Overview for the Avaya IG550 Integrated Gateway
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Chapter 1: Introduction

High level view of an IG550 solution configuration

The IG550 Integrated Gateway is a part of Avaya’s growing solutions for extending Communication Manager communication capabilities from the headquarters of an organization to all collaborative branch locations. The IG550 Integrated Gateway is an H.248 media gateway that combines Avaya’s high-performance telephony and Voice over IP (VoIP) communications with the sophisticated routing capabilities of the Juniper J-Series routers.

The IG550 is designed for use in a 2-to-100 user environment. The IG550 can be appropriately configured and priced to more precisely match the number of users.

The IG550 consists of the Telephony Gateway Module (TGM550) and Telephony Interface Modules (TIMs). The IG550 is inserted into a Juniper J2320, J2350, J4350, or J6350 Services Router. The IG550 is also connected over a LAN or WAN to an Avaya server running Communication Manager. Therefore, Avaya S8700-series, S8500, S8400, and S8300 Servers are able to provide the same top quality telephony services to the small branch office as to the headquarters of the organization. As a result, the IG550 provides full feature support for IP and analog telephones. See Figure 1.

The IG550 Integrated Gateway is available with three capacity levels, depending on which version of the TGM550 is used. The versions of the TGM550 are as follows:

- TGM550 MP80, which supports up to 80 concurrent VoIP calls, depending on the types of calls
- TGM550 MP20, which supports up to 20 concurrent VoIP calls
- TGM550 MP10, which supports up to 10 concurrent VoIP calls

For more detail on capacities, see IG550 maximum media gateway capacities on page 57. The VoIP module on the TGM550 is field-replaceable, as described in Installing and Configuring the IG550 Integrated Gateway, 03-601548.

Any J-series router can house a single TGM550 of any of the three versions.
Figure 1: Sample configuration of the IG550 in a Communication Manager network

- **Head Office**
  - 1. Media Gateway
  - 2. Legacy telephones
  - 3. S8700-series Server
  - 4. Router
  - 5. Integrated Management tools
  - 6. LAN
  - 7. IP telephones

- **Small Branch**
  - 8. Public Switched Telephone Network (PSTN)
  - 9. WAN
  - 10. J-series router with the IG550 Integrated Gateway
  - 11. Ethernet switch
  - 12. IP telephones
  - 13. Personal computers
  - 14. Fax

**Figure notes**: Sample configuration of the IG550 in a Communication Manager network

- 1. Media Gateway
- 2. Legacy telephones
- 3. S8700-series Server
- 4. Router
- 5. Integrated Management tools
- 6. LAN
- 7. IP telephones
- 8. Public Switched Telephone Network (PSTN)
- 9. WAN
- 10. J-series router with the IG550 Integrated Gateway
- 11. Ethernet switch
- 12. IP telephones
- 13. Personal computers
- 14. Fax

8 Overview of the Avaya IG550 Integrated Gateway
The IG550 features Standard Local Survivability (SLS). SLS provides partial backup media gateway controller (MGC) functionality in the event that the connection with the primary MGC is lost.

In addition to advanced and comprehensive telephony services that are provided by the TGM550, the Juniper J-series routers (J2320, J2350, J4350, or J6350) provides full data networking services, precluding the need for a WAN router. The J-series routers use Juniper Physical Interface Modules (PIMs) for the hardware components to support network and routing features. The J-series routers also provide Ethernet connections to a separate Ethernet switch that IP phones connect to.

---

**Features Summary**

---

**IG550 features**

The IG550, through its use of the TGM550 and TIMs, supports the following features:

- **Voice**
  - Traditional telephones and trunks. In particular:
    - Two built-in line ports to support two analog telephones or incoming analog DID trunks on the TGM550
    - Two built-in analog trunk ports to support a trunk or trunks of the following types on the TGM550:
      - Loop start
      - Ground start
      - Analog Centralized Automated Message Accounting (CAMA)
      - Direct Inward/Outbound Dialing (DIOD) (Japan only)
    - Additional line and trunk ports on the TIM508, TIM514, TIM516, and TIM518
  - IP telephones
  - Remote VPN IP telephone service, in conjunction with the J-series router and its Application Layer Gateway (ALG), Network Address Translation (NAT), and Dynamic VPN tunneling capability
  - Survivability features for continuous voice services
  - VoIP Media Gateway services
  - ISDN-BRI trunks
  - E1/T1 DS1 trunks
- Fax, Teletypewriter (TTY), and modem over IP
- Real Time Transport Protocol (RTP)/Real Time Transport Control Protocol (RTCP) processing
- Announcement ports

**Security**
- Remote Authentication Dial-in User Service (RADIUS) Authentication support
- Simple Network Management Protocol (SNMP) traps and informs (v1 and v2 only) sent to the primary controller
- SNMP v3 for remote management access, traps and informs
- Secure Shell (SSH) Authentication support
- Secrets encryption of configuration data

**Provisioning**
- Avaya Communication Manager (CM) server management
- Integrated Management Solutions support
- Extensive alarming and troubleshooting features
- Modem access for remote administration

**Survivability**
- Media Gateway Controller (MGC) automatic switchover, migration, and survivability features
- Modem backup connection to the MGC via a modem connected to the J-series router
- Standard Local Survivability (SLS)
- Dynamic Call Admission Control (CAC), in conjunction with the J-series router, for Fast Ethernet, Serial, and GRE tunnel interfaces

**Server and client applications**
- File Transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP), and Secure Copy (SCP) client
- Telnet client
- FTP/TFTP server
- Secure Shell (SSH) and Telnet server

For more detail on these features, see *Administration Guide and CLI Reference for the Avaya IG550 Integrated Gateway*, 03-601883.
The J2320, J2350, J4350, and J6350 Services Routers support the TGM550 and TIMs with the following features:

- **WAN**
  - Dynamic Call Admission Control (CAC) for Fast Ethernet, Serial, and GRE tunnel interfaces on the J-series routers
  - Routing protocols
    - Open Shortest Path First (OSPF)
    - Routing Information Protocol (RIP)
    - Border Gateway Protocol (BGP)
  - Point-to-Point Protocol over Ethernet (PPPoE)
  - Policy-based routing
  - Dynamic Host Configuration Protocol (DHCP) client, server, and relay functions
  - Generic Routing Encapsulation (GRE) tunneling
  - Dynamic IP addressing
  - Class of Service (COS)
  - Dynamic Name Server (DNS)

- **LAN**
  - Virtual LANs (VLANs)

- **Security**
  - Virtual Private Network (VPN) support
  - Network Address Translation (NAT)
  - Application Layer Gateway (ALG)

- **Provisioning**
  - Modem access for remote administration
  - UNIX command line interface (CLI)
  - JUNOS software CLI
  - J-Web browser interface

- **Survivability**
  - Dynamic Call Admission Control (CAC) for Fast Ethernet, Serial, and GRE tunnel interfaces
  - Virtual Router Redundancy Protocol (VRRP)
Introduction

- Management applications
  - J-Web Quick Configuration
  - CLI

For detailed information on J-series router WAN and routing features and administration, see the following documents:

- *J2320, J2350, J4350, and J6350 Services Router Getting Started Guide*, Release 8.4
- *J-series Services Router Administration*, Release 8.4
IG550 and J4350 Services Router Physical Description

Figure 2: Example of the IG550 Integrated Gateway in a J4350 Services Router

Figure notes:

1. Juniper Services Router, J4350 shown
2. TGM550 Telephony Gateway Module (in slot V1)
3. TGM550 console port
4. TGM550 analog trunk ports
5. TGM550 analog line ports
6. TIM521 BRI telephony interface module (in slot V4)
7. TIM514 analog telephony interface module (in slot V2)
8. TIM510 E1/T1 telephony interface module (in slot V3)
9. J-series Router Alarm LEDs
10. J-series Router Power LEDs
11. Power button
12. Reset button
13. Gigabit Ethernet ports
14. Console port
15. Aux port
16. USB ports
17. Slot V5 (empty in illustration)
18. Slot V6 (empty in illustration)
Slot locations on J4350 Services Router

The slots on the J4350 Services Router are identified as follows:

Figure 3: Slot numbers on the Juniper J4350 Services Router

The J4350 Services router chassis has six slots. Modules can be inserted into the slots according to the following guidelines:

- The TGM550 and TIMs can be housed in any of the six router slots.
- Fast Ethernet and Gigabit Ethernet ePIMs can be housed only in slots 3 or 6.
- The 16-port GigaE uPIM can be housed in slot 2, 3, 5 or 6.
- Other PIMs, including all other uPIMs, can be housed in any slots.

