



# CHAPTER 7

## Card Protection

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This chapter explains the Cisco ONS 15454 SDH card protection configurations. To provision card protection, refer to the *Cisco ONS 15454 SDH Procedure Guide*.

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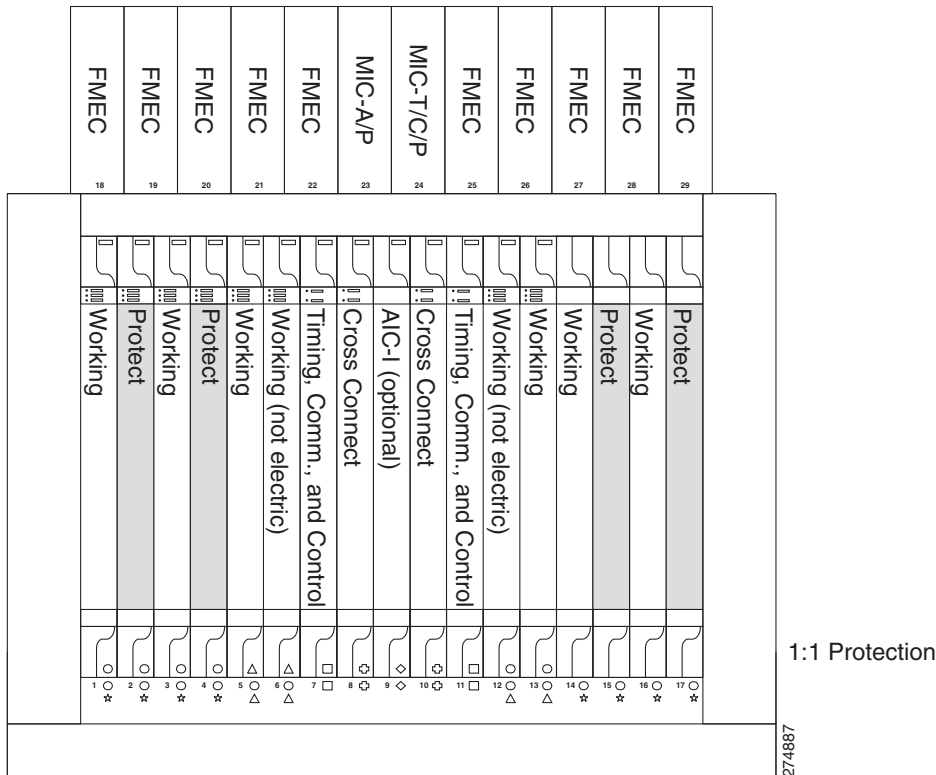
### 7.1 Electrical Card Protection

The ONS 15454 SDH provides a variety of electrical card protection methods. This section describes the protection options.

#### 7.1.1 1:1 Protection

In 1:1 protection, a working card is paired with a protect card of the same type. If the working card fails, the traffic from the working card switches to the protect card. When the failure on the working card is resolved, traffic automatically reverts to the working card. [Figure 7-1](#) shows the ONS 15454 SDH in a 1:1 protection configuration; Slot 2 is protecting Slot 1, Slot 4 is protecting Slot 3, Slot 17 is protecting Slot 16, and Slot 15 is protecting Slot 14. Each working card is paired with a protect card. Slots 6 and 12 are not used for electrical cards. They have no corresponding Front Mount Electrical Connection (FMEC) slots.

