

### M5 and M10 Routers Major Hardware Components

Component	Quantity	Function	Redundant	Field-replaceable	Offline Button
Forwarding Engine Board (FEB)	1	Connects PICs to router components, houses shared memory	–	Requires router shutdown	–
Physical Interface Cards (PICs)	1–4 <i>M5 router</i> 1–8 <i>M10 router</i>	Provides interfaces to various network media	–	Hot-removable Hot-insertable	Yes
Routing Engine	1	Handles routing protocols, maintains routing tables	–	Requires router shutdown	–
Power supplies	2 AC or 2 DC	Distributes voltages to components	Yes	Hot-removable Hot-insertable	–
Cooling system	1 fan tray (3 fans)	Cools router components	Yes	Hot-removable Hot-insertable	–
Craft interface	1	Displays status and allows you to take PICs offline	–	–	–

*Hot-removable and hot-insertable*—Can remove and replace without powering down the router or disrupting routing functions.

*Hot-pluggable*—Can remove without powering down the router, but the routing and forwarding functions are interrupted until the replacement component is installed.

### M5 and M10 Routers Physical Specifications

Dimensions	5.25 in. (13.3 cm) high x 17.4 in. (44.2 cm) wide x 24 in. (61 cm) deep
Weight	57 lb (25.8 kg) minimum configuration 61 lb (27.6 kg) maximum configuration, <i>M5 router</i> 65 lb (29.5 kg) maximum configuration, <i>M10 router</i>
Required clearances	24 in. (61 cm) front and rear; 6 in. (15.2 cm) each side

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### M5 and M10 Routers Power Supply Specifications

Specification	AC	DC
Maximum power consumption	434 W	434 W
Input voltage	100 through 264 VAC operating range	-42.5 through -72 VDC operating range
Input line frequency	47 through 63 Hz, autoranging	-
Input current rating	8 A @ 100 VAC; 4 A @ 240 VAC	13.5 A @ -48 VDC (typical)
Output voltages	+1.5 V; +2.5 V; +3.3 V; +5 V; +12 V	+1.5 V; +2.5 V; +3.3 V; +5 V; +12 V
Power and grounding cords and cables	Country-specific; see <i>M5 and M10 Internet Backbone Router Hardware Installation Guide</i>	12 AWG wire cables attaching to quick-connect terminals; grounding cable attaches to single-hole cable lug

### M5 and M10 Routers LEDs

Component	LED	Location
PICs	1 LED per port, with 4 states: Red, Green, Amber, Off	PIC faceplate
Power supplies	Blue OUTPUT OK	Power supply faceplate
<b>Alarm LEDs</b>		
Red alarm	Large circular red	Craft interface
Yellow alarm	Large triangular amber	Craft interface

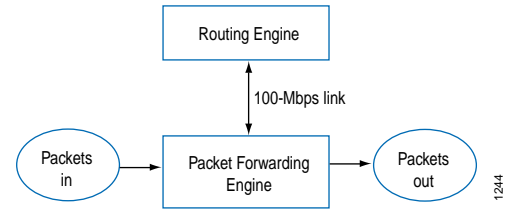
Red alarms occur when the router is started if no device is physically connected to the management *fxp0* interface or if two power supplies are physically installed but only one is switched on.

### Taking Components Offline

Component	Procedure
PIC	<ol style="list-style-type: none"><li>1. Press the PIC offline button, located on the PIC faceplate.</li><li>2. Press and hold the button until the PIC LED lights red (about 5 seconds).</li><li>3. Press and hold the offline button again after installing the replacement PIC to bring the PIC online.</li></ol>

### System Architecture

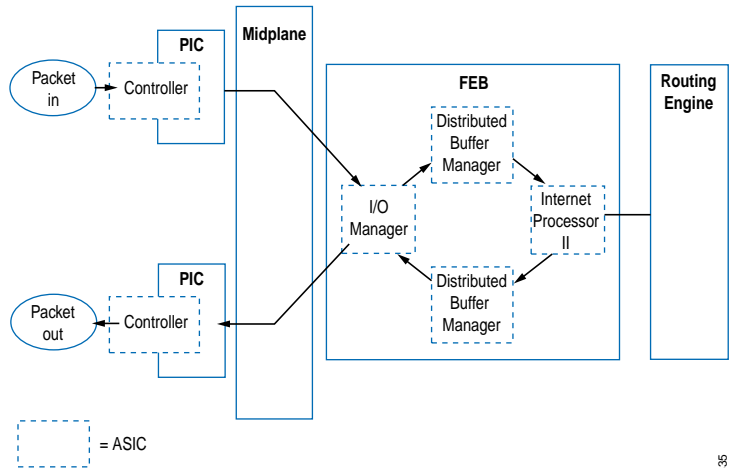
The router has two major architectural components: The Routing Engine, which provides Layer 3 routing services and network management; and the Packet Forwarding Engine, which provides packet switching, route lookups, and packet forwarding. The Routing Engine and Packet Forwarding Engine operate independently, but constantly communicate through a 100-Mbps link, as illustrated in the figure at the right.