Fixed ports and buttons on the Juniper J4350 Services Router

Table 1: Fixed ports and buttons on the Juniper J4350 Services Router

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>Four Gigabit Ethernet ports. The JUNOS software identifies the port locations, from left to right, as ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3. One port can serve as a management interface, typically ge-0/0/0.</td>
</tr>
<tr>
<td>Alarm LED</td>
<td>Lights yellow for a minor alarm condition, red for a major alarm condition, or is off when no alarm conditions exist. Alarm notification applies only to the J-series router, not to the TGM550.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Green light that lights steadily, blinks, or is off to show power on/off status.</td>
</tr>
<tr>
<td>Status LED</td>
<td>Blinks to show startup of the router, lights steadily to show normal operation after startup, and red to indicate an error condition upon startup.</td>
</tr>
</tbody>
</table>
### Table 1: Fixed ports and buttons on the Juniper J4350 Services Router (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console</td>
<td>Console RS-232 interface port for direct connection of CLI console. RJ-45 connector.</td>
</tr>
<tr>
<td>USB</td>
<td>Two USB ports. Support the connection of</td>
</tr>
<tr>
<td></td>
<td>● Disk on Key USB memory stick</td>
</tr>
<tr>
<td></td>
<td>● USB flash drive</td>
</tr>
<tr>
<td></td>
<td>● The Multitech MT5634ZBA-USB-V92 USB modem.</td>
</tr>
<tr>
<td>Power button</td>
<td>Turns on power to the router and TGM550.</td>
</tr>
<tr>
<td>Reset button</td>
<td>Resets chassis configuration to either rescue configuration or factory default, if rescue not available. Resends configuration data to the TGM550. If the button is held 12 or more seconds, the root password is also reset.</td>
</tr>
<tr>
<td>Aux</td>
<td>Not activated.</td>
</tr>
</tbody>
</table>
IG550 and J6350 Services Router Physical Description

Figure 4: The IG550 Integrated Gateway in a J6350 Services Router

Figure notes:

1. Juniper Services Router, J6350 shown
2. TGM550 Telephone Gateway Module (in slot V1)
3. TGM550 console port
4. TGM550 analog trunk ports
5. TGM550 analog line ports
6. TIM521 BRI telephony interface module (in slot V4)
7. TIM514 analog telephony interface module (in slot V2)
8. TIM510 E1/T1 telephony interface module (in slot V3)
9. J-series Router Alarm LEDs
10. J-series Router Power LEDs
11. Power button
12. Reset button
13. Gigabit Ethernet ports
14. Console port
15. Aux port
16. USB ports
17. Slot V5 (empty)
18. Slot V6 (empty)

Slot locations on J6350 Services Router

The slots on the J6350 Services Router are identified as follows:

Figure 5: Slot numbers on the Juniper J6350 Services Router
The J6350 Services router chassis has six slots. Modules can be inserted into the slots according to the following guidelines:

- The TGM550 and TIMs can be housed in any of the six router slots.
- The four-port Fast Ethernet, the Gigabit Ethernet ePIMs, and the 16-port GigaE uPIM can be housed only in slots 2, 3, 5, or 6.
- Other PIMs, including all other uPIMs, can be housed in any slots.

**Fixed ports and buttons on the Juniper J6350 Services Router**

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>Four Gigabit Ethernet ports. The JUNOS software identifies the port locations, from left to right, as ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3. One port can serve as a management interface, typically ge-0/0/0.</td>
</tr>
<tr>
<td>Alarm LED</td>
<td>Lights yellow for a minor alarm condition, red for a major alarm condition, or is off when no alarm conditions exist. Alarm notification applies only to the J-series router, not to the TGM550.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Green light that lights steadily, blinks, or is off to show power on/off status.</td>
</tr>
<tr>
<td>Status LED</td>
<td>Blinks to show startup of the router, lights steadily to show normal operation after startup, and red to indicate an error condition upon startup.</td>
</tr>
<tr>
<td>Console</td>
<td>Console RS-232 interface port for direct connection of CLI console. RJ-45 connector.</td>
</tr>
</tbody>
</table>
| USB           | Two USB ports. Support the connection of  
- Disk on Key USB memory stick  
- USB flash drive  
- The Multitech MultiModemUSB MT5634ZBA-USB-V92 USB modem. |
| Power button  | Turns on power to the router and TGM550.                                                                                                  |
Table 2: Fixed ports and buttons on the Juniper J6350 Services Router (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset button</td>
<td>Resets chassis configuration to either rescue configuration or factory default, if rescue not available. Resends configuration data to the TGM550. If the button is held 12 or more seconds, the root password is also reset.</td>
</tr>
<tr>
<td>Aux</td>
<td>Not activated.</td>
</tr>
</tbody>
</table>

IG550 and J2320 Services Router Physical Description

Figure 6: Example of the IG550 Integrated Gateway in a J2320 Services Router

Figure notes:

1. J-series Router Alarm LEDs
2. J-series Router Power LEDs
3. Power button
4. Reset button
5. Console port
6. Aux port
7. Gigabit Ethernet ports
8. USB ports
9. TIM514 analog telephony interface module (in slot V1)
10. TGM550 Telephony Gateway Module (in slot V2)
11. Dual port T1 PIM (in slot V3)
Slot locations on J2320 Services Router

The slots on the J2320 Services Router are identified as follows:

Figure 7: Slot numbers on the Juniper J2320 Services Router

The J2320 Services router chassis has three slots. Modules can be inserted into the slots according to the following guidelines:

- The TGM550 and TIMs can be housed in any of the three router slots.
- The 16-port GigaE uPIM must be inserted into slot 3.
- All other supported PIMs, including all other uPIMs, can be housed in any slots.

Note:
The J2320 does not support the following PIMs:

- Any of the ePIMs
- T3/E3 PIMs
- The four-port fast Ethernet PIM

Fixed ports and buttons on the Juniper J2320 Services Router

Table 3: Fixed ports and buttons on the Juniper J2320 Services Router

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>Four Gigabit Ethernet ports. The JUNOS software identifies the port locations, from left to right, as ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3. One port can serve as a management interface, typically ge-0/0/0.</td>
</tr>
<tr>
<td>Alarm LED</td>
<td>Lights yellow for a minor alarm condition, red for a major alarm condition, or is off when no alarm conditions exist. Alarm notification applies only to the J-series router, not to the TGM550.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Green light that lights steadily, blinks, or is off to show power on/off status.</td>
</tr>
</tbody>
</table>
Table 3: Fixed ports and buttons on the Juniper J2320 Services Router (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status LED</td>
<td>Blinks to show startup of the router, lights steadily to show normal operation after startup, and red to indicate an error condition upon startup.</td>
</tr>
<tr>
<td>Console</td>
<td>Console RS-232 interface port for direct connection of CLI console. RJ-45 connector.</td>
</tr>
<tr>
<td>USB</td>
<td>Two USB ports. Support the connection of</td>
</tr>
<tr>
<td></td>
<td>● Disk on Key USB memory stick</td>
</tr>
<tr>
<td></td>
<td>● USB flash drive</td>
</tr>
<tr>
<td></td>
<td>● The Multitech MultiModemUSB MT5634ZBA-USB-V92 USB modem</td>
</tr>
<tr>
<td>Power button</td>
<td>Turns on power to the router and TGM550.</td>
</tr>
<tr>
<td>Reset button</td>
<td>Resets chassis configuration to either rescue configuration or factory default, if rescue not available. Resends configuration data to the TGM550. If the button is held 12 or more seconds, the root password is also reset.</td>
</tr>
<tr>
<td>Aux</td>
<td>Not activated.</td>
</tr>
</tbody>
</table>
IG550 and J2350 Services Router Physical Description

Figure 8: Example of the IG550 Integrated Gateway in a J2350 Services Router

Figure notes:
1. J-series Router Alarm LEDs
2. J-series Router Power LEDs
3. Power button
4. Reset button
5. Console port
6. Aux port
7. Gigabit Ethernet ports
8. USB ports
9. TIM514 analog telephony interface module (in slot V1)
10. TIM508 (in slot V2)
11. TGM550 Telephony Gateway Module (in slot V3)
12. Dual port T1 PIM (in slot V4)
13. TIM510 (in slot V5)

Slot locations on J2350 Services Router

The slots on the J2350 Services Router are identified as follows:

Figure 9: Slot numbers on the Juniper J2350 Services Router

The J2350 Services router chassis has five slots. Modules can be inserted into the slots according to the following guidelines:

- The TGM550 and TIMs can be housed in any of the five router slots.
Introduction

- The 16-port GigaE uPIM must be inserted into slot 2, 4, or 5.
- All other supported PIMs, including all other uPIMs, can be housed in any slots.

