode |
| Transceiver type | Fixed | Fixed |
| Standard | Telcordia GR-253 | Multivendor agreement |
| Maximum distance | SMF cable: 9.3 miles/15 km | MMF cable: 546.8 yards/500 m |
| Transmitter wavelength | 1274 through 1356 nm | 1270 through 1380 nm |
| Average launch power | -15 through -8 dBm | -20 through -14 dBm |
| Receiver saturation | -8 dBm | -14 dBm |
| Receiver sensitivity | -28 dBm | -26 dBm |

SONET/SDH OC48c/STM16 PIC with SFP



| | |
|-------------------|--|
| Software release | ■ JUNOS 6.1 and later |
| Description | ■ One OC48 port ■ Power requirement: 0.86 A @ 48 V (41.4 W) |
| Hardware features | ■ Multiplexing and demultiplexing ■ Rate policing on input ■ Rate shaping on output ■ Packet buffering, Layer 2 parsing |

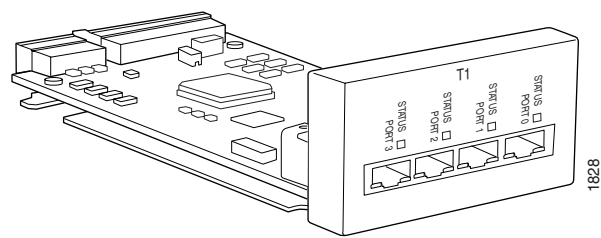
| | |
|------------------------------|---|
| Software features | <ul style="list-style-type: none"> ■ Configuration of SONET or SDH framing on a per-port basis (JUNOS 8.1 and later) ■ SONET/SDH framing ■ Link aggregation ■ Alarm and event counting and detection ■ Dual-router automatic protection switching (APS) ■ Multiprotocol Label Switching (MPLS) fast reroute ■ Encapsulations: <ul style="list-style-type: none"> ■ High-level Data Link Control (HDLC) ■ Frame Relay ■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC) and translational cross-connect (TCC) ■ Point-to-Point Protocol (PPP) |
| Cables and connectors | <p>You can install any transceiver supported by the PIC. For information about installing and removing transceivers, see the <i>PIC and Transceiver Installation Instructions</i>.</p> <ul style="list-style-type: none"> ■ Duplex LC/PC Connector (Rx and Tx) ■ Optical interface support—see Table 11 <p>NOTE: To extend the life of the laser, when a PIC is not being actively used with any valid links, take the PIC offline until you are ready to establish a link to another device. For information about taking a PIC offline, see the <code>request chassis pic offline</code> command in the <i>JUNOS System Basics and Services Command Reference</i>.</p> |

| | |
|-----------------------------------|--|
| LEDs | <p>One tricolor per port:</p> <ul style="list-style-type: none"> ■ Off—Not enabled ■ Green—Online with no alarms or failures ■ Amber—Online with alarms for remote failures ■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none"> ■ SONET alarms: <ul style="list-style-type: none"> ■ Alarm indication signal—line (AIS-L) ■ Alarm indication signal—path (AIS-P) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (LOP-P) ■ Loss of signal (LOS) ■ Far-end bit error: remote error indication—line (REI-L) (CV-LFE) ■ Far-end bit error: remote error indication—path (REI-P) (CV-PFE) ■ Payload mismatch (path label mismatch) (PLM-P) ■ Payload unequipped (unequipped STS at path level) (UNEQ-P) ■ Remote defect indication—line (RDI-L) ■ Remote defect indication—path (RDI-P) ■ SDH alarms: <ul style="list-style-type: none"> ■ Multiplex section alarm indication signal (MS-AIS) ■ Administrative unit alarm indication signal (AU-AIS) ■ Bit error rate signal degrade (BERR-SD) ■ Bit error rate signal fail (BERR-SF) ■ Bit interleaved parity (BIP) error B1 ■ Bit interleaved parity (BIP) error B2 ■ Bit interleaved parity (BIP) error B3 ■ Loss of frame (LOF) ■ Loss of pointer (HP-LOP) ■ Loss of signal (LOS) ■ Multiplex section remote error indication (MS-REI) ■ Higher path label mismatch (HP-PLM) ■ Higher path unequipped (HP-UNEQ) ■ Multiplex section remote defect indication (MS-RDI) ■ Higher path remote defect indication (HP-RDI) ■ Errored seconds (ES-S, ES-L, ES-P), Far-end errored seconds (ES-LFE, ES-PFE), Far-end severely errored seconds (SES-LFE, SES-PFE), Far-end unavailable seconds (UAS-LFE, UAS-PFE) ■ Severely errored framing (SEF), Severely errored framing seconds (SEFS-S), Severely errored seconds (SES-S, SES-L, SES-P), Unavailable seconds (UAS-L, UAS-P) |

