



Ethernet Cards



Note

The terms "Unidirectional Path Switched Ring" and "UPSR" may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as "Path Protected Mesh Network" and "PPMN," refer generally to Cisco's path protection feature, which may be used in any topological network configuration. Cisco does not recommend using its path protection feature in any particular topological network configuration.

The Cisco ONS 15454 SDH integrates Ethernet into a SDH time-division multiplexing (TDM) platform. This chapter describes the Cisco ONS 15454 SDH E-Series Ethernet cards, the G-Series Ethernet cards, and ML-Series Ethernet cards. It includes descriptions, hardware specifications, and block diagrams for each card. For G-Series and E-Series Ethernet application information, see [Chapter 16, "Ethernet Operation."](#) For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide*. For ML-Series configuration information, see the *Cisco ONS 15454 SONET/SDH ML-Series Multilayer Ethernet Card Software Feature and Configuration Guide*.

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- [5.2 E100T-G Card, page 5-3](#)
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5.1 Ethernet Card Overview

The card overview section summarizes card functions, power consumption, and temperature ranges.



Note

Each card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 SDH shelf assembly. The cards are then installed into slots displaying the same symbols. See the *Cisco ONS 15454 SDH Procedures Guide* for a list of slots and symbols.

5.1.1 Ethernet Cards

Table 5-1 lists the Cisco ONS 15454 SDH Ethernet cards.

Table 5-1 Ethernet Cards for the ONS 15454 SDH

Card	Port Description	For Additional Information...
E100T-G	The E100T-G card provides 12 switched, autosensing, 10/100BaseT Ethernet ports.	See the “E100T-G Card” section on page 5-3.
E1000-2-G	The E1000-2-G card provides two IEEE-compliant, 1000-Mbps ports. Gigabit Interface Converters (GBICs) are separate.	See the “E1000-2-G Card” section on page 5-6.
G1000-4	The G1000-4 card provides four IEEE-compliant, 1000-Mbps ports. GBICs are separate.	See the “G1000-4 Card” section on page 5-9.
G1K-4	The G1K-4 card provides four IEEE-compliant, 1000-Mbps ports. GBICs are separate. The G1K-4 card is functionally identical to the G1000-4 card.	See the “G1K-4 Card” section on page 5-12.
ML100T-12	The ML100T-12 card provides 12 switched, autosensing, 10/100Base-T Ethernet ports.	See the “ML100T-12 Card” section on page 5-15.
ML1000-2	The ML1000-2 card provides two IEEE-compliant, 1000-Mbps ports. Small form-factor pluggable (SFP) connectors are separate.	See the “ML1000-2 Card” section on page 5-18.

5.1.2 Card Power Requirements

Table 5-2 lists power requirements for Ethernet cards.

Table 5-2 Ethernet Card Power Requirements

Card Name	Watts	Amps	BTU/hr
E100T-G	65.00	1.35	221.93
E1000-2-G	53.50	1.11	182.67
G1000-4	63.00 incl. GBICs	1.31	215.11
G1K-4	63.00 incl. GBICs	1.31	215.11
ML100T-12	53.00	1.10	181.0
ML1000-2	49.00 incl. SFPs	1.02	167.3

5.1.3 Card Temperature Ranges

Table 5-3 shows C-Temp and I-Temp compliant cards and their product names.



Note

The I-Temp symbol is displayed on the faceplate of an I-Temp compliant card. A card without this symbol is C-Temp compliant.

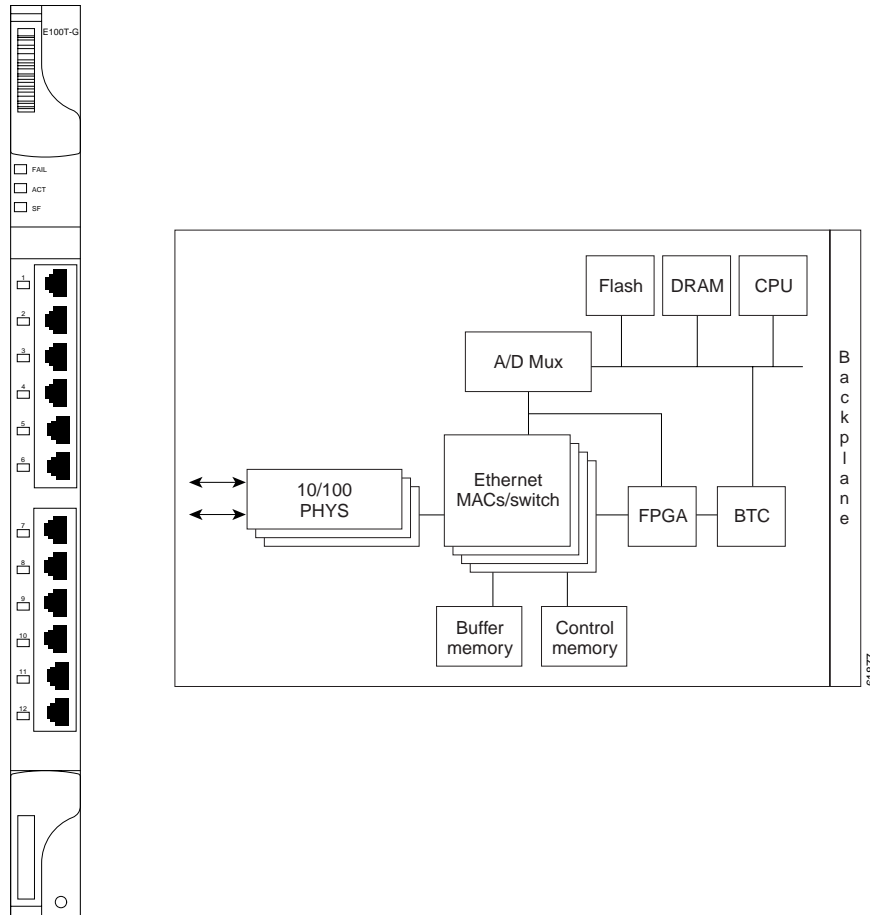
Table 5-3 Ethernet Card Temperature Ranges and Product Names for the ONS 15454 SDH