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### Packet Flow through the Packet Forwarding Engine

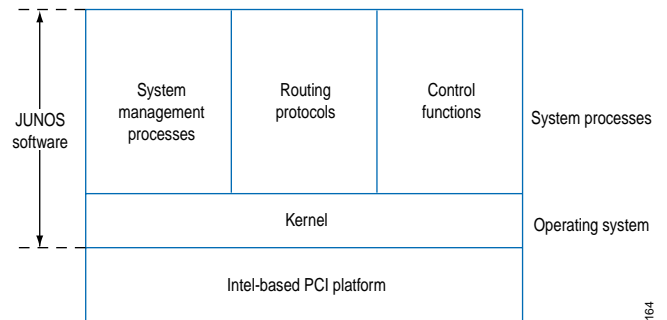
To ensure efficient packet flow through the system, data packet forwarding is handled by ASICs on the hardware components. The figure at the right shows the sequence of packet flow through the Packet Forwarding Engine.



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### Routing Engine Architecture

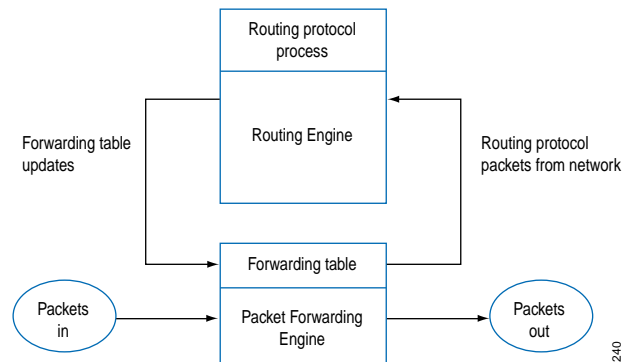
The Routing Engine handles all the routing protocol processes as well as processes controlling interfaces, router components, system management, and user access. These processes run on top of a kernel that interacts with the Packet Forwarding Engine.



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### Control Packet Handling

The Routing Engine constructs and maintains routing tables, and derives a table of active routes, called the forwarding table, from the routing tables. The forwarding table is then copied into the Packet Forwarding Engine.



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## M5 and M10 Internet Backbone Routers

### General Safety Guidelines

- Only trained and qualified personnel should install or replace the router.
- Perform only the procedures described in the *M5 and M10 Internet Backbone Routers Hardware Installation Guide*. Other services should be performed by authorized service personnel only.
- For protection against shock hazard, verify that all power cables are disconnected before servicing the router.
- Before installing the router, read the guidelines in the “Prepare the Site” section of the *M5 and M10 Internet Backbone Routers Hardware Installation Guide* to make sure that the site meets power, environmental, and clearance requirements for the router.
- Manually installing the router requires two people to lift the chassis and a third person to secure the mounting screws. To prevent injury, keep your back straight and lift with your legs, not your back. Do not attempt to lift the chassis with the handles on the power supplies.
- Do not work on the router or connect or disconnect cables during electrical storms.
- Never install electrical jacks in wet locations unless the jacks are specifically designed for wet environments.
- Operate the router only when the grounding wire is connected.
- Use copper conductors only.
- Avoid touching uninsulated electrical wires or terminals that have not been disconnected from their power source. Doing so could cause electrical shock.
- Do not open or remove chassis covers or sheet metal parts when instructions are not provided in the *M5 and M10 Internet Backbone Routers Hardware Installation Guide*. Doing so could cause severe electrical shock.
- Do not push or force any objects through any of the openings in the chassis frame. Doing so could result in electrical shock or fire.
- Avoid spilling liquid into the router chassis or onto any router components. Doing so could cause electrical shock or damage the router.
- Before working on equipment that is connected to power lines, remove jewelry, including rings, necklaces, and watches. Metal objects heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.
- Failure to observe these safety warnings could result in serious physical injury.

### Agency Approvals

Category	Approval
Safety	<ul style="list-style-type: none"> <li>■ CSA C22.2 No. 950</li> <li>■ UL 1950</li> <li>■ EN 60950, Safety of Information Technology Equipment</li> <li>■ EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification, Requirements and User's Guide</li> <li>■ EN 60825-2 Safety of Laser Products—Part 2: Safety of Optical Fibre Communication Systems</li> </ul>
EMI	<ul style="list-style-type: none"> <li>■ AS 3548 Class A (Australia)</li> <li>■ EN 55022 Class A emissions (Europe)</li> <li>■ FCC Class A (USA)</li> <li>■ VCCI Class A (Japan)</li> </ul>
Immunity	<ul style="list-style-type: none"> <li>■ EN 61000-3-2 Power Line Harmonics</li> <li>■ EN 61000-4-2 ESD</li> <li>■ EN 61000-4-3 Radiated Immunity</li> <li>■ EN 61000-4-4 EFT</li> <li>■ EN 61000-4-5 Surge</li> <li>■ EN 61000-4-6 Low Frequency Common Immunity</li> <li>■ EN 61000-4-11 Voltage Dips and Sags</li> </ul>
NEBS	Designed to meet the following standards: <ul style="list-style-type: none"> <li>■ GR-63-Core: NEBS, Physical Protection</li> <li>■ GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment</li> <li>■ SR-3580 NEBS Criteria Levels (Level 3 Compliance)</li> </ul>
ETSI	<ul style="list-style-type: none"> <li>■ ETS-300386-2 Switching Equipment</li> </ul>

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For support issues, contact the Juniper Networks Technical Assistance Center (JTAC) at 1-888-314-JTAC (within the United States) or 408-745-2121 (from outside the United States). For other contact information, refer to [www.juniper.net/contactus.html](http://www.juniper.net/contactus.html).