The J2350 does not support the following PIMs:
- Any of the ePIMs
- T3/E3 PIMs
- The four-port fast Ethernet PIM

Fixed ports and buttons on the Juniper J2350 Services Router

Table 4: Fixed ports and buttons on the Juniper J2350 Services Router

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>Four Gigabit Ethernet ports. The JUNOS software identifies the port locations, from left to right, as ge-0/0/0, ge-0/0/1, ge-0/0/2, and ge-0/0/3. One port can serve as a management interface, typically ge-0/0/0.</td>
</tr>
<tr>
<td>Alarm LED</td>
<td>Lights yellow for a minor alarm condition, red for a major alarm condition, or is off when no alarm conditions exist. Alarm notification applies only to the J-series router, not to the TGM550.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Green light that lights steadily, blinks, or is off to show power on/off status.</td>
</tr>
<tr>
<td>Status LED</td>
<td>Blinks to show startup of the router, lights steadily to show normal operation after startup, and red to indicate an error condition upon startup.</td>
</tr>
<tr>
<td>Console</td>
<td>Console RS-232 interface port for direct connection of CLI console. RJ-45 connector.</td>
</tr>
<tr>
<td>USB</td>
<td>Two USB ports. Support the connection of:</td>
</tr>
<tr>
<td></td>
<td>● Disk on Key USB memory stick</td>
</tr>
<tr>
<td></td>
<td>● USB flash drive</td>
</tr>
<tr>
<td></td>
<td>● The Multitech MultiModemUSB MT5634ZBA-USB-V92 USB modem.</td>
</tr>
<tr>
<td>Power button</td>
<td>Turns on power to the router and TGM550.</td>
</tr>
</tbody>
</table>
Table 4: Fixed ports and buttons on the Juniper J2350 Services Router (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset button</td>
<td>Resets chassis configuration to either rescue configuration or factory default, if rescue not available. Resends configuration data to the TGM550. If the button is held 12 or more seconds, the root password is also reset.</td>
</tr>
<tr>
<td>Aux</td>
<td>Not activated.</td>
</tr>
</tbody>
</table>

TGM550 physical description

All versions of the TGM550 (MP80, MP20 and MP10) have the same faceplate, ports, buttons, and LEDs. The customer can upgrade the capacity of the TGM550 by ordering a field replacement of the Digital Signal Processor (DSP), versions of which are identified as MP80, MP20 and MP10.

Figure 10: The TGM550 Gateway Module

Figure notes:

1. Alarm LED
2. ACT LED
3. Console port
4. RST button
5. ASB LED
6. ETR LED
7. Analog trunk ports
8. Analog line ports
## Fixed ports and buttons on the TGM550 Gateway Module

### Table 5: Fixed ports and buttons on the TGM550

<table>
<thead>
<tr>
<th>Port/Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALM LED</td>
<td>Lights red to indicate an alarm on the TGM550 or a reboot.</td>
</tr>
<tr>
<td>ACT LED</td>
<td>Lights yellow to show activity of trunk or line ports. Also lights yellow during a reboot.</td>
</tr>
<tr>
<td>CONSOLE</td>
<td>Console port for direct connection of TGM550 CLI console. RJ-45 connector.</td>
</tr>
<tr>
<td>RST</td>
<td>Reset button. Resets the TGM550 configuration. It also reboots the TGM550 with the software image in the alternate bank.</td>
</tr>
<tr>
<td>ASB</td>
<td>Alternate Software Bank LED. Lights green if the software is not running from the selected boot bank.</td>
</tr>
<tr>
<td>ETR</td>
<td>Lights green if the Emergency Transfer Relay is active or the TGM550 reboots. ETR uses trunk port 2 and line port 3.</td>
</tr>
<tr>
<td>Analog Trunk</td>
<td>Two analog trunk ports</td>
</tr>
<tr>
<td>Analog Line</td>
<td>Two analog trunk lines</td>
</tr>
</tbody>
</table>
Chapter 2: Optional components

The IG550 Gateway Module supports a variety of optional internal boards called Telephony Interface Modules (TIMs). In addition, the Juniper J-series Routers support swappable internal components called Physical Interface Modules (PIMs).

Supported optional modules in the J-series routers and the IG550

Note:
This list of PIMs for J-series routers is a sample only. For a complete list of PIMs, see the Juniper J-series router documentation at http://juniper.net.

Table 6: Supported interface modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telephony Interface Modules</strong></td>
<td></td>
</tr>
<tr>
<td>TIM508</td>
<td>8 analog line, or station ports, which can be administered as stations or DID trunk ports</td>
</tr>
<tr>
<td>TIM514</td>
<td>4 analog line, or station, ports and 4 analog trunk ports</td>
</tr>
<tr>
<td>TIM516</td>
<td>16 analog line, or station, ports. Off-Premise Stations are not supported.</td>
</tr>
<tr>
<td>TIM518</td>
<td>8 analog line, or station, ports and 8 analog trunks</td>
</tr>
<tr>
<td>TIM510</td>
<td>1 E1/T1 trunk port, a DS1 level port that provides a wide variety of E1 or T1 circuit support. Can provide up to 30 E1 or 24 T1 channels</td>
</tr>
<tr>
<td>TIM521</td>
<td>4 ISDN BRI trunk ports providing up to 8 bearer channels</td>
</tr>
<tr>
<td><strong>J-series Router Physical Interface Modules</strong></td>
<td></td>
</tr>
<tr>
<td>Dual-Port Serial PIM</td>
<td>2 serial ports</td>
</tr>
</tbody>
</table>
## Optional components

### Table 6: Supported interface modules (continued)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual-Port T1 or E1 PIM</td>
<td>2 E1/T1 ports, each providing up to 30 E1 or 24 T1 data channels for WAN connections</td>
</tr>
<tr>
<td>Dual-Port Channelized T1 or E1 PIM</td>
<td>2 T1 or E1 ports</td>
</tr>
<tr>
<td>T3 or E3 PIM</td>
<td>1 E3/T3 port for WAN connections</td>
</tr>
<tr>
<td>Gigabit Ethernet SFP ePIM</td>
<td>One Gigabit port. Supported on the J4350 and J6350 Services routes only.</td>
</tr>
<tr>
<td>Gigabit Ethernet copper ePIM</td>
<td>One Gigabit port. Supported on the J4350 and J6350 Services routes only.</td>
</tr>
<tr>
<td>Dual-Port Fast Ethernet PIM</td>
<td>2 Fast Ethernet ports. Supported on the J4350 and J6350 Services routes only.</td>
</tr>
<tr>
<td>Four-Port Fast Ethernet ePIM</td>
<td>4 Fast Ethernet ports. Supported on the J4350 and J6350 Services routes only.</td>
</tr>
<tr>
<td>4-Port ISDN BRI S/T PIM</td>
<td>4 ISDN BRI data-only ports</td>
</tr>
<tr>
<td>4-Port ISDN BRI U PIM</td>
<td>4 ISDN BRI data-only ports</td>
</tr>
<tr>
<td>1-, 6-, 8-, or 16-Port GigaE uPIM</td>
<td>6-, 8-, or 16-Gigabit Ethernet ports</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The 16-port GigaE uPIM requires two slots in the router.</td>
</tr>
<tr>
<td>ADSL PIM (Annex A)</td>
<td>1 port for DSL over an analog trunk</td>
</tr>
<tr>
<td>ADSL PIM (Annex B)</td>
<td>One port for ADSL over ISDN providing up to 32 virtual channels</td>
</tr>
<tr>
<td>G.SHDSL PIM</td>
<td>Two ports for 32 virtual channels of ATM over SHDSL connections</td>
</tr>
</tbody>
</table>
Telephony Interface Modules

The IG550 supports the following telephony interface modules:

- TIM508 Analog Telephony Interface Module
- TIM514 Analog Telephony Interface Module
- TIM516 Analog Telephony Interface Module
- TIM518 Analog Telephony Interface Module
- TIM510 E1/T1 Telephony Interface Module
- TIM521 BRI Telephony Interface Module.

TIM508 analog media module

The TIM508 Analog Telephony Interface Module provides eight analog telephone ports. Some or all of the ports can be administered as analog DID trunks instead.

Figure 11: The TIM508 Analog Telephony Interface Module

Configuring TIM508 line ports

The TIM508 provides you with the capability to configure any of the eight line ports as:

- A wink start or an immediate start DID trunk
- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication

TIM508 also supports

- Three ringer loads, which is the ringer equivalency number for up to 2,000 feet (610 meters) for the four station ports
- Up to eight simultaneously-ringing ports
- Type 1 caller ID and Type 2 caller ID for line ports
- Ring voltage generation for a variety of international frequencies and cadences
Optional components

TIM514 analog media module

The TIM514 Analog Telephony Interface Module provides four analog telephone ports and four analog trunk ports.

**Note:**

The four analog trunk ports, ports 5 through 8, cannot be used for analog DID trunks. Instead, the four analog line ports, ports 1 through 4, must be used.

Figure 12: The TIM514 Analog Telephony Interface Module

Configuring TIM514 trunk ports

The TIM514 provides you with the capability to configure ports 5 through 8 as:

- A loop start or a ground start central office trunk with a loop current of 18 to 120 mA
- A two-wire analog Outgoing CAMA E911 trunk, for connectivity to the PSTN. MF signaling is supported for CAMA ports.
- Direct Inward/Outbound Dialing (DIOD) (Japan only)

Configuring TIM514 line ports

The TIM514 provides you with the capability to configure ports 1 through 4 as:

- A wink start or an immediate start DID trunk
- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication

TIM514 also supports

- Three ringer loads, which is the ringer equivalency number for up to 2,000 feet (610 meters) for all four line (station) ports
- Up to four simultaneously-ringing ports
- Type 1 caller ID and Type 2 caller ID
- Ring voltage generation for a variety of international frequencies and cadences
TIM516 analog media module

The TIM516 Analog Telephony Interface Module provides 16 analog telephone ports.

Figure 13: The TIM516 Analog Telephony Interface Module

Configuring TIM516 line ports

The TIM516 provides you with the capability to configure any of the line ports as:

- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication

**Note:**

The TIM516 does not support Off Premise Stations (OPS) or DID/DIOD trunks.