Card	C-Temp Product Name (0 to +55 degrees Celsius)	I-Temp Product Name (-40 to +65 degrees Celsius)
E100T-G	15454-E100T-G	—
E1000-2-G	15454-E1000-2-G	—
G1000-4	15454-G1000-4	—
G1K-4	15454-G1K-4	—
ML100T-12	15454-ML100T-12	—
ML1000-2	15454-ML1000-2	—

5.2 E100T-G Card

The ONS 15454 SDH uses E100T-G cards for Ethernet (10 Mbps) and Fast Ethernet (100 Mbps). Each card provides 12 switched, IEEE 802.3-compliant, 10/100BaseT Ethernet ports that can independently detect the speed of an attached device (autosense) and automatically connect at the appropriate speed. The ports autoconfigure to operate at either half or full duplex and determine whether to enable or disable flow control. You can also configure Ethernet ports manually. [Figure 5-1 on page 5-4](#) shows the faceplate and a block diagram of the card.

Figure 5-1 E100T-G Faceplate and Block Diagram



The E100T-G Ethernet card provides high-throughput, low-latency packet switching of Ethernet traffic across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. This Ethernet capability enables network operators to provide multiple 10/100-Mbps access drops for high-capacity customer LAN interconnects, Internet traffic, and cable modem traffic aggregation. It enables the efficient transport and co-existence of traditional TDM traffic with packet-switched data traffic.

Each E100T-G card supports standards-based, wire-speed, Layer 2 Ethernet switching between its Ethernet interfaces. The IEEE 802.1Q tag logically isolates traffic (typically subscribers). IEEE 802.1Q also supports multiple classes of service.

5.2.1 E100T-G Slot Compatibility

You can install the E100T-G card in slots 1 to 6 and 12 to 17. Multiple E-Series Ethernet cards installed in an ONS 15454 SDH can act independently or as a single Ethernet switch. You can create logical SDH ports by provisioning a number of SDH channels to the packet switch entity within the ONS 15454 SDH. Logical ports can be created with a bandwidth granularity of VC-4.

5.2.2 E100T-G Card-Level Indicators

The E100T-G card faceplate has three card-level LED indicators ([Table 5-4](#)).

Table 5-4 E100T-G Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the E100T-G card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the E100T-G. If the ACT LED is green, it indicates that the E100T-G card is active and the software is operational.
SF LED	Not used.

5.2.3 E100T-G Port-Level Indicators

The E100T-G card also has 12 pairs of LEDs (one pair for each port) to indicate port conditions ([Table 5-5](#)). You can find the status of the E100T-G card port using the LCD screen on the ONS 15454 SDH fan-tray assembly. Use the LCD to view the status of any port or card slot; the screen displays the number and severity of alarms for a given port or slot.

Table 5-5 E100T-G Port-Level Indicators

LED State	Description
Amber	Port is active (transmitting and/or receiving data). By default, indicates the transmitter is active but can be software controlled to indicate link status, duplex status, or receiver active.
Solid Green	Link is established. By default, indicates the link for this port is up, but can be software controlled to indicate duplex status, operating speed, or collision.

5.2.4 E100T-G Card Specifications

The E100T-G card has the following specifications:

- Environmental
 - Operating temperature:
C-Temp (15454-E100T-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 65 W, 1.35 A, 221.93 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Card weight: 1.0 kg (2.3 lb)
- Compliance
 - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950

