Common Control Cards

This chapter describes the Cisco ONS 15454 SDH common control card functions. It includes descriptions, hardware specifications, and block diagrams for each card. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 SDH Procedure Guide.*

Chapter topics include:

2.1 Common Control Card Overview

The cards for the ONS 15454 SDH include front mount electrical connection (FMEC) cards, common control cards, electrical cards, optical cards, and Ethernet cards. 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 (refer to the *Cisco ONS 15454 SDH Procedure Guide* for a list of slots/symbols). The overview in this section provides a summary of the cards.

2.1.1 Common Control Cards

Table 2-1 shows available common control cards for the ONS 15454 SDH.

Table 2-1 Common Control Cards for the ONS 15454 SDH

Card	Description	For Additional Information...
TCC2	The Advanced Timing Communications and Control (TCC2) card is the main processing center of the ONS 15454 SDH and provides system initialization, provisioning, alarm reporting, maintenance, and diagnostics.	See the "Advanced Timing Communications and Control (TCC2) Card" section on page 2-3.
XC10G	The 10 Gigabit Cross Connect (XC10G) card is the central element for switching; it establishes connections and performs time-division switching (TDS).	See the "XC10G Card" section on page 2-8.
XC-VXL-10G	The International Cross Connect 10 Gigabit AU3/AU4 high capacity tributary XC-VXL-10G card is the central element for switching; it establishes connections and performs time-division switching (TDS). It enables usage of cards up to a speed of 10 Gbits/s (Gbps).	See the "XC-VXL-10G Card" section on page 2-11.
XC-VXL-2.5G	The International Cross Connect 2.5 Gigabit AU3/AU4 high capacity tributary XC-VXL-2.5G card is the central element for switching; it establishes connections and performs time-division switching (TDS). It enables usage of cards up to a speed of 2.5 Gbits/s (Gbps).	See the "XC-VXL-2.5G Card" section on page 2-14.
AIC-I	The Alarm Interface Controller–International (AIC-I) card provides customer-defined alarm input/output (I/O), supports user data, and supports local and express orderwire.	See the "AIC-I Card" section on page 2-17.

2.1.2 Card Power Consumption

Table 2-2 shows power consumption per card.

Table 2-2 Card Power Consumption for the ONS 15454 SDH

Card	Watts	Amperage at –48 V	Amperage at –40.5 V	BTU/hr
TCC2	26.00	0.54 (0.43 A at –60 V)	0.64	88.8
XC10G	78.60	1.64	1.94	268.4
XC-VXL-10G	54.24	1.69	2.01	277.6
XC-VXL-2.5G	81.30	1.69	2.01	277.6
AIC-I	8.00	0.17	0.20	27.3
Fan Tray –48 VDC	129.60	1.10	1.31	181.0

Note The ONS 15454 SDH is a flexible metro optical transport system supporting a wide variety of applications. The power consumption of the shelf assembly varies depending upon shelf configuration. Design your power distribution network based on your maximum ONS 15454 SDH system power draw, or the ONS 15454 SDH's maximum rated shelf power draw.

If you select to design your power plant to your maximum planned ONS 15454 SDH system configuration, the *Cisco ONS 15454 SDH Reference Manual* lists the power consumption for each card that can be used to determine your maximum ONS 15454 SDH system power draw. The general guideline for fuse selection is 20 percent above the maximum calculated system power draw.

If you design your power system to the ONS 15454 SDH's maximum rated shelf power draw, Cisco recommends that you select a power distribution system supporting a minimum capacity of 30 A for each A and B power feeder on each ONS 15454 SDH shelf assembly. Feeder lines should be fused at 30 A. This recommendation is based on the shelf assembly's current rated maximum power draw of 30 A at –48 VDC. The maximum power draw configuration on the ONS 15454 SDH, based on the hardware available with Release 4.0, requires 30 A at –48 VDC.

2.2 Advanced Timing Communications and Control (TCC2) Card

The TCC2 performs system initialization, provisioning, alarm reporting, maintenance, diagnostics, IP address detection/resolution, SDH section overhead (SOH) data communications channel/generic communication channel (DCC/GCC) termination, and system fault detection for the ONS 15454 SDH. The TCC2 also ensures that the system maintains Stratum 3 (ITU-T G.812) timing requirements. It monitors the supply voltage of the system.

Note The TCC2 card can work with the XC10G, XC-VXL-10G, or XC-VXL-2.5G cross-connect cards. It requires Software Release 4.0.0 or later.

Note The LAN interfaces of the TCC2 card meet the standard Ethernet specifications by supporting a cable length of 100 m (328 ft.) at temperatures from 0 to 65 degrees Celsius (32 to 149 degrees Fahrenheit). The interfaces can operate with a cable length of 10 m (32.8 ft.) maximum at temperatures from –40 to 0 degrees Celsius (–40 to 32 degrees Fahrenheit).

Note The TCC2 has been designed to support both –48 VDC and –60 VDC input requirements.

Figure 2-1 shows the TCC2 faceplate.

