



## CHAPTER 6

# Tunable Dispersion Compensating Units

This chapter explains the Tunable Dispersion Compensating Units (T-DCU) used in Cisco ONS 15454 dense wavelength division multiplexing (DWDM) networks. For installation and card turn-up procedures, refer to the *Cisco ONS 15454 DWDM Procedure Guide*. For card safety and compliance information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document.



### Note

Unless otherwise specified, “ONS 15454” refers to both ANSI and ETSI shelf assemblies.

The T-DCU unit compensates for chromatic dispersion (CD) of the transmission fiber. The T-DCU provides two line cards with varied set of tunable wavelengths to compensate for CD.

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- [6.2 Class 1M Laser Safety Labels, page 6-2](#)
- [6.3 TDC-CC and TDC-FC Cards, page 6-3](#)
- [6.4 Monitoring Optical Performance, page 6-7](#)

## 6.1 Card Overview

The T-DCU card provides a selectable set of discrete negative chromatic dispersion values to compensate for chromatic dispersion of the transmission line. The card operates over the entire C-band (in the range of 1529.0 nm to 1562.5 nm) and monitors the optical power at the input and the output ports. The two types of T-DCU line cards are:

- TDC-CC (Coarse T-DCU)
- TDC-FC (Fine T-DCU)



### Note

Each T-DCU card is marked with a symbol that corresponds to a slot (or slots) on the ONS 15454 shelf assembly. Cards should be installed in slots that have the same symbols. See the [1.16.1 Card Slot Requirements section on page 1-59](#) for a list of slots and symbols.

## 6.1.1 Card Summary

Table 6-1 lists and summarizes the information about the TDC-CC and TDC-FC cards.

**Table 6-1** *T-DCU Cards*

Card	Port Description	For Additional Information
TDC-CC	The TDC-CC has one set of optical ports located on the faceplate. It operates in slots 1 to 6 and slots 12 to 17.	See the <a href="#">6.3 TDC-CC and TDC-FC Cards</a> section.
TDC-FC	The TDC-FC has one set of optical ports located on the faceplate. It operates in slots 1 to 6 and slots 12 to 17.	

## 6.2 Class 1M Laser Safety Labels

This section explains the significance of the safety labels attached to some of the cards. The faceplates of the cards are clearly labeled with warnings about the laser radiation levels. You must understand all warning labels before working on these cards.

### 6.2.1 Class 1M Laser Product Cards

The TDC-CC and TDC-FC cards can be connected to Class 1M lasers. The labels that appear on these cards are described in the following subsections.

Class 1M lasers are products that produce either a highly divergent beam or a large diameter beam. Therefore, only a small part of the whole laser beam can enter the eye. However, these laser products can be harmful to the eye if the beam is viewed using magnifying optical instruments.

#### 6.2.1.1 Hazard Level 1M Label

The Hazard Level 1M label is shown in [Figure 6-1](#).

**Figure 6-1** *Hazard Level Label*



The Hazard Level label warns users against exposure to laser radiation of Class 1 limits calculated in accordance with IEC60825-1 Ed.1.2.

### 6.2.1.2 Laser Source Connector Label

The Laser Source Connector label is shown in [Figure 6-2](#).

**Figure 6-2** *Laser Source Connector Label*

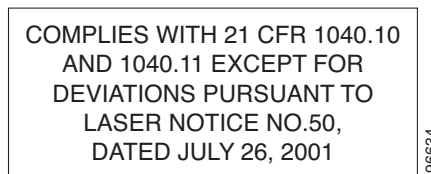


This label indicates that a laser source is present at the optical connector where the label has been placed.

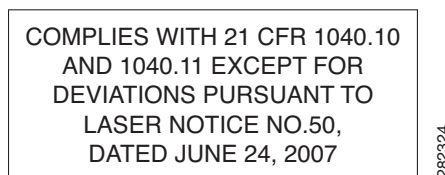
### 6.2.1.3 FDA Statement Label

The FDA Statement labels are shown in [Figure 6-3](#) and [Figure 6-4](#). These labels show compliance to FDA standards and that the hazard level classification is in accordance with IEC60825-1 Am.2 or Ed.1.2.