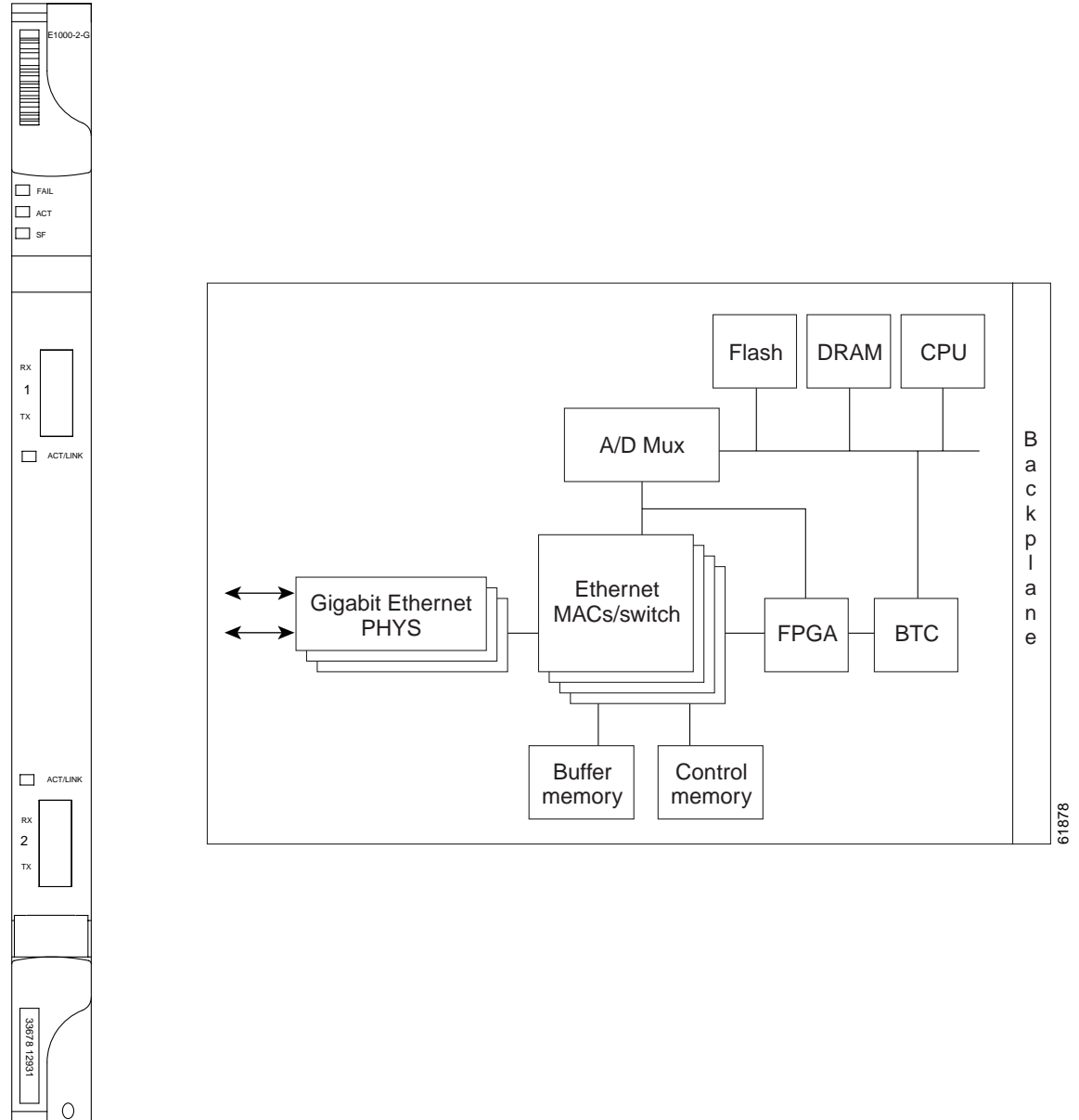
5.3 E1000-2-G Card

The ONS 15454 SDH uses E1000-2-G cards for Gigabit Ethernet (1000 Mbps). The E1000-2-G card provides two IEEE-compliant, 1000-Mbps ports for high-capacity customer LAN interconnections. Each port supports full-duplex operation.

The E1000-2-G card uses GBIC modular receptacles for the optical interfaces. For details, see the [“GBICs and SFPs” section on page 5-21](#).

[Figure 5-2 on page 5-7](#) shows the card faceplate and a block diagram of the card.

Figure 5-2 E1000-2-G Faceplate and Block Diagram



The E1000-2-G Gigabit Ethernet card provides high-throughput, low-latency packet switching of Ethernet traffic across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. This enables network operators to provide multiple 1000-Mbps access drops for high-capacity customer LAN interconnects. It enables efficient transport and co-existence of traditional TDM traffic with packet-switched data traffic.

Each E1000-2-G card supports standards-based, Layer 2 Ethernet switching between its Ethernet interfaces and SDH interfaces on the ONS 15454 SDH. The IEEE 802.1Q VLAN tag logically isolates traffic (typically subscribers).

Multiple E-Series Ethernet cards installed in an ONS 15454 SDH can act together as a single switching entity or as independent single switches supporting a variety of SDH port configurations.

You can create logical SDH ports by provisioning a number of SDH channels to the packet switch entity within the ONS 15454 SDH. Logical ports can be created with a bandwidth granularity of VC-4.

5.3.1 E1000-2-G Compatibility

The E1000-2-G is compatible with any traffic card slots (Slots 1 to 6 and 12 to 17).

5.3.2 E1000-2-G Card-Level Indicators

The E1000-2-G card faceplate has two card-level LED indicators ([Table 5-6](#)).

Table 5-6 E1000-2-G Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the E1000-2-G card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the E1000-2-G. If the ACT LED is green it indicates that the E1000-2-G card is active and the software is operational.
SF LED	Not used.

5.3.3 E1000-2-G Port-Level Indicators

The E1000-2-G card also has one bicolor LED per port ([Table 5-7](#)). When the green LINK LED is on, carrier is detected, meaning an active network cable is installed. When the green LINK LED is off, an active network cable is not plugged into the port, or the card is carrying unidirectional traffic. The amber port ACT LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.

Table 5-7 E1000-2-G Port-Level Indicators

LED State	Description
Amber	The port is active (transmitting and receiving data).
Solid green	The link is established.
Green light off	The connection is inactive, or traffic is unidirectional.

5.3.4 E1000-2-G Card Specifications

The E1000-2-G card has the following specifications:

- Environmental
 - Operating temperature:
C-Temp (15454-E1000-2-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 53.50 W, 1.11 A, 182.67 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Card weight: 0.9 kg (2.1 lb)
- Compliance
 - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950
 - Eye Safety Compliance: Class I (21 CFR 1040.10 and 1040.11) and Class 1M (IEC 60825-1 2001-01) laser products