Figure 7-1 ONS 15454 SDH Cards in a 1:1 Protection Configuration



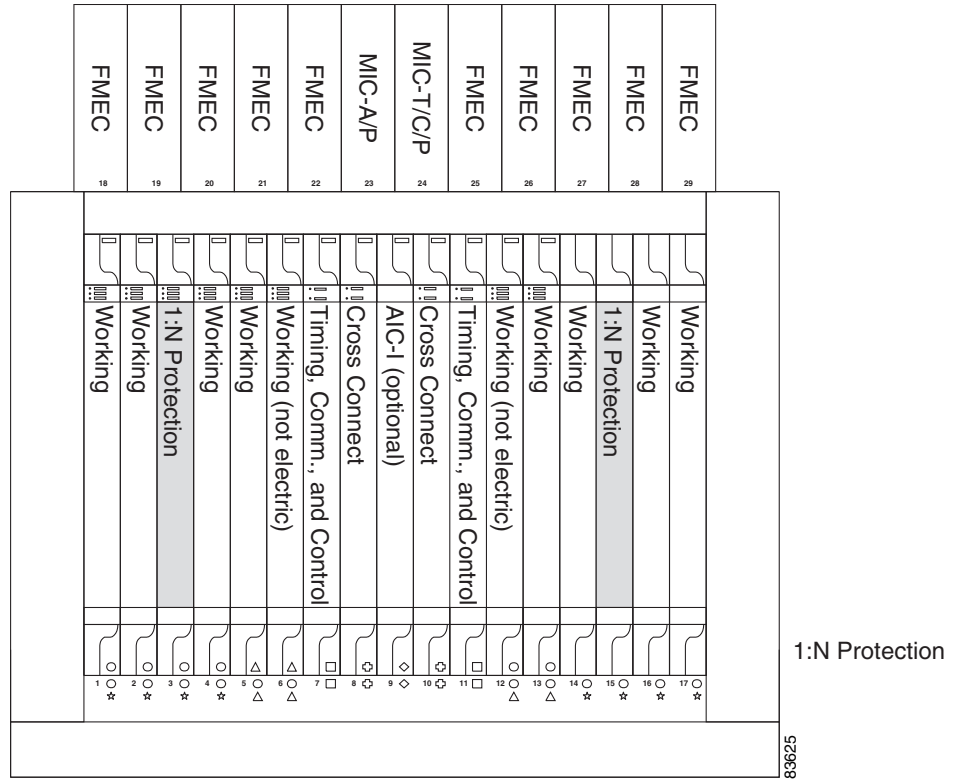
## 7.1.2 1:N Protection

1:N protection allows a single card to protect several working cards. An E1-N-14 card protects up to four E1-N-14 cards, and a DS3i-N-12 card protects up to four DS3i-N-12 cards.

Currently, 1:N protection operates only at the E-1, DS-3, and DS-1 levels. The 1:N protect cards must match the levels of their working cards. For example, an E1-N-14 protects only E1-N-14 cards, and a DS3i-N-12 protects only DS3i-N-12 cards.

The physical E-1, DS-3, or DS-1 ports on the ONS 15454 SDH FMEC cards use the working card until the working card fails. When the node detects this failure, the protect card takes over the physical E-1, DS-3, or DS-1 electrical interfaces through the relays and signal bridging on the backplane. [Figure 7-2](#) shows the ONS 15454 SDH in a 1:N protection configuration. Each side of the shelf assembly has only one card protecting all of the cards on that side.

Figure 7-2 ONS 15454 SDH Cards in a 1:N Protection Configuration



### 7.1.2.1 Revertive Switching

1:N protection supports revertive switching. Revertive switching sends the electrical interfaces back to the original working card after the card comes back online. Detecting an active working card triggers the reversion process. There is a variable time period for the lag between detection and reversion, called the revertive delay, which you can set using Cisco Transport Controller (CTC). For instructions, refer to the *Cisco ONS 15454 SDH Procedure Guide*. All cards in a protection group share the same reversion settings. 1:N protection groups default to automatic reversion.



**Caution**

A user-initiated switch (external switching command) overrides the revertive delay, that is, clearing the switch clears the timer.

### 7.1.2.2 1:N Protection Guidelines

Several rules apply to 1:N protection groups in the ONS 15454 SDH:

- Working and protect card groups must reside in the same card bank (A or B).
- The 1:N protect card must reside in Slot 3 for side A and Slot 15 for side B.
- Working cards might sit on either or both sides of the protect card.

The ONS 15454 SDH supports 1:N equipment protection for all add/drop multiplexer configurations (ring, linear, and terminal), as specified by ITU-T G.841.

The ONS 15454 SDH automatically detects and identifies a 1:N protect card when the card is installed in Slot 3 or Slot 15. However, the slot containing the 1:N card in a protection group must be manually provisioned as a protect slot because by default, all cards are working cards.

## 7.2 STM-N Card Protection

With 1+1 port-to-port protection, any number of ports on the protect card can be assigned to protect the corresponding ports on the working card. The working and protect cards do not have to be placed side by side in the node. A working card must be paired with a protect card of the same type and number of ports. For example, a single-port STM-4 must be paired with another single-port STM-4, and a four-port STM-4 must be paired with another four-port STM-4. You cannot create a 1+1 protection group if one card is single-port and the other is multiport, even if the STM-N rates are the same. The protection takes place on the port level, any number of ports on the protect card can be assigned to protect the corresponding ports on the working card.