**Figure 6-3** *FDA Statement Label*



**Figure 6-4** *FDA Statement Label*



## 6.3 TDC-CC and TDC-FC Cards

The TDC-CC card provides 16 values of CD ranging from 0 to -1650 ps/nm with a granularity of 110 ps/nm in the C-band spectrum.

The TDC-FC card provides 16 values of CD ranging from 0 to -675 ps/nm with a granularity of 45 ps/nm in the C-band spectrum.

You can configure the TDC-CC and TDC-FC cards for the CD value listed in [Table 6-2](#). Refer to the *Cisco ONS 15454 DWDM Procedure Guide* to set the compensating value using CTC.

**Table 6-2 TDC-CC and TDC-FC Tunable CD Value**

Unit Configuration	TDC-CC [ps/nm]	TDC-FC [ps/nm]
0	0 <sup>1</sup>	0 <sup>2</sup>
1	-110	-45
2	-220	-90
3	-330	-135
4	-440	-180
5	-550	-225
6	-660	-270
7	-770	-315
8	-880	-360
9	-990	-405
10	-1100	-450
11	-1210	-495
12	-1320	-540
13	-1430	-585
14	-1540	-630
15	-1650	-675

1. The default value of the TDC-CC CD value for Coarse Unit is 0.
2. The default value of the TDC-FC value for Fine Unit is 0.

## 6.3.1 Key Features

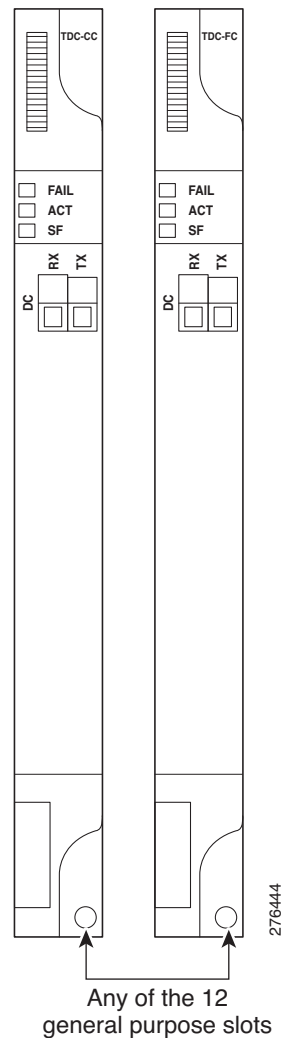
The TDC-CC and TDC-FC cards provide the following features:

- Single slot card with three LEDs on the front panel.
- Two LC-PC-II optical connectors on the front panel.
- Operates in slots from slot 1 to 6 and 12 to 17.
- Operates over the C-band (wavelengths from 1529 nm to 1562.5 nm) of the optical spectrum.
- Allows upto 16 provisionable CD values for chromatic dispersion compensation.
- Connects to OPT-PRE, OPT-AMP-C, OPT-RAMP-C, and OPT-RAMP-CE amplifiers and 40-SMR-1 and 40-SMR-2 cards.
- Supports performance monitoring and alarm handling for selectable thresholds.
- Allows monitoring and provisioning using CTC, SNMP, or TL1.

## 6.3.2 TDC-CC and TDC-FC Faceplate Diagram

Figure 6-5 shows the TDC-CC and TDC-FC faceplate diagram. The TDC-CC and TDC-FC cards can be installed or pulled out of operation from any user interface slot, without impacting other service cards operating within that shelf. To install the TDC-CC and TDC-FC cards, refer the section [NTP-G30 Install the DWDM Cards](#) of the *Cisco ONS 15454 DWDM Procedure Guide*.

**Figure 6-5** TDC-CC and TDC-FC Faceplates



**Note**

The coarse T-DCU is identified with the card label as TDC-CC and the fine T-DCU with TDC-FC in the faceplate of the T-DCU card.