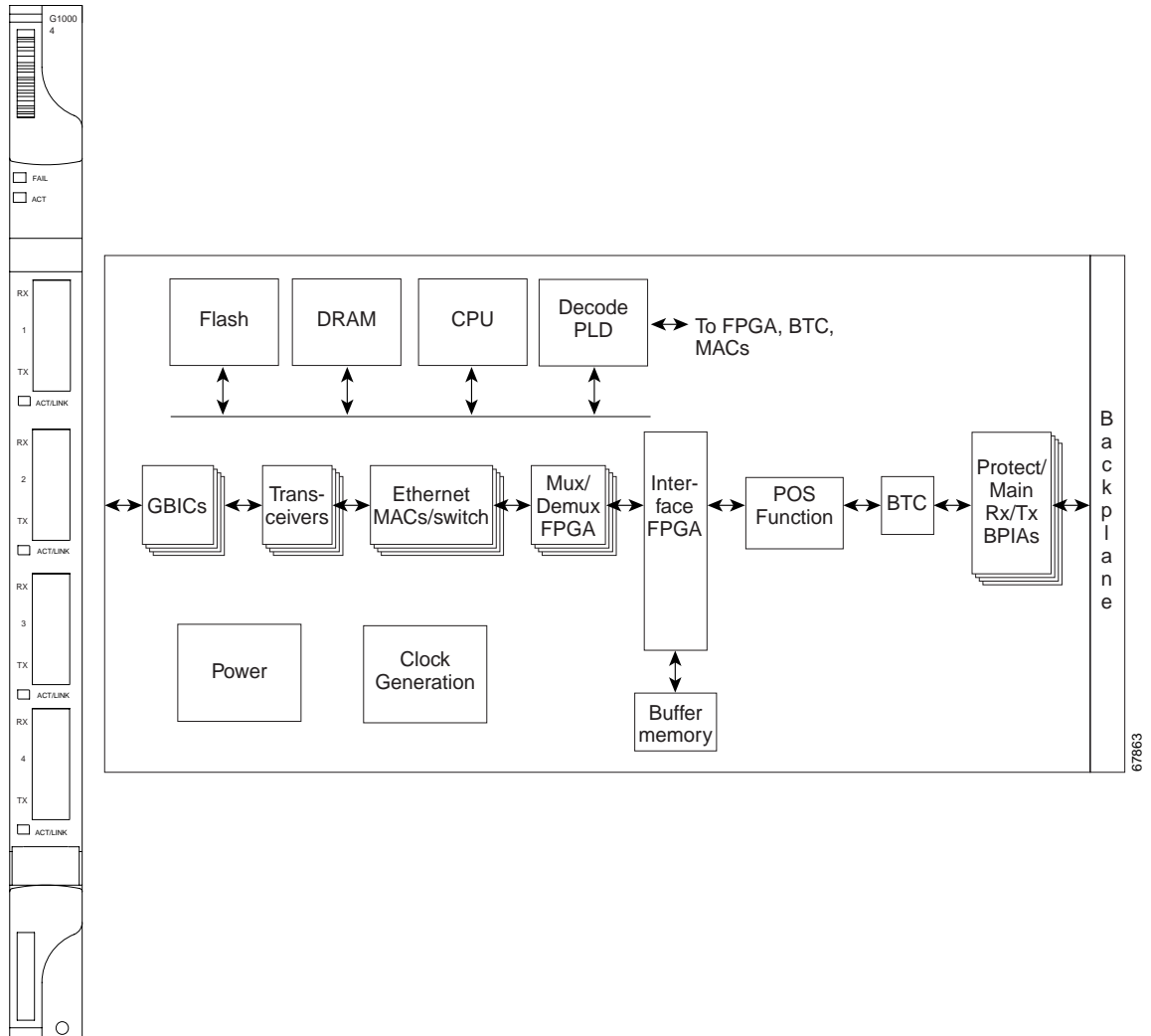
5.4 G1000-4 Card

The ONS 15454 SDH uses G1000-4 cards for Gigabit Ethernet (1000 Mbps). The G1000-4 card provides four ports of IEEE-compliant, 1000-Mbps interfaces. Each port supports full-duplex operation for a maximum bandwidth of STM-16 on each card.

The G1000-4 card uses GBIC modular receptacles for the optical interfaces. For details, see the [“GBICs and SFPs” section on page 5-21](#).

[Figure 5-3 on page 5-10](#) shows the card faceplate and the block diagram of the card.

Figure 5-3 G1000-4 Faceplate and Block Diagram



The G1000-4 Gigabit Ethernet card provides high-throughput, low latency transport of Ethernet encapsulated traffic (IP and other Layer 3 protocols) across a SDH network. Carrier-class Ethernet transport is achieved by hitless (< 50 ms) performance in the event of any failures or protection switches (such as 1+1 automatic protection switching [APS], path protection, or bidirectional line switched ring [BLSR]). Full provisioning support is possible via Cisco Transport Controller (CTC) or Cisco Transport Manager (CTM). Each G1000-4 card performs independently of the other cards in the same shelf.

5.4.1 G1000-4 Card-Level Indicators

The G1000-4 card faceplate has two card-level LED indicators ([Table 5-8](#)).

Table 5-8 G1000-4 Card-Level Indicators

Card-Level LEDs	Description
FAIL LED (red)	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the G1000-4 card. As part of the boot sequence, the FAIL LED turns on; it turns off if the software is deemed operational. The red FAIL LED blinks when the card is loading software.
ACT LED (green)	A green ACT LED provides the operational status of the G1000-4. If the ACT LED is green, it indicates that the G1000-4 card is active and the software is operational.

5.4.2 G1000-4 Port-Level Indicators

The G1000-4 card has one bicolor LED per port. [Table 5-9](#) describes the status that each color represents.

Table 5-9 G1000-4 Port-Level Indicators

Port-Level LED	Description
Off	No link exists to the Ethernet port.
Steady amber	A link exists to the Ethernet port, but traffic flow is inhibited. For example, an unconfigured circuit, an error on line, or a nonenabled port might inhibit traffic flow.
Solid green	A link exists to the Ethernet port, but no traffic is carried on the port.
Flashing green	A link exists to the Ethernet port, and traffic is carried on the port. The LED flash rate reflects the traffic rate for the port.

5.4.3 G1000-4 Compatibility

The G-Series card operates in slots 1 to 6 and 12 to 17, for a total shelf capacity of 48 Gigabit Ethernet ports. The practical G1000-4 port per shelf limit is 40, because at least two slots are typically filled by OC-N trunk cards such as the OC-192.