TIM516 also supports

- Three ringer loads, which is the ringer equivalency number for up to 2,000 feet (610 meters) for all sixteen ports
- Up to 16 simultaneously-ringing ports
- Type 1 caller ID and Type 2 caller ID for line ports
- Ring voltage generation for a variety of international frequencies and cadences

TIM518 analog media module

The TIM518 Analog Telephony Interface Module provides eight analog telephone ports and eight analog trunk ports. Some or all of the line ports can be administered as analog DID trunks instead.

Figure 14: The TIM518 Analog Telephony Interface Module
Optional components

Configuring TIM518 line ports
The TIM518 provides you with the capability to configure any of the first eight line ports as:
- A wink start or an immediate start DID trunk
- Analog tip/ring devices such as single-line telephones with or without LED message waiting indication

Configuring TIM518 trunk ports
The TIM518 provides you with the capability to configure ports 9 through 16 as:
- A loop start or a ground start central office trunk with a loop current of 18 to 120 mA
- A two-wire analog Outgoing CAMA E911 trunk, for connectivity to the PSTN. MF signaling is supported for CAMA ports.

TIM518 also supports
- Three ringer loads, which is the ringer equivalency number for up to 2,000 feet (610 meters) for all eight ports
- Up to eight simultaneously-ringing ports
- Type 1 caller ID and Type 2 caller ID for line ports
- Type 1 caller ID for trunk ports
- Ring voltage generation for a variety of international frequencies and cadences

TIM510 E1/T1 Telephony Interface Module
The TIM510 T1/E1 Telephony Interface Module terminates a T1 or E1 trunk. The TIM510 has a built-in Channel Service Unit (CSU) so an external CSU is not necessary. The CSU is only used for the T1 circuit.

The TIM510 features:
- DS1 level support for a variety of E1 and T1 trunk types
- Trunk signaling to support US and International CO or tie trunks
- Echo cancellation in either direction

Figure 15: The TIM510 Telephony Interface Module
TIM521 BRI Telephony Interface Module

The TIM521 BRI Telephony Interface Module provides four ports with RJ-45 jacks that can be administered as BRI trunk connections.

The TIM521 supports up to four BRI interfaces to the central office at the ISDN TE reference point. Information is communicated over each port in two ways:

- Over two 64-kbps channels, called B1 and B2, that can be circuit-switched simultaneously
- Over a 16-kbps channel, called the D-channel, that is used for signaling. The TIM521 occupies one time slot for D-channel use, regardless of whether one, two, three, or four D channels are in use.

The circuit-switched connections have an A- or Mu-law option for voice operation. The circuit-switched connections operate as 64-kbps clear channels when in the data mode.

Each port interfaces to the central office at the ISDN T reference point.

**Figure 16: The TIM521 Telephony Interface Module**

---

Note:
The TIM521 module does not support BRI stations, video endpoints, or combining both B channels together to form a 128-kbps channel.

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**Juniper Physical Interface Modules for serial and WAN connectivity**

For details about the optional Juniper Physical Interface Modules, see *J2320, J2350, J4350, and J6350 Services Router Getting Started Guide*, Release 8.4.
TIM combination limitations in the IG550

The following limitations apply to combining TIMs in the IG550:

<table>
<thead>
<tr>
<th>Maximum number of interface TIMs (excluding TGM)</th>
<th>J2320 slots 1-3</th>
<th>J2350 slots 1-5</th>
<th>J4350/J6350 slots 1-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of TIM516s (Analog)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Maximum number of TIM514s (Analog)</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Maximum number of TIM508s (Analog)</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Maximum number of TIM518s (Analog)</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Maximum number of TIM521s (BRI)</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Maximum number of TIM510s (E1/T1)</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

⚠️ CAUTION:

The limitations listed in this section are recommended maximums. You must also calculate the power requirements and heat generation for the specific TIM and PIM combination the customer wants to ensure the J-series router can support that combination. See TIM and PIM limits based on heat and power used by the IG550 on page 33.
Supported optional modules in the J-series routers and the IG550

**TIM and PIM limits based on heat and power used by the IG550**

Some TIMs and PIMs use more power and generate more heat than other TIMs and PIMs. The J-series routers have limits on the power they can expend on TIMs and PIMs and still maintain normal operation. As a result, the maximum capacities listed in the previous section, TIM combination limitations in the IG550 on page 32, may be lower, depending on the specific combinations of TIMs and PIMs the customer wants to include.

Use the following table, Table 8: Power and heat calculations, to calculate the total power and heat associated with the TIMs and PIMs the customer wants. With the table, you calculate three values, Low Power, Heat, and High Power, for the specific combination of components the customer wants. For each of the three values, the maximum value for any combination of components is as follows:

- 100 for the J6350 and J4350
- 84 for the J2350
- 50 for the J2320

To calculate the power and heat values for a combination of components, use the following steps:

1. For each component in the list, enter in column 4 the number of components the customer wants.

   **Note:**
   The TGM550 is always included in the configuration when calculating power and heat.

2. In column 5, enter in each row the product of the value in column 1 times the value in column 4.
3. In column 6, enter in each row the product of the value in column 2 times the value in column 4.
4. In column 7, enter in each row the product of the value in column 3 times the value in column 4.
5. Add up all values in column 5, and enter the sum in the Totals row at the bottom of the table.
6. Add up all values in column 6, and enter the sum in the Totals row at the bottom of the table.
7. Add up all values in column 7, and enter the sum in the Totals row at the bottom of the table.
Optional components

8. If the Totals value in all of the columns 5, 6, or 7 is below the maximum (100 for J4350/ J6350, 84 for J2350, or 50 for J2320), the customer can configure the J-series router with the desired components.

If any Totals value equals or exceeds the router’s maximum value, the customer cannot configure the J-series router with the components desired. In this case, you must remove components from the configuration or replace them with components with lower power and heat values. Recalculate the heat and power values using different combinations of components until you have a combination that falls below 100 for power and heat.

Note:

The customer can choose to insert TIMs and PIMs such that the calculated heat and power values exceed the maximum allowed. However, the router removes from operation enough modules so that the operating heat and power values are within limits. Therefore, one or more modules might not be operational when power and heat values are exceeded.

Tip:

If a TIM’s red Alarm LED lights, you can use the `show chassis fpc` command in the Juniper CLI to check whether the TIM exceeded heat or power maximum values. Alternatively, you can view the list of TIMs at the bottom of the Monitor page in J-Web. The list displays all TIMs that exceed heat or power maximum values as being "offline".
### Table 8: Power and heat calculations

<table>
<thead>
<tr>
<th>TIM or PIM</th>
<th>Low Power Value (per unit)</th>
<th>Heat Value (per unit)</th>
<th>High Power Value (per unit)</th>
<th>Number of TIMs or PIMs</th>
<th>Low Power Value (Col1 x Col4)</th>
<th>Heat Value (Col2 x Col4)</th>
<th>High Power Value (Col3 x Col4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TGM550</td>
<td>13</td>
<td>18</td>
<td>7</td>
<td>1</td>
<td>13</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>TIM510 (T1/E1-PRI)</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM514 (4 x FXS/4 x FXO)</td>
<td>4</td>
<td>12</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM521 (4 x ISDNBRI)</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM508 (8 x FXS)</td>
<td>4</td>
<td>17</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM516 (16 x FXS)</td>
<td>6</td>
<td>22</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM518 (8 x FXS/8 x FXO)</td>
<td>6</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2Serial-S (2 x Serial)</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2E1-1EL-RJ48-S (2 x E1)</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2T1-1TL-RJ48-S (2 x T1)</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2CT1E1-RJ45-S (2xchT1/E1)</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-1DS3-S (1 x DS3)</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-1E3-S (1 x E3)</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-1ADSL-A-S(1x ADSL2+ A)</td>
<td>16</td>
<td>16</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-1ADSL-B-S (1x ADSL2+ B)</td>
<td>16</td>
<td>16</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2SHDSL-S (2xG.SHDSL)</td>
<td>9</td>
<td>10</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-4BRI-S-S (4xISDN BRI-S)</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-4BRI-U-S (4xISDN BRI U)</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-2FE-TX-S (2 x Fast Eth)</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JXE-4FE-TX-S (4x Fast Eth ePIM)</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JXE-1GE-TX-S (1 Port GigE ePIM)</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JXE-1GE-SFP-S (1 Port SFP ePIM)</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-port GigaE uPIM (16 Port uPIM)</td>
<td>38</td>
<td>36</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-port SFP GigaE uPIM</td>
<td>13</td>
<td>13</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-port GigaE uPIM (8 Port uPIM)</td>
<td>21</td>
<td>27</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-port SFP GigaE uPIM</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JX-ISM-200-WXC (ISM-200-WXC)</td>
<td>7</td>
<td>49</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTALS (Add rows 1 through 27)**
Optional components
Chapter 3: Summary of services

The IG550 offers various services, which are described in Integrated gateway services on page 37. The Juniper J-series Routers offer additional support LAN services on page 42, and WAN services on page 43.