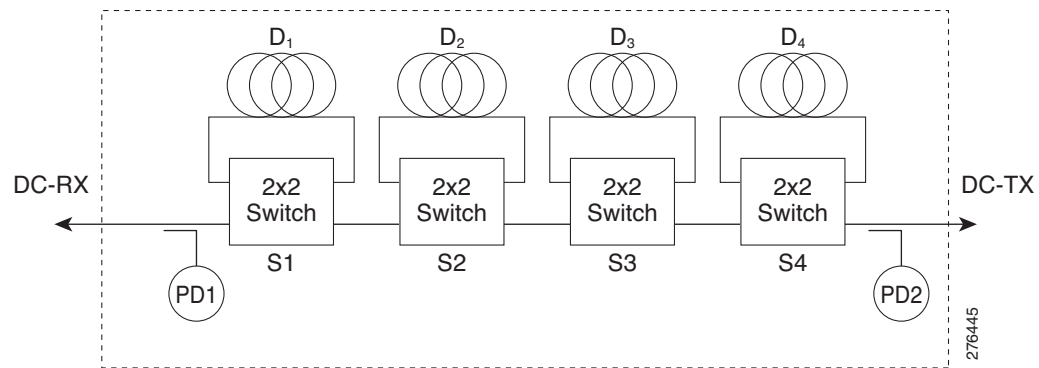
### 6.3.3 Functioning of Optical Ports

The T-DCU unit contains the DC-RX (input) and DC-TX (output) ports. The optical signal enters the DC-RX port, compensates the chromatic dispersion and then exits from the DC-TX port.

### 6.3.4 TDC-CC and TDC-FC Block Diagram

The TDC-CC and TDC-FC cards embed an optical module with four spools (D1, D2, D3, and D4) of dispersion compensating fiber that connects through the 2x2 bypass switches (Figure 6-6). Each bypass switch allows the corresponding dispersion compensation fiber spools to connect to the optical path from the DC-RX (input port) to the DC-TX (output port). The switch configuration selects the requested CD value and combines the four spools based on the 16 chromatic dispersion compensation values fetched. The photodiodes PD1 and PD2 are used to monitor the input and output ports respectively.

**Figure 6-6** Block Diagram of TDC-CC and TDC-FC



### 6.3.5 Lamp Test

The TDC-CC and TDC-FC cards support a lamp test function that is activated either from the ONS 15454 front panel or CTC to ensure that all LEDs are functional.

### 6.3.6 TDC-CC and TDC-FC Card-Level Indicators

Table 6-3 lists the card-level LEDs on the TDC-CC and TDC-FC cards.

**Table 6-3** TDC-CC and TDC-FC Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card 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) Amber (Standby)	If the ACT/STBY LED is green, the card is operational (one or both ports active) and ready to carry traffic. If the ACT/STBY LED is amber, the card is operational and in standby (protect) mode.
Amber SF LED	The Amber SF LED indicates a signal failure or condition such as LOS and LOF on one or more of the card ports. The amber SF LED is also <b>ON</b> if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns OFF.

## 6.4 Monitoring Optical Performance

The TDC-CC and TDC-FC cards monitor the optical input power and optical output power of the fiber. It monitors the insertion loss from the input (DC-RX) to the output (DC-TX) port, with the help of the two photodiodes PD1 and PD2. The TDC-CC and TDC-FC cards report the minimum, average, and maximum power statistics of each of the monitored ports or channels in the specific card. To view the optical power statistics of the TDC-CC and TDC-FC cards, refer to the *Cisco ONS 15454 DWDM Procedure Guide*. The performance data is recorded at 15 minutes and 24 hours intervals.


**Note**

You can view the performance monitoring (PM) data of the card using CTC, SNMP, and TL1 interfaces.


**Note**

The PM data is stored on a wrap-around basis at 32 x 15 min and 2 x 24 hour intervals.