Figure 2-1 TCC2 Faceplate

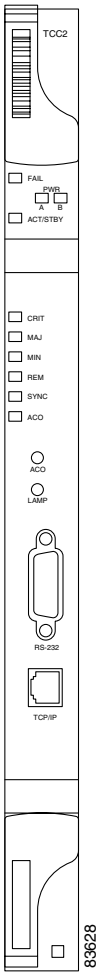
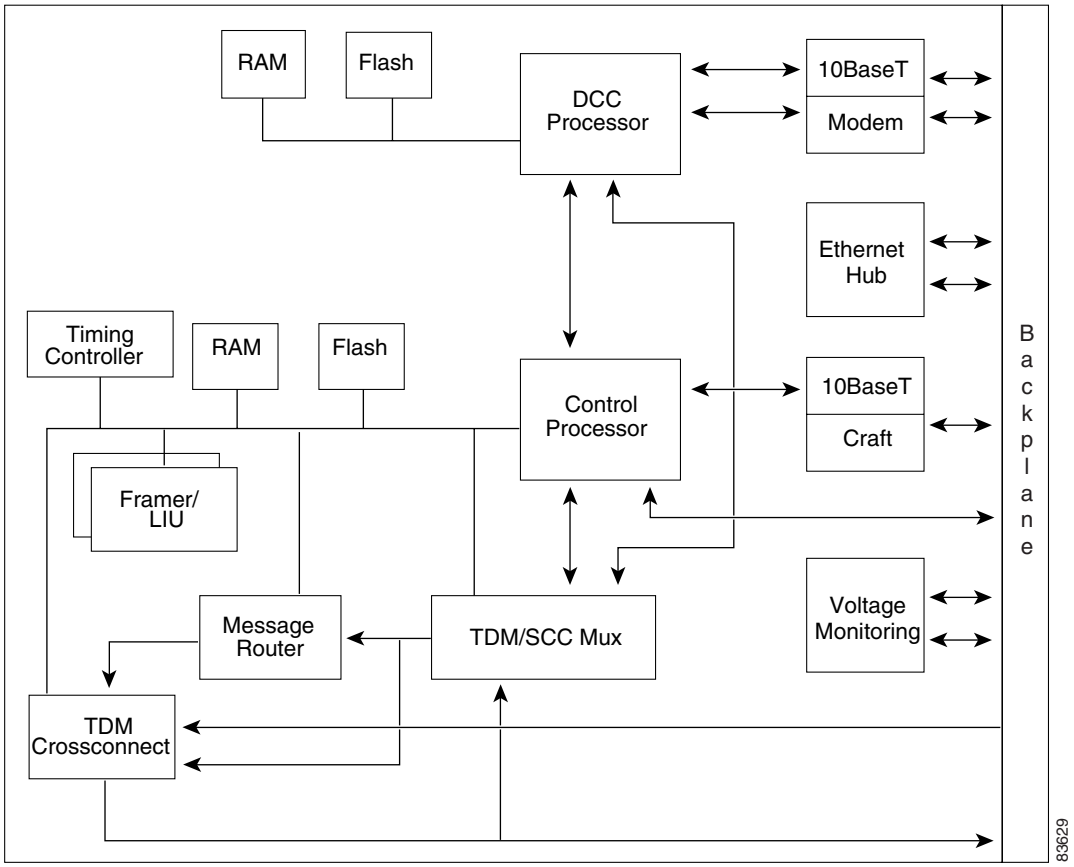


Figure 2-2 shows a block diagram of the TCC2 card.

Figure 2-2 TCC2 Block Diagram



2.2.1 TCC2 Functionality

The TCC2 supports multichannel, high-level data link control (HDLC) processing for the DCC/GCC. Up to 32 DCCs/GCCs can be routed over the TCC2 and up to 32 DCCs/GCCs can be terminated at the TCC2 (subject to the available optical digital communication channels). The TCC2 selects and processes 32 DCCs/GCCs to facilitate remote system management interfaces. The TCC2 hardware is prepared for 84 DCCs/GCCs, which will be available in a future software release.

The TCC2 also originates and terminates a cell bus carried over the module. The cell bus supports links between any two cards in the node, which is essential for peer-to-peer communication. Peer-to-peer communication accelerates protection switching for redundant cards.

The node database, IP address, and system software are stored in TCC2 nonvolatile memory, which allows quick recovery in the event of a power or card failure.

The TCC2 performs all system-timing functions for each ONS 15454 SDH. The TCC2 monitors the recovered clocks from each traffic card and two building integrated timing supply (BITS) ports for frequency accuracy. The TCC2 selects a recovered clock, a BITS or an internal Stratum 3 reference as

the system-timing reference. You can provision any of the clock inputs as primary or secondary timing sources. A slow-reference tracking loop allows the TCC2 to synchronize with the recovered clock, which provides holdover if the reference is lost.

The TCC2 monitors both supply voltage inputs of the shelf. An alarm is generated if one of the supply voltage inputs has a voltage out of the specified range.

Install TCC2 cards in Slots 7 and 11 for redundancy. If the active TCC2 fails, traffic switches to the protect TCC2. All TCC2 protection switches conform to protection switching standards when the bit error rate (BER) counts are not in excess of 1 * 10 exp – 3 and completion time is less than 50 ms.

The TCC2 card has two built-in interface ports for accessing the system: an RJ-45 10BaseT LAN interface and an EIA/TIA-232 ASCII interface for local craft access. It also has a 10BaseT LAN port for user interfaces via the backplane to the port accessible on the front of the MIC-C/T/P FMEC.

Note Cisco does not support operation of the ONS 15454 SDH with only one TCC2 card. For full functionality and to safeguard your system, always operate in a redundant configuration.

Note CTC software does not monitor for the presence or absence of FMECs unless the TCC2 card(s) have reached the Active/Standby state. During transitional states such as power-up or TCC2 reset, CTC ignores the FMEC inventory displayed in node view.

Note When a second TCC2 card is inserted into a node, it synchronizes its software, its backup software, and its database with the active TCC2. If the software version of the new TCC2 does not match the version on the active TCC2, the newly inserted TCC2 copies from the active TCC2, taking about 15 to 20 minutes to complete. If the backup software version on the new TCC2 does not match the version on the active TCC2, the newly inserted TCC2 copies the backup software from the active TCC2 again, taking about 15 to 20 minutes. Copying the database from the active TCC2 takes about 3 minutes. Depending on the software version and backup version the new TCC2 started with, the entire process can take between 3 and 40 minutes.

2.2.2 TCC2 Card-Level Indicators

Table 2-3 describes the two card-level LEDs on the TCC2 faceplate.

Table 2-3 TCC2 Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	This LED is on during reset. The FAIL LED flashes during the boot and write process. Replace the card if the FAIL LED persists.
ACT/STBY LED Green (Active) Yellow (Standby)	The ACT/STBY (Active/Standby) LED indicates the TCC2 is active (green) or in standby (yellow) mode. The ACT/STBY LED also provides the timing reference and shelf control. When the TCC2 is writing to the active or standby TCC2, its active or standby LED blinks. To avoid memory corruption, do not remove the TCC2 when the active or standby LED is blinking.

2.2.3 Network-Level Indicators

.Table 2-4 describes the six network-level LEDs on the TCC2 card faceplate.