Integrated gateway services

The IG550 provides a telephone exchange service, supporting the connection of various types of telephones and outside telephone lines. Telephones and lines are connected to the IG550 via ports and Telephony Interface Modules (TIMs) on the chassis. Different TIMs provide access ports for different types of telephones and lines.

Telephony services are controlled by a media gateway controller (MGC) running Avaya Communication Manager (CM) call processing software. You can use the Avaya CM to configure many advanced telephone exchange functions. For more information, see the Administrator’s Guide for Avaya Communication Manager, 555-233-506.

This section describes the services the IG550 provides as a media gateway.

Voice over IP (VoIP)

The IG550 features a VoIP engine that provides voice services over IP data networks. The IG550 allows you to use many types of telephones and trunks that do not directly support VoIP. The IG550 translates voice and signalling data between VoIP and the system used by the telephones and trunks, as follows: Avaya TIMs convert the voice path of traditional circuits such as analog trunk, and T1/E1 to a TDM bus inside the IG550. The VoIP engine then converts the voice path from the TDM bus to a compressed or uncompressed and packetized VoIP on an Ethernet connection.

The IG550 provides VoIP services over the LAN and WAN. The IG550 supports the G.711, G.729A, G.729AB, and the G.726A codecs, for the following number of concurrent VoIP calls:

- Up to 80 concurrent VoIP calls with TGM550 MP80
- Up to 20 concurrent VoIP calls with TGM550 MP20
- Up to 10 concurrent VoIP Calls with TGM550 MP10
Physical media — TGM550 and TIMs

There are various types of telephones and lines supported by the TGM550 and the TIMs.

Telephones

The IG550 supports IP telephones and analog telephones. For information about which Avaya telephones are supported, see Appendix B: Supported Avaya telephones.

Telephones must be connected to the correct type of port for the telephone type. Analog telephone ports are provided by fixed ports on the IG550 front panel. The table below lists which ports you can use to connect each type of telephone. See TGM550 physical description on page 23 for more information about each type of port.

Note:

The IG550 does not support DCP telephones.

Table 9: Telephones supported and ports provided

<table>
<thead>
<tr>
<th>Telephone type</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP telephones</td>
<td>Through an Ethernet switch connected to a J2320, J2350, J4350, or J6350 Gigabit interface.</td>
</tr>
<tr>
<td>Analog telephones</td>
<td>Analog line ports on the IG550 front panel or on the TIM508, TIM514, TIM516, or TIM518.</td>
</tr>
</tbody>
</table>

Voice software

The IG550 supports telephone calls between a computer on the network running Avaya Softphone software and analog telephones connected to the IG550.

Outside telephone trunks

The table below lists which ports you can use to connect each type of outside trunk.

Table 10: Outside telephone lines supported and ports provided

<table>
<thead>
<tr>
<th>Line Type</th>
<th>Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISDN BRI trunks</td>
<td>IG550-BRI only — ISDN BRI TRUNK ports on the TIM521.</td>
</tr>
<tr>
<td>Analog trunks</td>
<td>Analog TRUNK ports on the TGM550 front panel or the TIM508, TIM514, or TIM518.</td>
</tr>
<tr>
<td>T1/E1 voice lines</td>
<td>T1/E1 port on the TIM510.</td>
</tr>
</tbody>
</table>
Media Gateway Controllers

A Media Gateway Controller (MGC) is an Avaya Server that controls telephone services on a media gateway. For an IG550, the MGC is external to the media gateway and communicates with the IG550 over the network.

Supported servers

Table 11: MGCs supported by the IG550 Integrated Gateway

<table>
<thead>
<tr>
<th>MGCs</th>
<th>Type</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avaya S8300 Server</td>
<td>Media module</td>
<td>ECC</td>
</tr>
<tr>
<td>Avaya S8400 Server</td>
<td>External</td>
<td>ECC</td>
</tr>
<tr>
<td>Avaya S8500 Server</td>
<td>External</td>
<td>ECC</td>
</tr>
<tr>
<td>Avaya S8710 Server</td>
<td>External</td>
<td>ECC</td>
</tr>
<tr>
<td>Avaya S8720 Server</td>
<td>External</td>
<td>ECC</td>
</tr>
<tr>
<td>Avaya S8730 Server</td>
<td>External</td>
<td>ECC</td>
</tr>
</tbody>
</table>

Configuring IG550 options

The IG550 provides the following configuration options to help you ensure continuous telephone services:

- You can configure the IG550 to use up to four servers. If the primary MGC is an S8700-series server, the first server on the list will normally be the primary C-LAN board connected to the server. The remaining servers will be alternate C-LAN boards connected to the server (S8400, S8500, or S8700-series servers), an S8300 configured as an Local Survivable Processor (LSP), or the port enabled as the Ethernet processor port on an S8500 configured as an LSP. In addition, the gateway can also register to the Standard Local Survivability engine (see the SLS description that follows).

If the primary MGC is an S8400 or S8500, the first server on the list will be either the primary C-LAN board connected to the server or an Ethernet port on the server that has been enabled for processor Ethernet connections. Additional backup servers on the list are the same as those previously listed for the S8700-series servers.

If the primary MGC is an S8300, the first server on the list will be the IP address of the S8300. Additional backup servers on the list are normally LSPs and/or SLS.
Summary of services

- Using the connection preserving migration feature, you can configure the IG550 to preserve the bearer paths of stable calls in the event that the IG550 migrates to another MGC (including an LSP), including migration back from an LSP to the primary MGC. A call for which the talk path between parties in the call has been established is considered stable. A call consisting of a user listening to announcements or music is not considered stable and is not preserved. Any change of state in the call prevents the call from being preserved. For example, putting a call on hold during MGC migration will cause the call to be dropped. Special features, such as conference and transfer, are not available on preserved calls. Connection preserving migration preserves all types of bearer connects except BRI. PRI trunk connections are preserved.

- You can configure Standard Local Survivability (SLS) to enable a local IG550 to provide a degree of MGC functionality when no link is available to an external MGC. SLS is configured on a system-wide basis using the Provisioning and Installation Manager (PIM). Alternatively, SLS can be configured from the individual IG550 itself using the CLI. SLS supports all analog interfaces, ISDN BRI/PRI trunk interfaces, non-ISDN digital DS1 trunk interfaces, IP phone, and IP Softphone.

- You can configure the dialer interface to connect to the IG550’s primary MGC via a modem connected to the J-series router in the event that the connection between the IG550 and the MGC is lost.

- You can configure the Avaya CM to support the auto fallback feature, which enables a IG550 being serviced by an LSP to return to its primary MGC automatically when the connection is restored between the IG550 and the MGC. When the IG550 is being served by its LSP, it automatically attempts to register with its MGC at periodic intervals. The MGC can deny registration in cases in which it is overwhelmed with call processing, or in other configurable circumstances. By migrating the IG550 to the MGC automatically, a fragmented network can be unified more quickly, without the need for human intervention.

  **Note:**
  
  Auto fallback does not include survivability. Therefore, there is a short period during registration with the MGC during which calls are dropped and service is not available. This problem can be minimized using the connection preserving migration feature.

- The IG550 features a dynamic trap manager, which enables you to ensure that the IG550 sends traps directly to the currently active MGC. If the MGC fails, the dynamic trap manager ensures that traps are sent to the backup MGC.

**MGC management**

The MGC is managed by the Avaya Communication Manager (CM). The IG550 supports Avaya Communication Manager (CM) release 5.0.
Avaya CM features

Avaya CM is an open, scalable, highly reliable, and secure telephony application. Avaya CM provides user and system management functionality, intelligent call routing, application integration and extensibility, and enterprise communications networking. Avaya CM offers over 500 features, in the following categories:

- Telephony features
- Localization
- Collaboration
- Mobility
- Messaging
- Telecommuting
- System management
- Reliability
- Security, privacy, and safety
- Hospitality
- Attendant features
- Networking
- Intelligent call routing
- Application programming interfaces

Avaya CM software applications

- Determine where to connect your telephone call based on the number you dial
- Assign numbers to local telephones
- Play dial tones, busy signals, and prerecorded voice announcements
- Allow or prohibit access to outside lines for specific telephones
- Assign telephone numbers and buttons to special features
- Exchange call switching information with older telephone switches that do not support VoIP

For more information about Avaya CM software, see Administrator’s Guide for Avaya Communication Manager, 03-300509.
Additional features

The IG550s also provide voice-related features.

Emergency Transfer Relay (ETR)

The Emergency Transfer Relay (ETR) feature provides basic telephone services in the event of a power outage or a failed connection to Avaya Communication Manager. Using ETR, you can connect the second fixed analog trunk port (TRUNK - Vx02) to the first line port (LINE - Vx03).

⚠️ WARNING:
Do not enable ETR on ports used for DID.

An outside telephone exchange can be connected to the trunk port, and an analog telephone can be connected to the line port. All calls are then directed by the analog relay between the outside line and the analog telephone. A current-loop detection circuit prevents ongoing calls from being disconnected when normal functioning resumes. It is recommended that ETR not be enabled for line ports that are administered for use with analog DID trunks.

Fax, modem, TTY over IP

The IG550 supports fax, modem, and Teletypewriter (TTY) over IP.