5.4.4 G1000-4 Card Specifications

The G1000-4 card has the following specifications:

- Environmental
 - Operating temperature:
 - C-Temp (15454-G1000-4): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 63.00 W, 1.31 A, 215.11 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)

- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Card weight: 0.9 kg (2.1 lb)

5.5 G1K-4 Card

The G1K-4 card is the functional equivalent of the G1000-4 card and provides four ports of IEEE-compliant, 1000-Mbps interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 1 Gbps or 2 Gbps bidirectional per port, and 2.5 Gbps or 5 Gbps bidirectional per card. Each port autonegotiates for full duplex and IEEE 802.3x flow control. The G1K-4 card uses GBIC modular receptacles for the optical interfaces. For details, see the “[GBICs and SFPs](#)” section on [page 5-21](#).

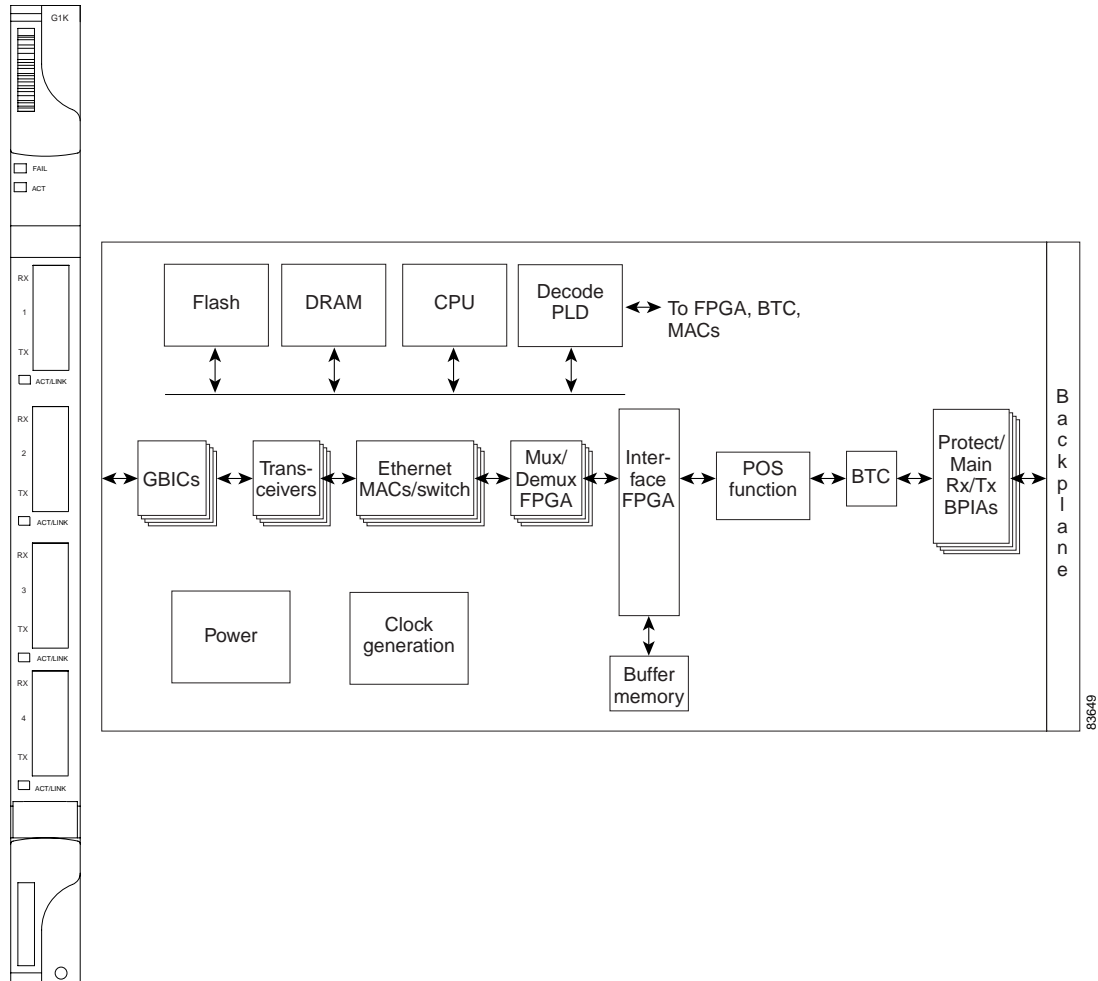
[Figure 5-4 on page 5-13](#) shows the card faceplate and the block diagram of the card.



Warning

Class 1 laser product.

Figure 5-4 G1K-4 Faceplate and Block Diagram

**Warning**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

The G1K-4 Gigabit Ethernet card provides high-throughput, low-latency transport of Ethernet encapsulated traffic (IP and other Layer 3 protocols) across a SDH network while providing a greater degree of reliability through SDH self-healing protection services. Carrier-class Ethernet transport is achieved by hitless (< 50 ms) performance in the event of any failures or protection switches (such as 1+1 APS, path protection, BLSR, or optical equipment protection) and full provisioning and manageability, as in SDH service. Full provisioning support is possible via CTC or CTM. Each G1K-4 card performs independently of the other cards in the same shelf.

5.5.1 G1K-4 Compatibility

Software R4.0 and later identifies G1K-4 cards as G1K-4s upon physical installation. Software prior to R4.0 identifies both G1000-4 and G1K-4 cards as G1000-4s upon physical installation.

You can install the G1K-4 card in slots 1 to 6 and 12 to 17, for a total shelf capacity of 48 Gigabit Ethernet ports. (The practical limit is 40 ports because at least two slots are typically populated by optical cards such as the OC-192.)

5.5.2 G1K-4 Card-Level Indicators

The G1K-4 card faceplate has two card-level LED indicators, listed in [Table 5-10](#).

Table 5-10 G1K-4 Card-Level Indicators

Card-Level LEDs	Description
FAIL LED (red)	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the G1K-4 card. As part of the boot sequence, the FAIL LED is turned on, and it goes off when the software is deemed operational. The red FAIL LED blinks when the card is loading software.
ACT LED (green)	A green ACT LED provides the operational status of the G1K-4. If the ACT LED is green, it indicates that the G1K-4 card is active and the software is operational.