Table 2-4 TCC2 Network-Level Indicators

System-Level LEDs	Definition
Red CRIT LED	Used to indicate critical alarms in the network at the local terminal.
Red MAJ LED	Used to indicate major alarms in the network at the local terminal.
Yellow MIN LED	Used to indicate a minor alarm in the network at the local terminal.
Red REM LED	Provides first-level alarm isolation. The remote (REM) LED turns red when an alarm is present in one or several of the remote terminals.
Green SYNC LED	Used to indicate that node timing is synchronized to an external reference.
Green ACO LED	After pressing the alarm cutoff (ACO) button, the green ACO LED illuminates. The ACO button opens the audible closure on the backplane. ACO state is stopped if a new alarm occurs. After the originating alarm is cleared, the ACO LED and audible alarm control are reset.

2.2.4 TCC2 Card Specifications

The TCC2 card has the following specifications:

- CTC software
  - Interface: EIA/TIA-232 (local craft access, on TCC2 faceplate)
  - Interface: 10BaseT LAN (on TCC2 faceplate)
  - Interface: 10BaseT LAN (via backplane, access on the MIC-A/P card)
- Synchronization
  - Stratum 3, per ITU-T G.812
  - Free running access: Accuracy +/– 4.6 ppm
  - Holdover stability: 3.7 * 10 exp – 7 per day including temperature (< 255 slips in first 24 hours)
  - Reference: External building integrated timing source (BITS), line, internal
- Supply voltage monitoring
  - Both supply voltage inputs are monitored
  - Normal operation:
    –40.5 to –56.7 V (in –48 VDC systems)
    –50.0 to –72.0 V (in –60 VDC systems)
  - Undervoltage: Major alarm
  - Overvoltage: Major alarm
- Environmental
  - Operating temperature: –40 to +65 degrees Celsius (–40 to +149 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 26.00 W, 0.54 A at –48 V, 0.43 A at –60 V, 88.8 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: 0.7 kg (1.5 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, AS/NZS 3260

2.3 XC10G Card

The XC10G card cross connects STM-1, STM-4, STM-16, and STM-64 signal rates. The XC10G provides a maximum of 384 x 384 VC-4 nonblocking cross connections. Any STM-1 on any port can be connected to any other port, meaning that the STM cross-connections are nonblocking.

Figure 2-3 shows the XC10G faceplate.

Note The lowest level cross-connect with XC10G is STM-1. Lower level signals, such as E-1, DS-3, or E-3, can be dropped. This might leave part of the bandwidth unused.

Figure 2-3 XC10G Faceplate

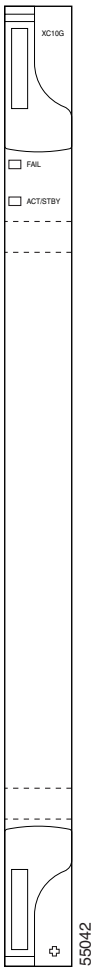


Figure 2-4 shows the XC10G cross-connects.

Figure 2-4 XC10G Cross-Connect Matrix

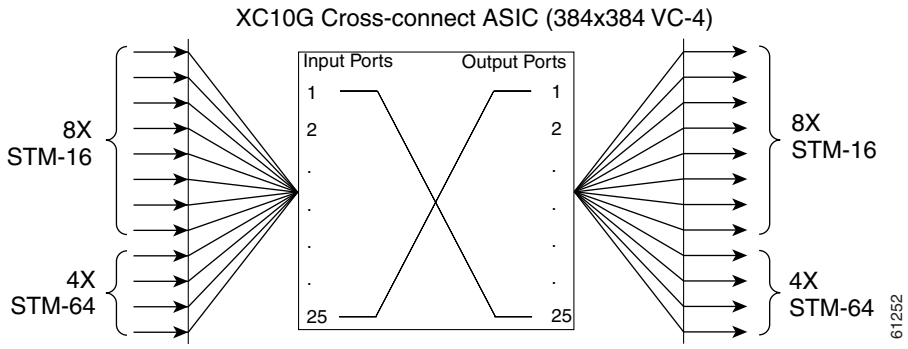
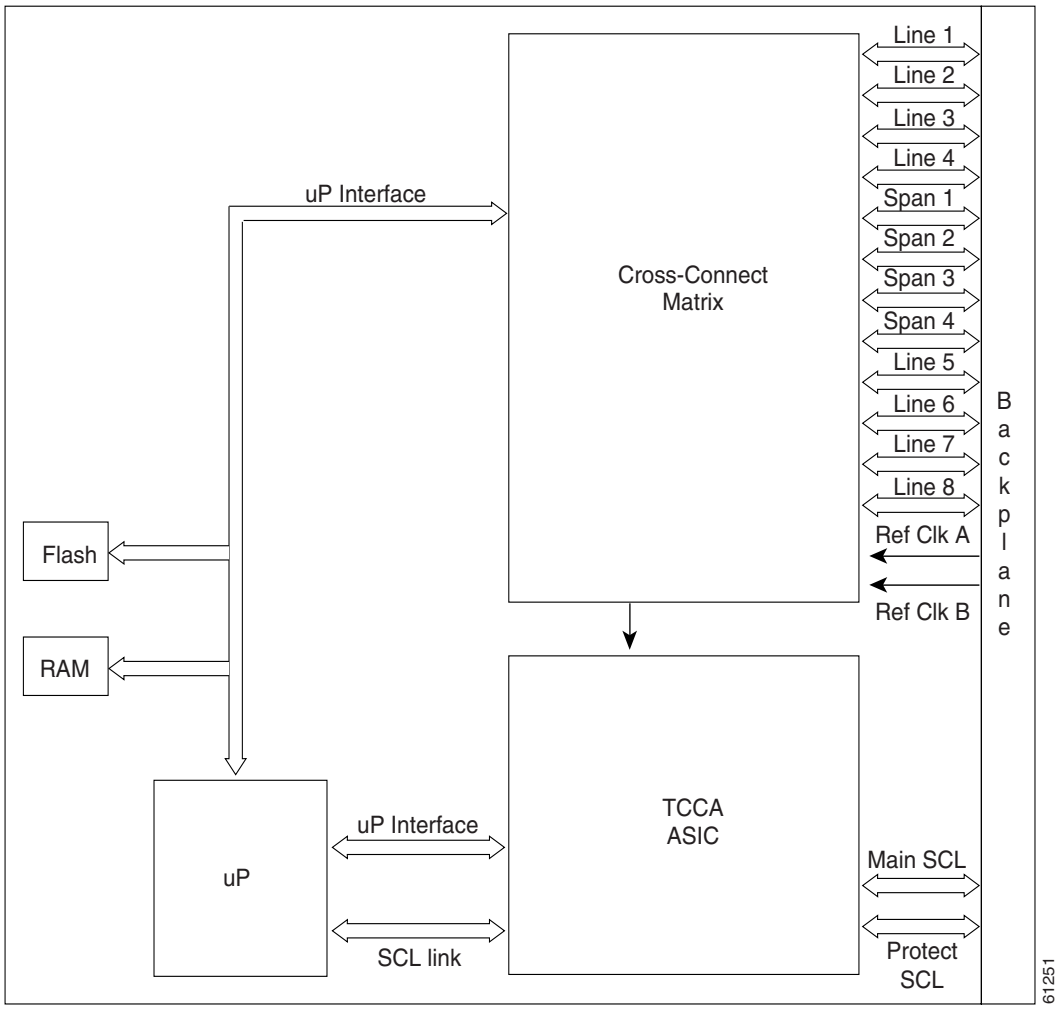