LAN services

You can integrate the J-series router into an existing LAN.

Physical media

LAN services are provided through the fixed Gigabit ports on the J-series router for the connection of local data devices. LAN services are also available through the use of the optional Fast Ethernet PIMs, if they are installed (see Table 6: Supported interface modules on page 25). An external Ethernet switch that is used to connect IP telephones communicates with the router through these Fast Ethernet or Gigabit ports.
VLANs

In the J-series Router, you can configure VLANs to support the TGM550.

WAN services

The J-series router provides the router and interface capabilities for direct access to outside WAN lines.

For detailed information on J-series router WAN and routing features and administration, see the following documents:

- J2320, J2350, J4350, and J6350 Services Router Getting Started Guide, Release 8.4
- J-series Services Router Basic LAN and WAN Access Configuration Guide, Release 8.4
- J-series Services Router Administration, Release 8.4

Physical Interface Modules

To use the IG550 as the endpoint device for a WAN, install a Juniper WAN Physical Interface Module and connect the WAN line to a port on the PIM. When you connect a WAN line to a PIM, the J-series router serves as the router for the WAN line.

WAN line support

Note:
This list of WAN lines for J-series routers is a sample only. For a complete list of supported WAN lines, see the Juniper J-series router documentation at http://juniper.net.

The J-series routers support the following types of WAN line:

- E1/T1
- E3/T3
- ADSL
- G.SHDSL
- USP
- PPPoE
Routing features

Note:
This list of routing features for J-series routers is a sample only. For a complete list of features and PIMs, see the Juniper J-series router documentation at http://juniper.net.

The J-series routers support the following to ensure efficient and secure routing of VoIP calls:

- OSPF v2
- BGP v4
- BGP Router Reflector*
- RIPv2
- Static routes
- IS-IS
- Multicast (IGMPv3, PIM, SDP, DVMRP, Source-specific)
- MPLS
- IPv6 Multicast Listener Discovery (MLD)
- DHCP (client & server)
- DHCP relay
- PPP (Synch)
- Frame Relay
- HDLC
- 802.1q support
- MLPPP
- MLFR (FRF.15, FRF.16)
- PPPoE
- DLSw
- Marking, policing & shaping
- Class based queuing with prioritization
- WRED
- Queuing based on VLAN/DLCI/Interface/Bundles/Filters
- Network attack detection
- DOS & DDOS protections (Anomaly-based)
● Tunnels (GRE, IP in IP, IPSec)
● DES (56-bit), 3DES (168-bit), AES (256-bit) encryption
● MD5 and SHA-1 authentication
● Prevent replay attack
● Stateful firewall filters
● FRF.12
● Link Fragmentation and Interleaving (LFI)
● Compressed Real-Time Protocol (CRTP)
● Virtual Router Redundancy Protocol (VRRP)
● Dial Backup
● MPLS features
  - Layer 2 VPN
  - Layer 3 VPN
  - Label Distribution Protocol (LDP)
  - Circuit Cross-Connect (CCC)
  - Translation Cross Connect (TCC)
Summary of services
Chapter 4: Management

In addition to using Communication Manager from the supporting server, the IG550 Integrated Gateway can be managed using the following applications:

- **Avaya TGM550 Command Line Interface** on page 47
- **Avaya Integrated Management** on page 48
- **Avaya Network Configuration Manager** on page 48
- **Avaya Secure Access Administration** on page 48
- **Avaya Software Update Manager** on page 49
- **Avaya Provisioning and Implementation Manager** on page 49

The J2320, J2350, J4350, and J6350 Services Routers can be managed with the following interfaces:

- **Juniper JUNOS Command Line Interface** on page 50
- **Juniper J-Web Interface** on page 50

For detailed information on J-series router WAN and routing features and administration, see the following documents:

- **J4350 and J6350 Services Router Getting Started Guide**, Release 8.4
- **J-series Services Router Basic LAN and WAN Access Configuration Guide**, Release 8.4
- **J-series Services Router Administration, Release 8.4**

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**Avaya TGM550 Command Line Interface**

You can use the TGM550 CLI to configure the TGM550 and its TIMs. The CLI is a textual command prompt interface. It is similar to the CLI of many other network devices.

You can access the CLI with any of the following:

- SSH (Secure Shell) through dialup, using a dialup PPP network connection over the J-series router’s USB modem
- A console device connected to the Console port on the TGM550 front panel
- SSH with a remote session over a secured tunnel
- SSH over the LAN
Management

Note:
Telnet is disabled by default. The customer may choose, however, to enable it and use it for TGM550 CLI access.

For information about each command in the CLI or how to use the CLI to perform specific configuration tasks, see the Administration Guide and CLI Reference for the Avaya IG550 Integrated Gateway, 03-601883.

Avaya Integrated Management

Avaya Integrated Management offers a comprehensive set of web-based network and system management solutions that support Avaya converged voice solutions. You can use Avaya Integrated Management to monitor SNMP traps on the IG550.

Avaya Network Configuration Manager

Avaya Network Configuration Manager is an application that allows you to backup and restore device configurations and configure multiple devices, including the TGM550. Avaya Network Configuration Manager uses Simple Network Management Protocol (SNMP) and Trivial File Transfer Protocol (TFTP) or Secure Copy Protocol (SCP) to exchange information with the devices in the network.

When using SCP, an SCP server must be installed on the management station. After defining users on the SCP server, you can configure Avaya Network Configuration Manager as an SCP user.

Note:
While this application supports the TGM550 Gateway Module, Network Configuration Manager does not support configuration of the J-series router in which the TGM550 resides.

Avaya Secure Access Administration

The Avaya Secure Access Administration is a centralized application used to define users and assign their privileges for access to network management applications and device configuration applications.

Avaya Secure Access Administration is used to perform the following administrative tasks:

- Define and manage users in Avaya Network Management applications.
- Define device users such as the IG550 and create instances of device users on devices, with or without SNMPv3 management access.
Once defined, a user without administrator privileges can use Secure Access Administration to change the user’s own passwords.

Avaya Software Update Manager

Avaya Software Update Manager helps network managers with enterprise networks containing Avaya devices, such as the IG550, ensure that all devices are running with the most current version of the device (agent) software/firmware. This application downloads the necessary update software to managed Avaya devices. Avaya Software Update Manager can also check the software versions currently in use against the latest versions available from Avaya and recommend updates when a newer version is available. You can use Avaya Software Update Manager to take a new release from Avaya’s Web site and store it on your hard disk for subsequent downloading to the appropriate devices.

Note:
Software Update Manager does not support the J-series router that houses the IG550.

Avaya Provisioning and Implementation Manager

Avaya Provisioning and Installation Manager provides the capability to remotely configure gateways such as the IG550 on a network-wide basis. It provides integrated network system views that ease centralized configuration tasks, especially provisioning and installing large numbers of gateways simultaneously.

Through the use of wizards that prompt you for required information, Avaya Provisioning and Installation Manager enables you to:

- Create templates and device profiles to use later.
- Import and export device profiles and templates.
- Save templates and device profiles as an incomplete status or completed.
- Copy configuration templates and device profiles to create placeholders for different parameters.
- Create a template from scratch or import data from an electronic pre-installation worksheet (EPW).
- Distribute a template through bulk provisioning to a group of devices.
- Send a profile to a device and make a choice to distribute now, schedule for a later, or make pending.
● Configure the IG500 with Standard Local Survivability (SLS) updates that include parameters such as automatic route selection (ARS) rules and dial plans. Survivability provides basic call processing controller functionality in the event that a main controller or LSP is unavailable.

● Store notes about templates and device profiles.

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**Juniper JUNOS Command Line Interface**

JUNOS is the operating system software for the J-series routers. The JUNOS CLI is a straightforward command interface in which you type commands on a line and press Enter to execute them. The CLI provides command help, command completion, and Emacs-style keyboard sequences for moving around on the command line and scrolling through a buffer of recently executed commands.

The CLI has several modes:

● Operational mode — Complete set of commands to control the CLI environment, monitor and troubleshoot network connectivity, manage the J-series router, and enter configuration mode.

● Configuration mode — Complete set of commands to configure the J-series router.

● Console mode — Enables using Linux commands to view files, change directories, etc.

---

**Juniper J-Web Interface**

The J-Web graphical user interface (GUI) allows you to monitor, configure, troubleshoot, and manage the J-series router on a client by means of a Web browser with Hypertext Transfer Protocol (HTTP) or HTTP over Secure Sockets Layer (HTTPS) enabled. The J-Web interface provides access to all the configuration statements supported by the router, so you can fully configure it without using the CLI.

The J-Web interface provides two methods of J-series router configuration:

● Quick Configuration

● Configuration editor

In addition to configuration, you can use the J-Web interface to perform many monitoring, troubleshooting, and management tasks on the J-series router.
Management access permissions

To use any management functions, the user must have a user name and password. Each user name is associated with one of three privilege levels: read-only, read-write, and administrator.