5.5.3 G1K-4 Port-Level Indicators

The G1K-4 card has four bicolor LEDs (one LED per port). [Table 5-11](#) describes these LEDs.

Table 5-11 G1K-4 Port-Level Indicators

Port-Level LED	Description
Off	No link exists to the Ethernet port.
Steady amber	A link exists to the Ethernet port, but traffic flow is inhibited. For example, a lack of circuit setup, an error on the line, or a nonenabled port might inhibit traffic flow.
Solid green	A link exists to the Ethernet port, but no traffic is carried on the port.
Flashing green	A link exists to the Ethernet port, and traffic is carried on the port. The LED flash rate reflects the traffic rate for the port.

5.5.4 G1K-4 Card Specifications

The G1K-4 card has the following specifications:

- Environmental
 - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 63.00 W, 1.31 A at –48 V, 215.1 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)

- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight not including clam shell: 0.9 kg (2.1 lb)
- Compliance. ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
 - Class 1 laser product

5.6 ML100T-12 Card

The ML100T-12 card provides 12 ports of IEEE 802.3-compliant, 10/100 interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 200 Mbps per port and 2.488 Gbps per card. Each port independently detects the speed of an attached device (autosenses) and automatically connects at the appropriate speed. The ports autoconfigure to operate at either half or full duplex and can determine whether to enable or disable flow control. For ML-Series configuration information, see the *Cisco ONS 15454 SONET/SDH ML-Series Multilayer Ethernet Card Software Feature and Configuration Guide*.

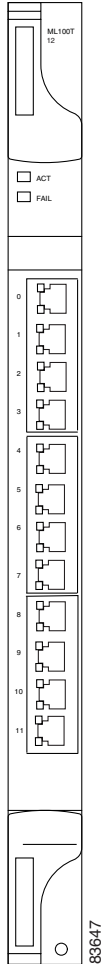
Figure 5-5 shows the card faceplate.



Caution

Shielded twisted-pair cabling should be used for inter-building applications.

Figure 5-5 ML100T-12 Faceplate



ML-Series cards feature two SDH virtual ports with a maximum combined bandwidth of VC4-16c. Each port carries an STM circuit with a size of VC3, VC4, VC4-2c, VC4-3c, VC4-4c, and VC4-8c. For step-by-step instructions on configuring an ML-Series card SDH STM circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

The ML-Series POS ports supports virtual concatenation (VCAT) of SONET/SDH circuits and a software link capacity adjustment scheme (SW-LCAS). The ML-Series card supports a maximum of two VCAT groups with each group corresponding to one of the POS ports. Each VCAT group can contain two circuit members. An ML-Series card supports VC-3-2v, VC-4-2v and VC-4-4c-2v. For step-by-step instructions on configuring an ML-Series card SDH VCAT circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

5.6.1 ML100T-12 Card-Level Indicators

The ML00T-12 card supports two card-level LED indicators. The card-level indicators are listed in [Table 5-12](#).

Table 5-12 ML100T-12 Card-Level Indicators

Card-Level LEDs	Description
Red SF LED	The red SF LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the ML100T-12 card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
Green ACT LED	A green ACT LED provides the operational status of the ML100T-12. If the ACT LED is green, it indicates that the ML100T-12 card is active and the software is operational.

5.6.2 ML100T-12 Port-Level Indicators

The ML100T-12 card provides a pair of LEDs for each Fast Ethernet port: an amber LED for activity (ACT) and a green LED for LINK. The port-level indicators are described in [Table 5-13](#).

Table 5-13 ML100T-12 Port-Level Indicators

Port-Level Indicators	Description
ACT LED (Amber)	<ul style="list-style-type: none"> Steady amber LED indicates that a link is detected, but there is an issue inhibiting traffic. Blinking amber LED means that traffic is flowing.
LINK LED (Green)	<ul style="list-style-type: none"> Steady green LED indicates that a link is detected, but there is no traffic. Blinking green LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.
Both ACT and LINK LED	<ul style="list-style-type: none"> Unlit green and amber LEDs indicate no traffic.

5.6.3 ML100T-12 Slot Compatibility

The ML100T-12 card works in slots 1 to 6 or 12 to 17.

5.6.4 ML100T-12 Card Specifications

The ML100T-12 card has the following specifications:

- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 53.00 W, 1.10 A at -48 V, 181.0 BTU/hr

- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight not including clam shell: 1.0 kg (2.3 lb)
- Compliance. ONS 15454 SDH cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, and AS/NZS 3260

5.7 ML1000-2 Card

The ML1000-2 card provides two ports of IEEE-compliant, 1000-Mbps interfaces. Each interface supports full-duplex operation for a maximum bandwidth of 2 Gbps per port and 4 Gbps per card. Each port autoconfigures for full duplex and IEEE 802.3x flow control.

SFP modules are offered as separate orderable products for maximum customer flexibility. For details, see the [“GBICs and SFPs” section on page 5-21](#).

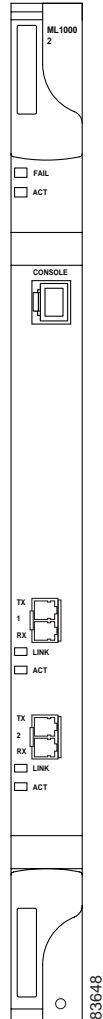
[Figure 5-6 on page 5-19](#) shows the ML1000-2 card faceplate.



Warning

Class 1 laser product.