Figure 2-5 shows a block diagram of the XC10G card.

Figure 2-5 XC10G Block Diagram



The XC10G card manages up to 192 bidirectional STM-1 cross-connects. The TCC2 assigns bandwidth to each slot on a per STM-1 basis. The XC10G card works with the TCC2 card to maintain connections and set up cross-connects within the system. Depending on requirement in the node, one of the XC10G, XC-VXL-10G, or XC-VXL-2.5G card types is required to operate the ONS 15454 SDH. You can establish cross-connect and provisioning information through the Cisco Transport Controller (CTC). The TCC2 establishes the proper internal cross-connect information and sends the setup information to the XC10G cross-connect card.

Note Cisco does not recommend nor support operating the ONS 15454 SDH with only one XC10G card. To safeguard your system, always operate in a redundant configuration.

2.3.1 XC10G Card-Level Indicators

Table 2-5 describes the two card-level LEDs on the XC10G faceplate.

Table 2-5 XC10G Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Yellow (Standby)	The ACT/STBY (active/standby) LED indicates whether the XC10G is active and carrying traffic (green) or in standby mode to the active XC10G card (yellow).

2.3.2 XC10G Card Specifications

The XC10G card has the following specifications:

- Environmental
  - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 78.60 W, 1.64 A at –48 V, 268.4 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: 0.6 kg (1.5 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, AS/NZS 3260

2.4 XC-VXL-10G Card

The XC-VXL-10G card cross connects E-1, E-3, DS-3, STM-1, STM-4, STM-16, and STM-64 signal rates. The XC-VXL-10G provides a maximum of 384 x 384 VC-4 nonblocking cross connections, 384 x 384 VC-3 nonblocking cross connections, or 2016 x 2016 VC-12 nonblocking cross connections. It is designed for 10 Gbps solutions.

Figure 2-6 shows the XC-VXL-10G faceplate.

Figure 2-6 XC-VXL-10G Faceplate

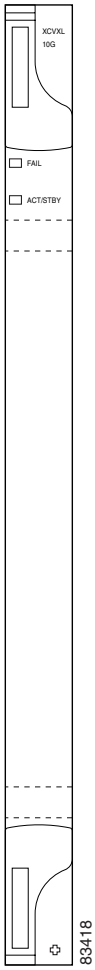


Figure 2-7 shows the XC-VXL-10G cross-connects.