Security features

The TGM550 provides the following security features:

- Management security features:
  - A basic authentication mechanism in which users are assigned privilege levels
  - Support for user authentication provided by external RADIUS server
  - SNMPv3 user authentication
  - Secure data transfer via SSH and SCP with user authentication
  - AES and AEA bearer encryption
  - Secrets management, such that passwords and keys associated with a configuration file are encrypted and stored with the configuration files
  - CHAP secrets for PPP, T1, and WAN connections

- Protection against DoS (Denial of Service) attacks via:
  - RSS notifications. The IG550 identifies predefined or custom-defined traffic patterns as suspected DoS attacks and generates SNMP notifications, referred to as Remote Security Services (RSS) notifications. RSS notifications are intercepted and, if certain conditions are met, may be forwarded to the Avaya Security Operations Center (SOC) as INADS alarms. The SOC is an Avaya service group that handles DoS alerts, responding as necessary to any DoS attack or related security issue.
  - SYN cookies, which protect against a well-known TCP/IP attack in which a malicious attacker targets a vulnerable device and effectively prevents it from establishing new TCP connections.

The Juniper J-series routers provide the following security features:

- Traffic security features:
  - Private secure connections can be configured between the J-series router and a remote peer, using VPN (Virtual Private Network). VPN at the IP level is deployed using a standards-based set of protocols defined by the IETF called IPSec. IPSec provides privacy, integrity, and authenticity to information transferred across IP networks.
- Access to the J-series router’s LAN ports is authenticated using the 802.1x protocol. The 802.1x protocol standard is extended to support an optional mode for authenticating multiple supplicants.

- GRE Tunneling
- IPSec Tunneling
- Network Attack Detection
- Stateful firewall filters

Backup and restore

The IG550 allows the backup and restore of TGM550 data to an FTP or SCP server on the network.

You should backup TGM550 configuration data separately from the J-series configuration data.

Note:
If a secure protocol is required for remote access and copying of files, SCP can be used for each file individually.

You can backup J-series router data to a USB stick, the internal compact flash, or an external compact flash.

Alarms and troubleshooting features

The IG550s have extensive features for error detection, alarms, and troubleshooting. Detailed diagnostic information and troubleshooting are provided by software-based solutions accessible by laptops in the field or remotely from an administrator’s computer. Administration Guide and CLI Reference for the Avaya IG550 Integrated Gateway, 03-601883, provides a comprehensive guide to configuring and using these solutions.

Front panel LEDs

LEDs on the front panel of the TGM550 and its TIMs give a quick overall understanding of the health of the system and subsystems. When alarms or problems occur, LEDs indicate that a technician’s attention is needed.
SNMP

The TGM550 reports alarms using SNMP traps. It supports sending SNMPv1, SNMPv2c and SNMPv3 traps and SNMPv2c and SNMPv3 informs.

VoIP debugging using RTP-MIB

The IG550 includes the RTP-MIB feature for debugging QoS-related problems across the VoIP network without any dedicated hardware. During each RTP stream, counters representing various QoS metrics increment whenever configured thresholds for the metrics are exceeded. A limited history of the QoS metric statistics is stored on the IG550 for active and terminated RTP streams. Statistics can be displayed via the TGM550 CLI. In addition, the TGM550 can be configured to send SNMP traps to the SNMP trap manager on the server at the termination of each RTP stream that has QoS problems. The traps are converted to syslog messages and stored for viewing in the messages file on the server hard disk.

Converged Network Analyzer (CNA) test plug

CNA test plugs are a component of CNA, a distributed system tool for real-time network monitoring that detects and diagnoses converged network-related issues. CNA is deployed in the IG550 to identify any network conditions or impairments that can degrade the user experience for IP telephony and to monitor overall network performance. Test plugs in media gateways provide the ability to measure end-to-end service to the edge of the PSTN, or at points where codec changes are required for interworking between high (LAN) and low (WAN) speed links.
Chapter 5: Documentation

The following documentation is available to help you implement the Integrated Gateway in your environment:

- **Installing and Configuring the Avaya IG550 Integrated Gateway, 03-601554.** Describes how to install and upgrade the IG550 and perform some basic configurations. This guide describes how to insert Telephony Interface Modules (TIMs) and connect a modem to the IG550.

- **Quick Start for Hardware Installation for the Avaya IG 550 Integrated Gateway, 03-601553.** A concise installation guide covering assembly and basic configuration of the IG550.

- **Administration Guide and CLI Reference for the Avaya IG550 Integrated Gateway, 03-601883.** Describes how to configure and manage the IG550s after it is already installed. This guide contains detailed information about all the features of the IG550s and how to implement them. Also describes the commands in the TGM550 CLI.

- **Avaya Maintenance Commands for Communication Manager, Servers, and Media Gateways, 03-300431.** Describes commands used for maintaining servers that run Communication Manager and media gateways that Communication Manager controls.

- **Avaya Maintenance Alarms for Communication Manager, Servers, and Media Gateways, 03-300430.** Describes alarms and repair procedures for servers that run Communication Manager and media gateways that Communication Manager controls.

- **Avaya Maintenance Procedures for Communication Manager, Servers, and Media Gateways, 03-300432.** Describes maintenance procedures for servers that run Communication Manager and media gateways that Communication Manager controls.

For a description of Juniper J-series router features, administration, and maintenance, see the following documents:

- **J2320, J2350, J4350, and J6350 Services Router Getting Started Guide, Release 8.4**
- **J-series Services Router Basic LAN and WAN Access Configuration Guide, Release 8.4**
- **J-series Services Router Administration, Release 8.4**

Additional documentation is available on the Juniper Networks Web site, [http://juniper.net](http://juniper.net).
# Appendix A: IG550 capacities

## IG550 maximum media gateway capacities

Table 12: IG550 media gateway capacities

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy Hour Call rate (BHCC)</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Maximum number of TGM550s controlled by an S8500 or S8700-series Server</td>
<td>250</td>
<td>This number also applies if a combination of Avaya G700, G250, G350, and G450 Media Gateways are controlled by the same server.</td>
</tr>
<tr>
<td>Maximum number of TGM550s controlled by an S8400 Server</td>
<td>5</td>
<td>This number also applies if a combination of Avaya G700, G250, G350, and G450 Media Gateways are controlled by the same server.</td>
</tr>
<tr>
<td>Maximum number of TGM550s controlled by an S8300 Server in a G450 or G700</td>
<td>49</td>
<td>This capacity is 50 if a combination of Avaya G700, G250, G350, and G450 Media Gateways are also controlled by the same server in the G700 or G450. Therefore, the maximum of 50 H.248 gateways supported by the S8300 means that 49 of the 50 could be IG550s.</td>
</tr>
<tr>
<td>Maximum number of TGM550s controlled by an S8300 Server in a G350</td>
<td>4</td>
<td>This capacity is 5 if a combination of Avaya G250 and G350 Media Gateways are also controlled by the server in the G350. Therefore, the maximum of 5 H.248 gateways supported by the S8300 means that 4 of the 5 could be IG550s.</td>
</tr>
</tbody>
</table>

1 of 3
### Table 12: IG550 media gateway capacities (continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers registered as Media Gateway Controllers. If an MGC becomes unavailable, the IG550 uses the next MGC on the list.</td>
<td>4</td>
<td>The built-in SLS module can be considered a fifth MGC, although its functionality is more limited than that of a full scale server.</td>
</tr>
<tr>
<td>Module slots for TGM550, TIMs and PIMs</td>
<td>6 — J4350 or J6350, 5 — J2350, 3 — J2320</td>
<td>The J-series router allows any slot to be used for the TGM550 or TIMs and most PIMs. ePIMs and E3/T3 PIMs are not supported on the J2320 and J2350 routers and ePIMs must be inserted in slots 3 or 6 on the J4350 and in slots 2, 3, 5, or 6 on the J6350. Also, the 16-port GigaE uPIM requires two slots vertically-aligned slots.</td>
</tr>
<tr>
<td>Fixed analog line ports</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Fixed analog trunk ports</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Maximum number of TIMs</td>
<td>5 — J4350 or J6350, 4 — J2350, 2 — J2320</td>
<td>2 to 5 TIMs can be inserted into a J-series router, depending on the model. The TGM550 is always inserted in one of the slots on the router. For additional limitations, see TIM and PIM limits based on heat and power used by the IG550 on page 33.</td>
</tr>
<tr>
<td>Maximum number of TIM510 E1/T1 TIMs</td>
<td>4 — J2350, J4350, J6350, 1 — J2320</td>
<td></td>
</tr>
<tr>
<td>Maximum number of TIM521 BRI TIMs</td>
<td>4 — J2350, J4350, J6350, 1 — J2320</td>
<td></td>
</tr>
<tr>
<td>Maximum total number of telephones supported by the IG550</td>
<td>100</td>
<td>Maximum includes a combination of analog and IP telephones.</td>
</tr>
</tbody>
</table>
Table 12: IG550 media gateway capacities (continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Signal Processors (DSPs)</td>
<td>1 (MP80 — up to 80 channels; MP20 — up to 20 channels; MP10 — up to 10 channels)</td>
<td>The MP80 DSP supports 80 channels for calls using voice codec sets with 20 millisecond or higher packet sizes. For calls with 10 millisecond or lower packet sizes, the MP80 DSP supports 40 channels. For TTY, fax, or modem over IP calls, the MP80 DSP supports 40 channels. The MP20 and MP10 DSPs support all codecs and call types to the maximum number of channels.</td>
</tr>
<tr>
<td>Touch-tone recognition (TTR)</td>
<td>32</td>
<td>Receivers</td>
</tr>
<tr>
<td>Tone Generation</td>
<td>As much as necessary for all TDM calls.</td>
<td></td>
</tr>
<tr>
<td>Announcements (VAL)</td>
<td>16 playback channels for playing announcements, one of which can be used for recording. Communication Manager uses only 15 channels maximum for playback, and reserves one channel for recording.</td>
<td>20 minutes for G711-quality stored announcements and music-on-hold. 256 maximum announcements stored.</td>
</tr>
</tbody>
</table>

⚠️ **CAUTION:**

Some capacities may change. For the most up-to-date list, see System Capabilities Table for Avaya Communication Manager on Avaya Servers, 555-245-601.
IG50 capacities
Appendix B: Supported Avaya telephones

There are various Avaya telephones supported by the IG550, including both IP and analog telephones.