Figure 5-6 ML1000-2 Faceplate

**Warning**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

ML-Series cards feature two SDH virtual ports with a maximum combined bandwidth of VC4-16c. Each port carries an STM circuit with a size of VC3, VC4, VC4-2c, VC4-3c, VC4-4c, and VC4-8c. For step-by-step instructions on configuring an ML-Series card SDH STM circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

The ML-Series POS ports supports virtual concatenation (VCAT) of SONET/SDH circuits and a software link capacity adjustment scheme (SW-LCAS). The ML-Series card supports a maximum of two VCAT groups with each group corresponding to one of the POS ports. Each VCAT group can contain two circuit members. An ML-Series card supports VC-3-2v, VC-4-2v and VC-4-4c-2v. For step-by-step instructions on configuring an ML-Series card SDH VCAT circuit, refer to the “Create Circuits and Tunnels” chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

5.7.1 ML1000-2 Card-Level Indicators

The ML1000-2 card faceplate has two card-level LED indicators. The card-level indicators are listed in [Table 5-14](#).

Table 5-14 ML1000-2 Card-Level Indicators

Card-Level LEDs	Description
FAIL LED (Red)	The red FAIL LED indicates that the card's processor is not ready or that a catastrophic software failure occurred on the ML1000-2 card. As part of the boot sequence, the FAIL LED is turned on until the software deems the card operational.
ACT LED (Green)	A green ACT LED provides the operational status of the ML1000-2. When the ACT LED is green, it indicates that the ML1000-2 card is active and the software is operational.

5.7.2 ML1000-2 Port-Level Indicators

The ML1000-2 card has two LEDs for each of the two Gigabit Ethernet ports. The port-level indicators are described in [Table 5-15](#).

Table 5-15 ML1000-2 Port-Level Indicators

Port-Level Indicators	Description
ACT LED (Amber)	<ul style="list-style-type: none"> Steady amber LED indicates that a link is detected, but there is an issue inhibiting traffic. Blinking amber LED means that traffic is flowing.
LINK LED (Green)	<ul style="list-style-type: none"> Steady green LED indicates that a link is detected, but there is no traffic. Blinking green LED flashes at a rate proportional to the level of traffic being received and transmitted over the port.
Both ACT and LINK LED	<ul style="list-style-type: none"> Unlit green and amber LEDs indicate no traffic.

5.7.3 ML1000-2 Slot Compatibility

The ML1000-2 card works in slots 1 to 6 or 12 to 17.

5.7.4 ML1000-2 Card Specifications

The ML1000-2 card has the following specifications:

- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95%, noncondensing
 - Power consumption: 49.00 W, 1.02 A at -48 V, 167.3 BTU/hr

- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight not including clam shell: 2.1 lb (0.9 kg)
- Compliance. ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
 - Class 1 laser product

5.8 GBICs and SFPs

The ONS 15454 Ethernet cards use industry standard small form-factor pluggable connectors (SFPs) and gigabit interface converter (GBIC) modular receptacles. The ML-Series Gigabit Ethernet cards use standard Cisco SFPs. The Gigabit E-Series card and the G-Series card use standard Cisco GBICs. With Software Release 4.1 and later, G-Series cards can also be equipped with DWDM and CWDM GBICs to function as Gigabit Ethernet transponders.

For all Ethernet cards, the type of GBIC or SFP plugged into the card is displayed in CTC and TL1. Cisco offers SFPs and GBICs as separate orderable products.

Table 5-16 lists specifications for the non-WDM GBICs and SFPs.

Table 5-16 GBIC and SFP Specifications (non-WDM)

Parameter	1000BaseSX GBIC	1000BaseLX GBIC	1000BaseZX GBIC	1000BaseSX SFP	1000BaseZX SFP
Product Name	15454-GBIC-SX	15454-GBIC-LX	15454-GBIC-ZX	15454-SFP-LC-SX	15454-SFP-LC-ZX
E1000-2-G/E1000-2	Compatible	Compatible	Not Compatible	Not Compatible	Not Compatible
G1K-4/G1000-4	Compatible	Compatible	Compatible	Not Compatible	Not Compatible
ML1000-2	Not Compatible	Not Compatible	Not Compatible	Compatible	Compatible
IEEE Compliant	Yes	Yes	Yes	Yes	Yes
CenterWavelength (Nominal)	850nm	1310nm	1550nm	850nm	1310nm
Central Wavelength (Spectral Range)	770 to 860nm	1270 to 1355nm	1540 to 1570nm	770 to 860nm	1270 to 1355nm
Temperature Range (Ambient)	-5 to +55 Celsius	-5 to +55 Celsius	-5 to +50 Celsius	-5 to +55 Celsius	-5 to +55 Celsius
Transmitter Output Power (minimum)	-9.5dBm	-11dBm	0dBm	9.5dBm	11dBm
Optical Input Power (Rx)-Minimum	-17dBm	-19dBm	-24dBm	-17dBm	-19dBm

Table 5-16 GBIC and SFP Specifications (non-WDM)

Parameter	1000BaseSX GBIC	1000BaseLX GBIC	1000BaseZX GBIC	1000BaseSX SFP	1000BaseLX SFP
Optical Input Power (Rx)-Maximum	0dBm	-3dBm	-1dBm	0dBm	-3dBm
Operating Range for 62.5-micron multimode fiber	220 meters	550 meters ¹	Not Compatible	220 meters	550 meters ¹
Operating Range for 50-micron multimode fiber	550 meters	550 meters ¹	Not Compatible	550 meters	550 meters ¹
Operating Range for 10-micron singlemode fiber	Not Compatible	10 Kilometers	70 Kilometers	Not Compatible	10 Kilometers

1. When using an LX SFP or LX GBIC with multimode fiber, you must install a mode-conditioning patch cord between the SFP/GBIC and the multimode fiber cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances less than 100 m (328 feet) or greater than 300 m (984 feet). The mode-conditioning patch cord prevents overdriving the receiver for short lengths of multimode fiber and reduces differential mode delay for long lengths of multimode fiber.