Figure 2-7 XC-VXL-10G Cross-Connect Matrix

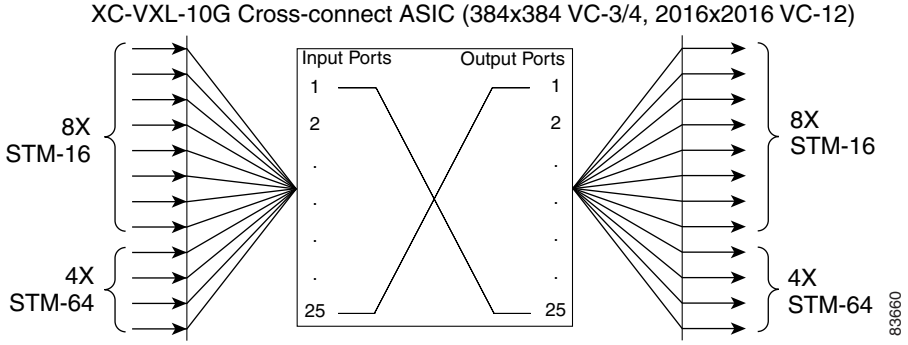
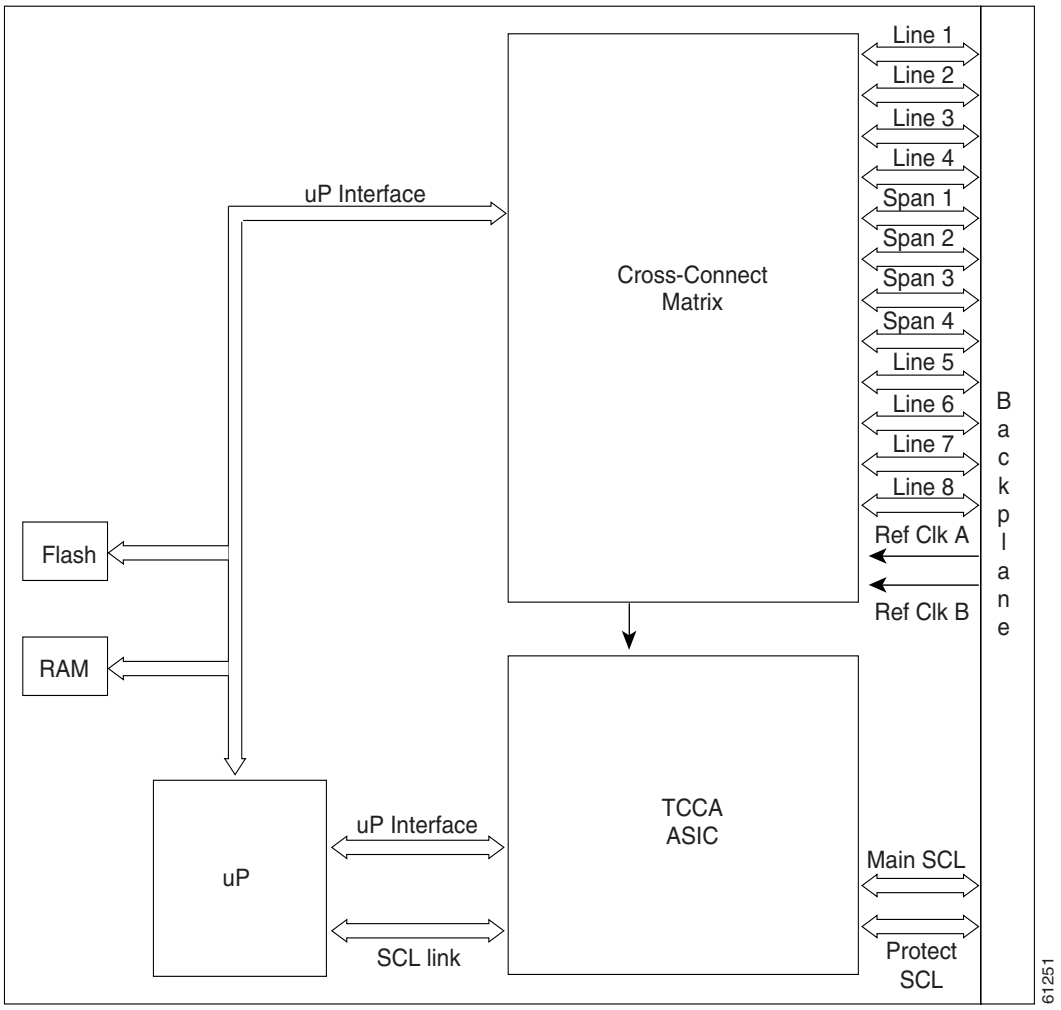


Figure 2-8 shows a block diagram of the XC-VXL-10G card.

Figure 2-8 XC-VXL-10G Block Diagram



The XC-VXL-10G card manages up to 192 bidirectional STM-1 cross-connects, 192 bidirectional E-3 or DS-3 cross-connects, or 1008 bidirectional E-1 cross-connects. The TCC2 assigns bandwidth to each slot on a per STM-1 basis. The XC-VXL-10G card works with the TCC2 card to maintain connections and set up cross-connects within the system. Depending on requirement in the node, one of the XC10G, XC-VXL-10G, or XC-VXL-2.5G card types is required to operate the ONS 15454 SDH. You can establish cross-connect and provisioning information through CTC. The TCC2 establishes the proper internal cross-connect information and sends the setup information to the XC-VXL-10G cross-connect card.

Note Cisco does not recommend nor support operating the ONS 15454 SDH with only one XC-VXL-10G card. To safeguard your system, always operate in a redundant configuration. The XC-VXL-10G is to be placed in Slots 8 and 10.

2.4.1 XC-VXL-10G Card-Level Indicators

Table 2-6 describes the two card-level LEDs on the XC-VXL-10G faceplate.

Table 2-6 XC-VXL-10G Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Yellow (Standby)	The ACT/STBY (Active/Standby) LED indicates whether the XC-VXL-10G is active and carrying traffic (green) or in standby mode to the active XC-VXL-10G card (yellow).

2.4.2 XC-VXL-10G Card Specifications

The XC-VXL-10G card has the following specifications:

- Environmental
  - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 81.30 W, 1.69 A at –48V, 277.6 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: 0.6 kg (1.5 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, AS/NZS 3260

2.5 XC-VXL-2.5G Card

The XC-VXL-2.5G card cross connects E-1, E-3, DS-3, STM-1, STM-4, STM-16, and STM-64 signal rates. The XC-VXL-2.5G provides a maximum of 192 x 192 VC-4 nonblocking cross connections, 384 x 384 VC-3 nonblocking cross connections, or 2016 x 2016 VC-12 nonblocking cross connections. It is designed for 2.5-GBits/s (Gbps) solutions.

Figure 2-9 shows the XC-VXL-2.5G card faceplate.

Figure 2-9 XC-VXL-2.5G Faceplate

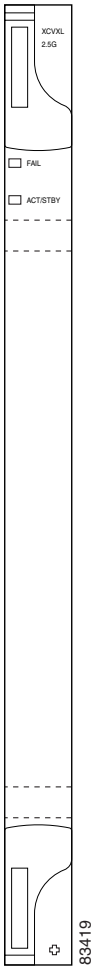


Figure 2-10 shows the XC-VXL-2.5G cross-connect matrix.