Avaya IP telephones

The IG550 supports the following Avaya IP telephones:

- Avaya 4602 IP Telephone
- Avaya 4602SW IP Telephone
- Avaya 4601 IP Telephone
- Avaya 4606 IP Telephone
- Avaya 4610 IP Telephone
- Avaya 4612 IP Telephone
- Avaya 4620 IP Telephone
- Avaya 4621 IP Telephone
- Avaya 4624 IP Telephone
- Avaya 4630 IP Screenphone
- Avaya 4630SW IP Screenphone
- Avaya 4690 IP Telephone

Note:
The Avaya 4630 IP and 4630SW IP Screenphones cannot be powered via PoE ports.

VPNRemote client for 4600-series telephones

The IG550 Integrated Gateway supports the VPNRemote client software of the 4600-series telephones. The VPNRemote client software enables any 4600-series IP telephone to be used securely from remote locations over any broadband Internet connection. VPNRemote client also requires the use of a Juniper NetScreen device for connections between the J-series router and the 4600-series telephone.
Supported Avaya telephones

Computer-based telephones

The IG550 Integrated Gateway supports the following computer-based telephones:

- Softphone
- IP Agent
- IP Callmaster

Avaya analog telephones

The IG550 supports the following Avaya analog telephones:

- Avaya 6211 Analog Telephone
- Avaya 6219 Analog Telephone
- Avaya 2500 and the Avaya 2554 Analog Telephones
- 2520 Explosive Atmosphere Telephone
Appendix C: IG550 and J-series router technical specifications

These specifications include physical dimensions and tolerances of the Juniper J-series Services Router, power cord specifications and TGM550 Gateway Module specifications.

J2320 Services Router specifications

Table 13: J2320 Services Router specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>1.75 in. (44.45 mm)</td>
</tr>
<tr>
<td>Width</td>
<td>17.5 in. (44.5 cm)</td>
</tr>
<tr>
<td>Depth</td>
<td>15.1 in. (38.4 cm)</td>
</tr>
<tr>
<td>Weight of empty chassis</td>
<td>14.8 lb. (6.7 kg)</td>
</tr>
<tr>
<td>Ambient working temperature</td>
<td>32° to 104°F (0° to 40°C)</td>
</tr>
<tr>
<td>Operation altitude</td>
<td>up to 10,000 ft. (3,048 m)</td>
</tr>
<tr>
<td>Front Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Rear Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5-90% relative humidity</td>
</tr>
<tr>
<td>Power rating</td>
<td>AC: 100-240 VAC, 50 to 60 Hz, 6 to 8 A, 350 Watts; DC: -48 to -60 VDC, 420 Watts</td>
</tr>
</tbody>
</table>
J2350 Services Router specifications

Table 14: J2350 Services Router specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>2.61 in. (66.22 mm)</td>
</tr>
<tr>
<td>Width</td>
<td>17.5 in. (44.5 cm)</td>
</tr>
<tr>
<td>Depth</td>
<td>15.1 in. (38.4 cm)</td>
</tr>
<tr>
<td>Weight of empty chassis</td>
<td>16.3 lb. (7.4 kg)</td>
</tr>
<tr>
<td>Ambient working temperature</td>
<td>32° to 104°F (0° to 40°C)</td>
</tr>
<tr>
<td>Operation altitude</td>
<td>up to 10,000 ft. (3,048 m)</td>
</tr>
<tr>
<td>Front Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Rear Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5-90% relative humidity</td>
</tr>
<tr>
<td>Power rating</td>
<td>AC: 100-240 VAC, 50 to 60 Hz, 6 to 8 A, 350 Watts; DC: -48 to -60 VDC, 420 Watts</td>
</tr>
</tbody>
</table>

J4350/J6350 Services Router specifications

The table of technical specifications provides detailed information on the physical dimensions and tolerances of the J4350 Services Router:

Table 15: J4350 Services Router specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>3.5 in. (8.9 cm)</td>
</tr>
<tr>
<td>Width</td>
<td>17.5 in. (44.5 cm)</td>
</tr>
<tr>
<td>Depth</td>
<td>21.5 in. (54.6 cm)</td>
</tr>
<tr>
<td>Weight of empty chassis</td>
<td>23.0 lb. (10.4 kg) — J4350; 25.0 lb. (11.3 kg) — J6350</td>
</tr>
</tbody>
</table>
### J-series Services Router power cord specifications

#### AC Power Cord

Detachable AC power cords, each 2.5 m (approximately 8 ft.) long, are supplied with the Services Router. The appliance coupler at the female end of the cord inserts into the appliance inlet on the faceplate of the AC power supply. The coupler is type C19 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source receptacle that is standard for your geographical location.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient working temperature</td>
<td>32° to 104°F (0° to 40°C)</td>
</tr>
<tr>
<td>Operation altitude</td>
<td>up to 10,000 ft. (3,048 m)</td>
</tr>
<tr>
<td>Front Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Rear Clearance</td>
<td>6 in. (15 cm)</td>
</tr>
<tr>
<td>Humidity</td>
<td>5-90% relative humidity</td>
</tr>
<tr>
<td>Power rating</td>
<td>AC: 100-240 VAC, 50 to 60 Hz, 6 to 8 A, 350 Watts; DC: -48 to -60 VDC, 420 Watts</td>
</tr>
</tbody>
</table>

Table 15: J4350 Services Router specifications (continued)
Note:
In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

<table>
<thead>
<tr>
<th>Country</th>
<th>Electrical Specifications</th>
<th>Plug Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>250 VAC, 10 A, 50 Hz</td>
<td>AS/NZ 3112 1-993</td>
</tr>
<tr>
<td>China</td>
<td>250 VAC, 10 A, 50 Hz</td>
<td>GB2099.1 1996 and GB1002 1996 (CH1-10P)</td>
</tr>
<tr>
<td>Europe (except Italy and United Kingdom)</td>
<td>250 VAC, 10 A, 50 Hz</td>
<td>CEE (7) VII</td>
</tr>
<tr>
<td>Italy</td>
<td>250 VAC, 10 A, 50 Hz</td>
<td>CEI 23 - 16/VII</td>
</tr>
<tr>
<td>Japan</td>
<td>125 VAC, 12 A, 50 Hz or 60 Hz</td>
<td>JIS 8303</td>
</tr>
<tr>
<td>North America</td>
<td>125 VAC, 10 A, 60 Hz</td>
<td>NEMA 5-15</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>250 VAC, 10 A, 50 Hz</td>
<td>BS 1363A</td>
</tr>
</tbody>
</table>

**DC Power Cord**

Each DC power supply has a single DC input (-48 VDC and return) that requires a dedicated 15 A (-48 VDC) circuit breaker. If the J6350 router contains redundant DC power supplies, one power supply must be powered by a dedicated power feed derived from feed A, and the other power supply must be powered by a dedicated power feed derived from feed B. This configuration provides the commonly deployed A/B feed redundancy for the system.

Most sites distribute DC power through a main conduit that leads to frame-mounted DC power distribution panels, one of which might be located at the top of the rack that houses the router. A pair of cables (one input and one return) connects each set of terminal studs to the power distribution panel.

Each DC power cable (-48 VDC and return) must be 14 AWG single-strand wire cable, or as permitted by the local code. Each lug attached to the power cables must be a ring-type, vinyl-insulated TV14-6R lug, or equivalent.
TGM550 Gateway Module specifications

Table 16: TGM550 Gateway Module

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient working temperature</td>
<td>32° to 158°F (0° to 70°C)</td>
</tr>
<tr>
<td>Operation altitude</td>
<td>up to 10,000 ft. (3,048 m)</td>
</tr>
</tbody>
</table>

Grounding Cable for a J-series router supporting the IG550

When housing a TGM550, the J-series router must use a grounding cable that meets the following specifications:

- 10 AWG
- Able to handle up to 8 Amp current
- Have a ring-type, vinyl-insulated TV14-6R lug, or equivalent, to accommodate the 10 AWG cable

⚠️ CAUTION:

The original grounding cable for Juniper Services Routers is 14 AWG only and must be replaced with a 10 AWG cable.
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