For example, on a four-port card, you can assign one port as a protection port on the protect card (protecting the corresponding port on the working card) and leave three ports unprotected. Conversely, you can assign three ports as protection ports and leave one port unprotected.

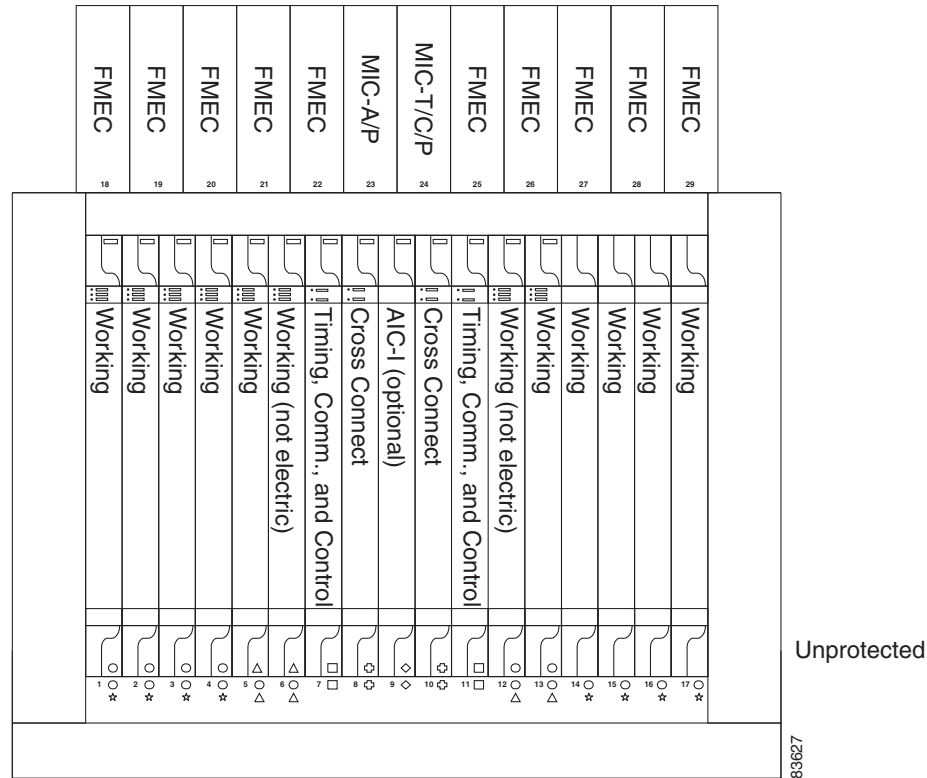
1+1 span protection can be either revertive or nonrevertive. With nonrevertive 1+1 protection, when a failure occurs and the signal switches from the working card to the protect card, the signal stays switched to the protect card until it is manually switched back. Revertive 1+1 protection automatically switches the signal back to the working card when the working card comes back online.

You create and modify protection schemes using CTC software. For more information, refer to the “Turn Up Node” chapter in the *Cisco ONS 15454 SDH Procedure Guide*.

## 7.3 Unprotected Cards

Unprotected cards are not included in a protection scheme; therefore, a card failure or a signal error results in lost data. An unprotected configuration is sometimes called 1:0 protection. Because no bandwidth is reserved for protection, unprotected schemes maximize the available ONS 15454 SDH bandwidth. [Figure 7-3](#) shows the ONS 15454 SDH in an unprotected configuration. All cards are in a working state.

**Figure 7-3 ONS 15454 SDH Cards in an Unprotected Configuration**



## 7.4 External Switching Commands

The external switching commands on the ONS 15454 SDH are Manual, Force, and lockout. If you choose a Manual switch, the command will switch traffic only if the path has an error rate less than the signal degrade (SD) bit error rate threshold. A Force switch will switch traffic even if the path has SD or signal fail (SF) conditions; however, a Force switch will not override an SF on a 1+1 protection channel. A Force switch has a higher priority than a Manual switch. Lockouts, which prevent traffic from switching to the protect port under any circumstance, can only be applied to protect cards (in 1+1 configurations). Lockouts have the highest priority.



**Note**

Force and Manual switches do not apply to 1:1 protection groups; these ports have a single switch command.

Another way to inhibit protection switching in a 1+1 configuration is to apply a lock-on to the working port. A working port with a lock-on applied cannot switch traffic to the protect port in the protection group (pair). In 1:1 protection groups, working or protect ports can have a lock-on.