Figure 2-10 XC-VXL-2.5G Cross-Connect Matrix

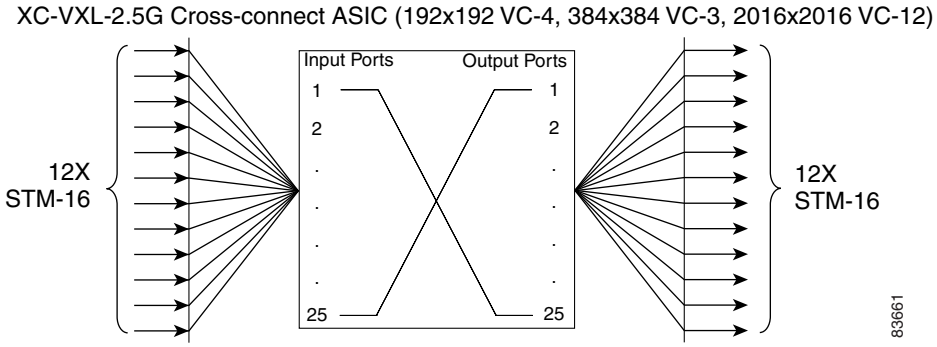
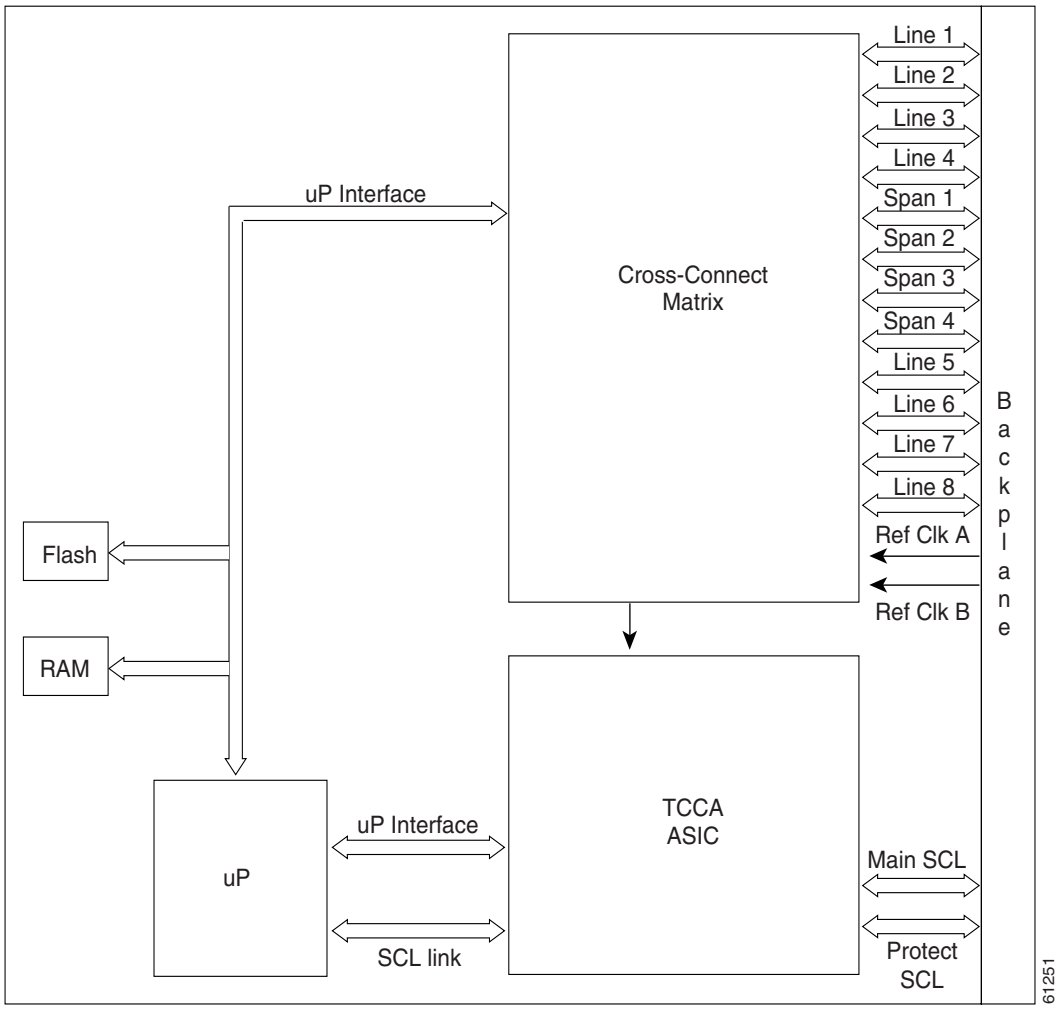


Figure 2-11 shows a block diagram of the XC-VXL-2.5G card.

Figure 2-11 XC-VXL-2.5G Block Diagram



The XC-VXL-2.5G card manages up to 192 bidirectional STM-1 cross-connects, 192 bidirectional E-3 or DS-3 cross-connects, or 1008 bidirectional E-1 cross-connects. The TCC2 assigns bandwidth to each slot on a per STM-1 basis. The XC-VXL-2.5G card works with the TCC2 card to maintain connections and set up cross-connects within the system. Depending on requirement in the node, one of the XC10G, XC-VXL-10G, or XC-VXL-2.5G card types is required to operate the ONS 15454 SDH. You can establish cross-connect and provisioning information through CTC. The TCC2 establishes the proper internal cross-connect information and sends the setup information to the XC-VXL-2.5G cross-connect card.

Note Cisco does not recommend nor support operating the ONS 15454 SDH with only one XC-VXL-2.5G card. To safeguard your system, always operate in a redundant configuration.

2.5.1 XC-VXL-2.5G Card-Level Indicators

Table 2-7 describes the two card-level LEDs on the XC-VXL-2.5G faceplate.

Table 2-7 XC-VXL-2.5G Card-Level Indicators

Card-Level LEDs	Definition
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Yellow (Standby)	The ACT/STBY (Active/Standby) LED indicates whether the XC-VXL-2.5G is active and carrying traffic (green) or in standby mode to the active XC-VXL-2.5G card (yellow).

2.5.2 XC-VXL-2.5G Card Specifications

The XC-VXL-2.5G card has the following specifications:

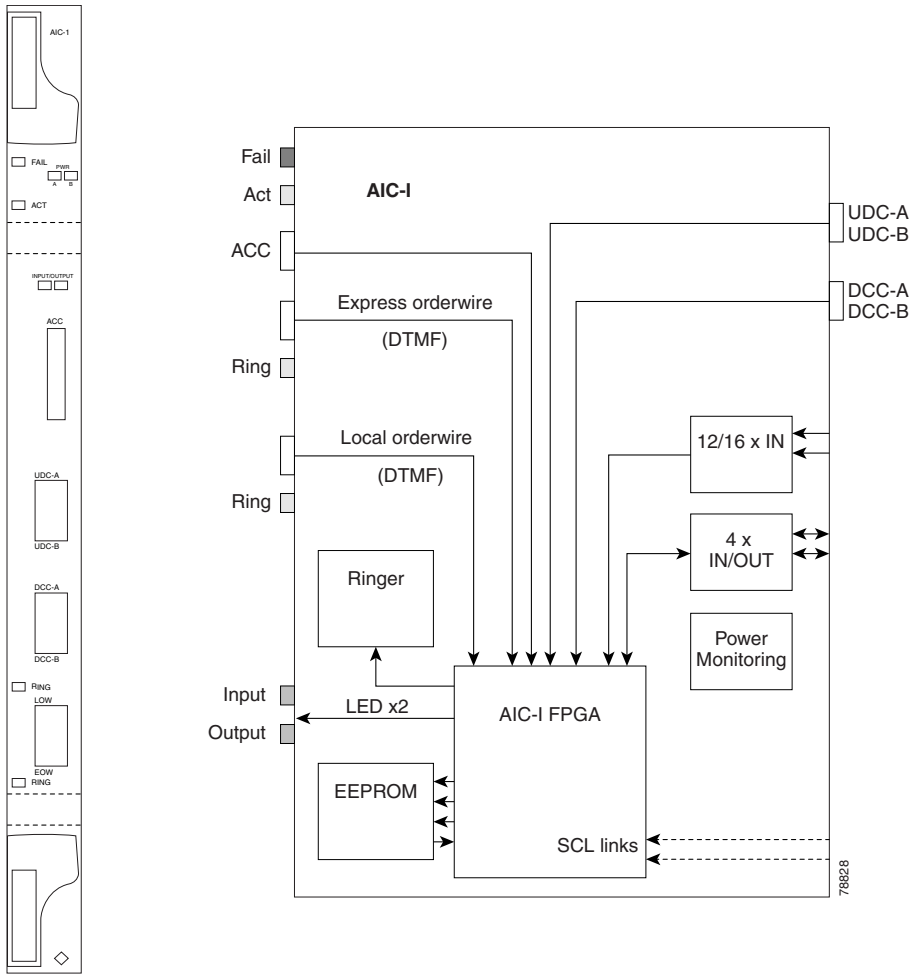
- Environmental
  - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
  - Operating humidity: 5 to 85%, noncondensing
  - Power consumption: 81.30 W, 1.69 A at –48 V, 277.6 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Depth with backplane connector: 235 mm (9.250 in.)
  - Weight, not including clam shell: 0.6 kg (1.5 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, AS/NZS 3260

2.6 AIC-I Card

The optional Alarm Interface Controller–International (AIC-I) card provides customer-defined alarm I/O and supports user data and local and express orderwire. It provides 16 customer-defined input contacts and 4 customer-defined input/output contacts. It requires the MIC-A/P for connection to the alarm contacts. Figure 2-12 shows the AIC-I faceplate and a block diagram of the card.

Figure 2-12 AIC-I Faceplate and Block Diagram



2.6.1 AIC-I Card-Level Indicators

Table 2-8 describes the eight card-level LEDs on the AIC-I card.

Table 2-8 AIC-I Card-Level Indicators

Card-Level LEDs	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the AIC-I card is provisioned for operation.
Green/Red PWR A LED	The PWR A LED is green when a supply voltage within the specified range has been sensed on supply input A. It is red when the input voltage on supply input A is out of range.

Table 2-8 AIC-I Card-Level Indicators (continued)

Card-Level LEDs	Description
Green/Red PWR B LED	The PWR B LED is green when a supply voltage within the specified range has been sensed on supply input B. It is red when the input voltage on supply input B is out of range.
Yellow INPUT LED	The INPUT LED is yellow when there is an alarm condition on at least one of the alarm inputs.
Yellow OUTPUT LED	The OUTPUT LED is yellow when there is an alarm condition on at least one of the alarm outputs.
Green RING LED	The green RING LED on the local orderwire (LOW) side is flashing when a call is received on the LOW.
Green RING LED	The green RING LED on the express orderwire (EOW) side is flashing when a call is received on the EOW.

2.6.2 User-Defined Alarms

The AIC-I card provides input/output alarm contact closures. You can define up to 16 external alarm inputs and four external alarm inputs/outputs (user configurable). The physical connections are made using the MIC-A/P. The alarms are defined using CTC. For instructions, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

LEDs on the front panel of the AIC-I indicate the status of the alarm lines: one LED representing all the inputs and one LED representing all the outputs. External alarms (input contacts) are typically used for external sensors such as open doors, temperature sensors, flood sensors, and other environmental conditions. External controls (output contacts) are typically used to drive visual or audible devices such as bells and lights, but they can control other devices such as generators, heaters, and fans.

You can program each of the sixteen input alarm contacts separately. Choices include alarm on closure or alarm on open, an alarm severity of any level (Critical, Major, Minor, Not Alarmed, Not Reported), Service affecting or non-service affecting alarm-service level, and a 63-character alarm description for CTC display in the alarm log. You cannot assign the fan-tray abbreviation for the alarm; the abbreviation reflects the generic name of the input contacts. The alarm condition remains raised until the external input stops driving the contact or you unprovision the alarm input.

The output contacts can be provisioned to close on a trigger or to close manually. The trigger can be a local alarm severity threshold, a remote alarm severity, or a virtual wire, as follows:

- Local NE alarm severity: A hierarchy of not reported, not alarmed, minor, major, or critical alarm severities that you set to cause output closure. For example, if the trigger is set to minor, a minor alarm or above is the trigger.
- Remote NE alarm severity: Same as the local NE alarm severity but applies to remote alarms only.
- Virtual wire entities: You can provision any environmental alarm input to raise a signal on any virtual wire on external outputs 1 through 4 when the alarm input is an event. You can provision a signal on any virtual wire as a trigger for an external control output.

You can also program the output alarm contacts (external controls) separately. In addition to provisionable triggers, you can manually force each external output contact to open or close. Manual operation takes precedence over any provisioned triggers that might be present.

2.6.3 Orderwire

Orderwire allows a craftsperson to plug a phone set into an ONS 15454 SDH and communicate with craftspeople working at other ONS 15454 SDHs or other facility equipment. The orderwire is a pulse code modulation (PCM) encoded voice channel that uses E1 or E2 bytes in the multiplex section overhead and in the regenerator section overhead.