5.8.1 DWDM and CWDM Gigabit Interface Converters

DWDM and CWDM GBICs operate in the ONS 15454 G-Series card when the card is configured in Gigabit Ethernet Transponding mode or Ethernet over SONET mode. DWDM and CWDM GBICs are both wavelength division multiplexing (WDM) technologies and operate over single-mode fibers with SC connectors. Cisco CWDM GBIC technology uses a 20-nm wavelength grid and Cisco ONS 15454 DWDM GBIC technology uses a 1-nm wavelength grid. CTC displays the specific wavelengths of the installed CWDM or DWDM GBICs. DWDM wavelengths are spaced closer together and require more precise lasers than CWDM. The DWDM spectrum allows for optical signal amplification. For more information on G-Series card transponding mode, see the [“G-Series Gigabit Ethernet Transponder Mode”](#) section on page 16-5.

The DWDM and CWDM GBICs receive across the full 1300-nm and 1500-nm bands, which includes all CWDM, DWDM, LX, ZX wavelengths, but transmit on one specified wavelength. This capability can be exploited in some of the G-Series transponding modes by receiving wavelengths that do not match the specific transmission wavelength.



Note

G1000-4 cards support CWDM and DWDM GBICs. G1K-4 cards with the CLEI code of WM5IRWPCAA (manufactured after August 2003) support CWDM and DWDM GBICs. G1K-4 cards manufactured prior to August 2003 do not support CWDM or DWDM GBICs.



Note

Operating temperature of the DWDM GBICs is -5 degrees C to 40 degrees C.

The ONS 15454 supported CWDM GBICs reach up to 100 to 120 km over single mode fiber and support eight wavelengths:

- 1470 nm
- 1490 nm
- 1510 nm

- 1530 nm
- 1550 nm
- 1570 nm
- 1590 nm
- 1610 nm

The ONS 15455 supported DWDM GBICs support 32 different wavelengths in the red and blue bands. Paired with optical amplifiers, such as the Cisco ONS 15216, the DWDM GBICs allow maximum unregenerated spans of approximately 300 km (Table 5-17).

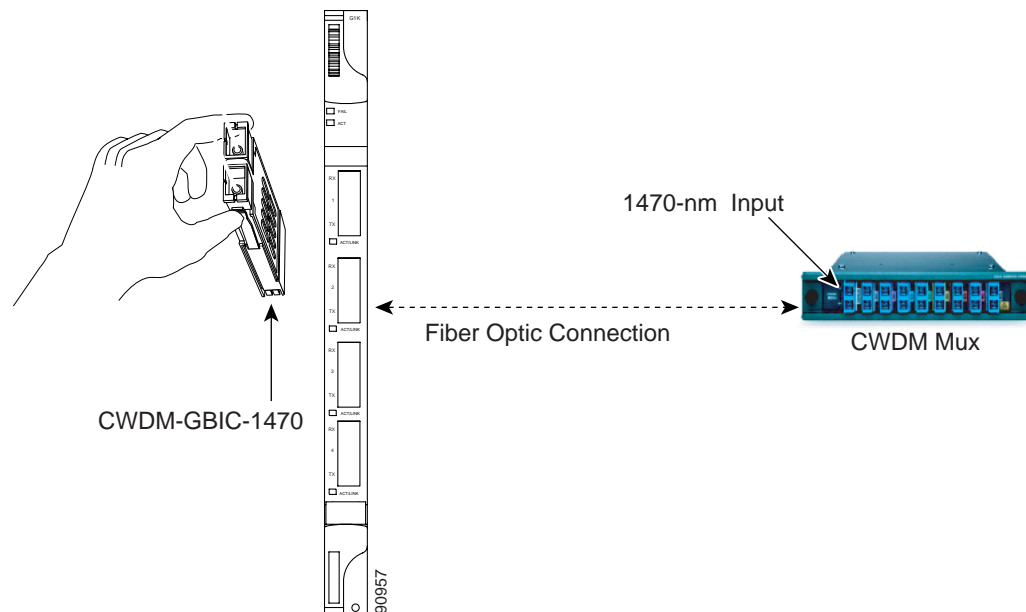
Table 5-17 32 ITU-100 GHz Wavelengths Supported by DWDM GBICs

Blue Band	1530.33 nm	1531.12 nm	1531.90 nm	1532.68 nm	1534.25 nm	1535.04 nm	1535.82 nm	1536.61 nm
	1538.19 nm	1538.98 nm	1539.77 nm	1540.56 nm	1542.14 nm	1542.94 nm	1543.73 nm	1544.53 nm
Red Band	1546.12 nm	1546.92 nm	1547.72 nm	1548.51 nm	1550.12 nm	1550.92 nm	1551.72 nm	1552.52 nm
	1554.13 nm	1554.94 nm	1555.75 nm	1556.55 nm	1558.17 nm	1558.98 nm	1559.79 nm	1560.61 nm

5.8.1.1 Placement of CWDM or DWDM GBICs

CWDM or DWDM GBICs for the G-Series card come in set wavelengths and are not provisionable. The wavelengths are printed on each GBIC, (example, CWDM-GBIC-1490). The user must insert the specific GBIC transmitting the wavelength required to match the input of the CWDM/DWDM device for successful operation (Figure 5-7 on page 5-23). Follow your site plan or network diagram for the required wavelengths.

Figure 5-7 CWDM GBIC with Wavelength Appropriate for Fiber-Connected Device



The *Cisco ONS 15454 Procedure Guide* contains specific procedures for attaching optical fiber to GBICs and inserting GBICs into the G-Series card.

5.8.1.2 Example of CWDM or DWDM GBIC Application

A G-Series card equipped with CWDM or DWDM GBICs supports the delivery of unprotected Gigabit Ethernet service over Metro DWDM and video on demand (VoD) transport networks (Figure 5-8). It can be used in short-haul and long-haul applications.

Figure 5-8 G-Series with CWDM/DWDM GBICs in Cable Network