Table 11: Optical Interface Support for SONET/SDH OC48c/STM16 PICs with SFP

| Parameter | Short Reach (SR) | Intermediate Reach (IR) | Long Reach (LR) |
|------------------------|----------------------------|--------------------------------|---|
| Optical interface | Single-mode | Single-mode | Single-mode; compatible with 1550 nm single-mode LR |
| Transceiver type | SFP | SFP | SFP |
| Maximum distance | SMF cable: 1.24 miles/2 km | SMF cable: 9.3 miles/15 km | SMF cable: 49.71 miles/80 km |
| Standard | Telcordia GR-253 | Telcordia GR-253 | Telcordia GR-253—L-16.3 |
| Transmitter wavelength | 1266 through 1360 nm | 1260 through 1360 nm | 1500 through 1580 nm |
| Average launch power | –10 through –3 dBm | –5 through 0 dBm | –2 through +3 dBm |
| Receiver saturation | –3 dBm | 0 dBm | –9 dBm |
| Receiver sensitivity | –18 dBm | –18 dBm | –28 dBm |

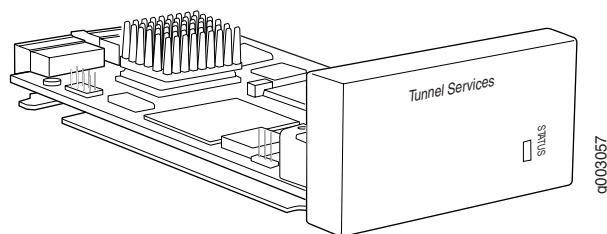
T1 PIC



| | |
|-------------------|--|
| Software release | ■ JUNOS 4.1 and later |
| Description | <div>■ Four T1 ports</div> <div>■ Power requirement: 0.08 A @ 48 V (3.7 W)</div> <div>■ Supports clear channel T1 per port (1.544 Mbps per channel)</div> <div>■ Supports attenuation up to -12 dBm</div> |
| Hardware features | <div>■ Per-port loop timing</div> <div>■ Onboard DSU functionality for T1 connectivity</div> |
| Software features | <div>■ ESF and SF framing</div> <div>■ B8ZS and AMI coding</div> <div>■ ESF CSU counters, WRT impairments, and CRC checking</div> <div>■ Local DS1 line loopback, remote line loopback</div> <div>■ Configurable clock source—internal or loop</div> <div>■ Encapsulations:<div>■ High-level Data Link Control (HDLC)</div><div>■ Frame Relay</div><div>■ Multiprotocol Label Switching (MPLS) circuit cross-connect (CCC)</div><div>■ Point-to-Point Protocol (PPP)</div></div> |

| | |
|-----------------------------------|---|
| LEDs | One tricolor per port: <ul style="list-style-type: none">■ Off—Not enabled■ Green—Online with no alarms or failures■ Amber—Online with alarms for remote failures■ Red—Active with a local alarm; router has detected a failure |
| Alarms, errors, and events | <ul style="list-style-type: none">■ Alarm indication signal (AIS)■ Bipolar violations■ Excessive zeros■ Far-end block errors (FEBE, E-bit errors)■ Loss of frame (LOF), Loss of signal (LOS)■ Yellow alarm bit (X-bit) disagreements |

Tunnel Services PIC



| | |
|--------------------------|---|
| Software release | <ul style="list-style-type: none"> JUNOS 3.3 and later |
| Description | <ul style="list-style-type: none"> Power requirement: 0.07 A @ 48 V (3.4 W) |
| Hardware features | <ul style="list-style-type: none"> Loopback function that encapsulates and de-encapsulates packets SONET/SDH OC12/STM4 tunneling bandwidth |
| Software features | <p>For a list of the software features available for services PICs, see the <i>JUNOS Services Interfaces Configuration Guide</i>.</p> <ul style="list-style-type: none"> IP-IP unicast tunneling GRE unicast tunneling PIM sparse mode unicast tunneling |
| LEDs | <p>One tricolor:</p> <ul style="list-style-type: none"> Off—Not enabled Green—Online with no alarms or failures Amber—Online with alarms for remote failures Red—Active with a local alarm; router has detected a failure |

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M40 Internet Router PIC Guide

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15 January 2005—530-012955-01. Revision 1. Removed Gigabit Ethernet PIC. Added PIC Feature Matrix table.

9 November 2004—Revision 2.

6 July 2004—Revision 1.

The information in this document is current as of the date listed in the revision history.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. The JUNOS software has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.