The AIC-I allows simultaneous use of both local (section overhead signal) and express (line overhead signal) orderwire channels on an SDH ring or particular optics facility. Express orderwire also allows communication via regeneration sites when the regenerator is not a Cisco device.

You can provision orderwire functions with CTC similar to the current provisioning model for DCC/GCC channels. In CTC, you provision the orderwire communications network during ring turn-up so that all NEs on the ring can reach one another. Orderwire terminations (that is, the optics facilities that receive and process the orderwire channels) are provisionable. Both express and local orderwire can be configured as on or off on a particular SDH facility. The ONS 15454 SDH supports up to four orderwire channel terminations per shelf. This allows linear, single ring, dual ring, and small hub-and-spoke configurations. Keep in mind that orderwire is not protected in ring topologies such as multiplex section-shared protection ring (MS-SPRing) and subnetwork connection protection (SNCP).

Caution Do not configure orderwire loops. Orderwire loops cause feedback that disables the orderwire channel.

The ONS 15454 SDH implementation of both local and express orderwire is broadcast in nature. The line acts as a party line. Anyone who picks up the orderwire channel can communicate with all other participants on the connected orderwire subnetwork. The local orderwire party line is separate from the express orderwire party line. Up to four OC-N/STM-N facilities for each local and express orderwire are provisionable as orderwire paths.

Note The OC3 IR 4/STM1 SH 1310 card does not support the express orderwire (EOW) channel.

The AIC-I supports selective dual tone multifrequency (DTMF) dialing for telephony connectivity which causes specific or all ONS 15454 SDH AIC-Is on the orderwire subnetwork to "ring." The ringer/buzzer resides on the AIC-I. There is also a "ring" LED that mimics the AIC-I ringer. It flashes when a call is received on the orderwire subnetwork. A party line call is initiated by pressing ***0000** on the DTMF pad. Individual dialing is initiated by pressing ***** and the individual four-digit number on the DTMF pad.

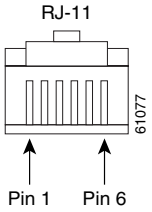
The orderwire ports are standard RJ-11 receptacles. The pins on the orderwire ports correspond to the tip and ring orderwire assignments. Table 2-9 describes the orderwire pin assignments.

Table 2-9 Orderwire Pin Assignments

RJ-11 Pin Number	Description
1	Four-wire receive ring
2	Four-wire transmit tip
3	Two-wire ring
4	Two-wire tip
5	Four-wire transmit ring
6	Four-wire receive tip

Figure 2-13 shows the RJ-11 connector.

Figure 2-13 RJ-11 Cable Connector



2.6.4 User Data Channel

The user data channel (UDC) features a dedicated data channel of 64 kbps (F1 byte) between two nodes in an ONS 15454 SDH network. Each AIC-I card provides two UDCs, UDC-A and UDC-B, through separate RJ-11 connectors on the front of the AIC-I. Each UDC can be routed to an individual optical interface in the ONS 15454 SDH system. For instructions, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

The UDC ports are standard RJ-11 receptacles. Table 2-10 lists the UDC pin assignments.

Table 2-10 UDC Pin Assignments

RJ-11 Pin Number	Description
1	For future use
2	TXN
3	RXN
4	RXP
5	TXP
6	For future use

2.6.5 Data Communications Channel/Generic Communication Channel

The data communication channel/generic communication channel (DCC/GCC) features a dedicated data channel of 576 kbps (D4 to D12 bytes) between two nodes in an ONS 15454 SDH network. Each AIC-I card provides two DCC/GCCs, DCC-A and DCC-B, through separate RJ-45 connectors on the front of the AIC-I. Each DCC/GCC can be routed to an individual optical interface in the ONS 15454 SDH system. For instructions, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

Note DCC/GCC connection cannot be provisioned if DCC/GCC tunneling is configured on this span.

The DCC/GCC ports are standard RJ-45 receptacles. Table 2-11 describes the DCC/GCC pin assignments.

Table 2-11 DCC/GCC Pin Assignments

RJ-45 Pin Number	Description
1	TCLKP
2	TCLKN
3	TXP
4	TXN
5	RCLKP
6	RCLKN
7	RXP
8	RXN

2.6.6 AIC-I Specifications

The AIC-I card has the following specifications:

- Alarm inputs
  - Number of inputs: 16
  - Opto-coupler isolated
  - Label customer provisionable
  - Severity customer provisionable
  - Common 32-V output for all alarm-inputs
  - Each input limited to 2 mA
  - Termination via MIC-A/P
- Alarm outputs
  - Number of outputs: 4 (user configurable as inputs)
  - Switched by opto-MOS (metal oxide semiconductor)
  - Triggered by definable alarm condition
  - Maximum allowed open circuit voltage: 60 VDC
  - Maximum allowed closed circuit current: 100 mA
  - Termination via MIC-A/P
- EOW/LOW
  - ITU-T G.711, ITU-T G.712, Telcordia GR-253-CORE
  - A-law, mu-law

Note Due to the nature of mixed coding, in a mixed-mode configuration (A-law/mu-law) the orderwire is not ITU-T G.712 compliant.

  - Orderwire party line
  - DTMF signaling

- UDC
  - Bit rate: 64 kbps, codirectional
  - ITU-T G.703
  - Input/output impedance: 120 ohms
  - Termination: RJ-11 connectors
- DCC/GCC
  - Bit rate: 576 kbps
  - EIA/TIA-485/V11
  - Input/output impedance: 120 ohms
  - Termination: RJ-45 connectors
- ACC connection for additional alarm interfaces
  - For future use
- Environmental
  - Operating temperature: –40 to +65 degrees Celsius (–40 to +149 degrees Fahrenheit)
  - Operating humidity: 5 to 95%, noncondensing
  - Power consumption: 8.00 W, 0.17 A, 27.3 BTU/hr
- Dimensions
  - Height: 321.3 mm (12.650 in.)
  - Width: 18.2 mm (0.716 in.)
  - Depth: 228.6 mm (9.000 in.)
  - Card weight: 1.8 lb (0.82 kg)
- Compliance

  ONS 15454 SDH cards, when installed in a system, comply with these standards:
  - Safety: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950