CHAPTER 16

Timing Reference

This chapter provides information about Cisco ONS 15454 users and node timing. To provision timing, refer to the *Cisco ONS 15454 DWDM Procedure Guide*.

Note Unless otherwise specified, "ONS 15454" refers to both ANSI and ETSI shelf assemblies.

Chapter topics include:

16.1 Node Timing Parameters

SONET timing parameters must be set for each Cisco ONS 15454 shelf. Each ONS 15454 independently accepts its timing reference from one of three sources:

- The building integrated timing supply (BITS) pins on the ONS 15454 backplane (ANSI) or MIC-C/T/P coaxial connectors (ETSI).
- An OC-N/STM-N card installed in the ONS 15454. The card is connected to a node that receives timing through a BITS source.
- The internal ST3 clock on the TCC2/TCC2P/TCC3/TNC/TSC card.

You can set ONS 15454 timing to one of three modes: external, line, or mixed. If timing is received from a BITS source, set ONS 15454 timing to external. If timing is received from an OC-N/STM-N card, set the timing to line. The BITS connection on Cisco ONS 15454 M6 shelf is through the external connection unit (ECU) and is through the power module on Cisco ONS 15454 M2 shelf.

In typical ONS 15454 networks:

- One node is set to external. The external node derives its timing from a BITS source wired to the BITS backplane pins. The BITS source, in turn, derives its timing from a primary reference source (PRS) such as a Stratum 1 clock or global positioning satellite (GPS) signal.
- The other nodes are set to line. The line nodes derive timing from the externally timed node through the OC-N/STM-N trunk (span) cards. The DWDM node normally derives timing from the line using the OSCM or OSC-CSM card that are inside an OC-3/STM-1 channel.

You can set three timing references for each ONS 15454. The first two references are typically two BITS-level sources, or two line-level sources optically connected to a node with a BITS source. The third reference is usually assigned to the internal clock provided on every ONS 15454 TCC2/TCC2P/TCC3/TNC/TSC card. However, if you assign all three references to other timing sources, the internal clock is always available as a backup timing reference. The internal clock is a Stratum 3 (ST3), so if an ONS 15454 node becomes isolated, timing is maintained at the ST3 level.

The CTC Maintenance > Timing > Report tab show current timing information for an ONS 15454, including the timing mode, clock state and status, switch type, and reference data.

Caution Mixed timing allows you to select both external and line timing sources. However, Cisco does not recommend its use because it can create timing loops. Use this mode with caution.

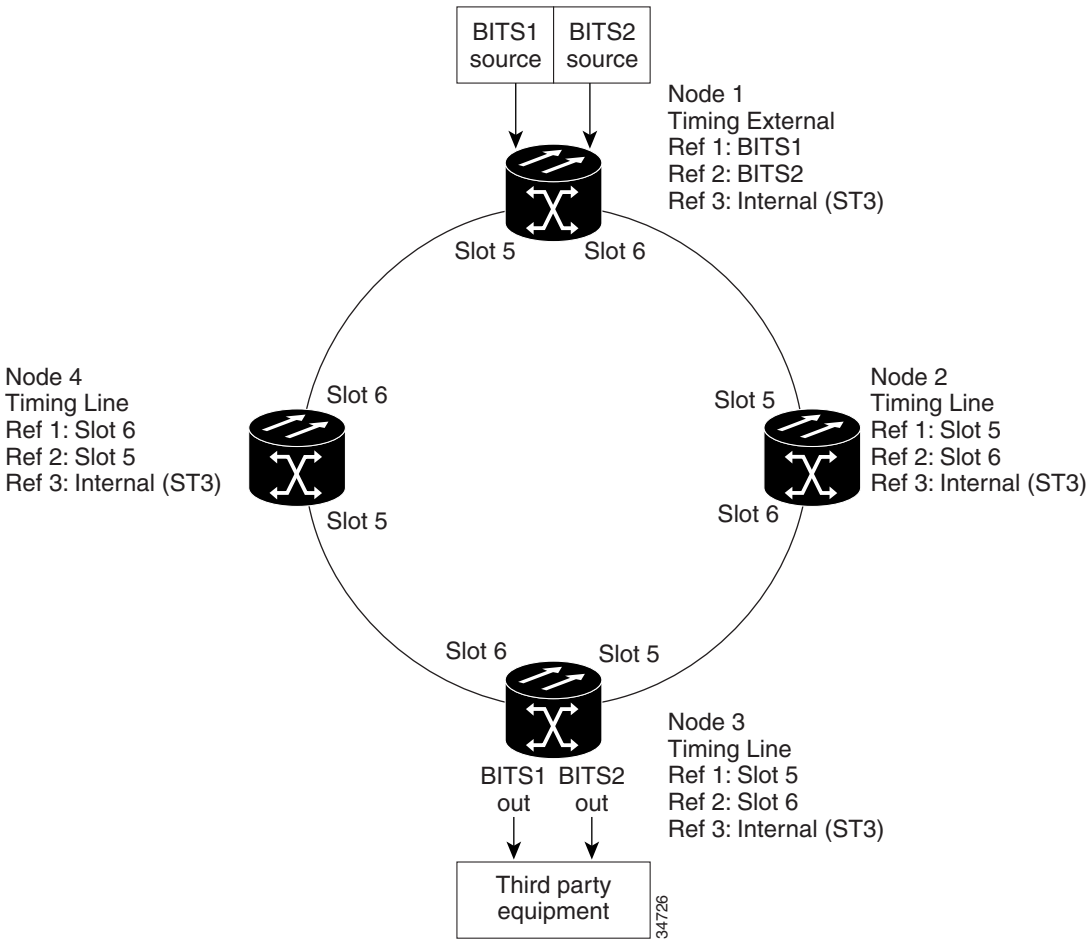
The OC3 port of the TNC/TSC card can be set as the timing reference. In the ONS 15454 M2 shelf, BITS-2 is not supported.

16.2 Network Timing

Figure 16-1 shows an ONS 15454 network timing setup example. Node 1 is set to external timing. Two timing references are set to BITS. These are Stratum 1 timing sources wired to the BITS input pins on the Node 1 backplane. The third reference is set to internal clock. The BITS output pins on the backplane of Node 3 are used to provide timing to outside equipment, such as a digital access line access multiplexer.

In the example, Slots 5 and 6 contain the trunk (span) cards. Timing at Nodes 2, 3, and 4 is set to line, and the timing references are set to the trunk cards based on distance from the BITS source. Reference 1 is set to the trunk card closest to the BITS source. At Node 2, Reference 1 is set to Slot 5 because it is connected to Node 1. At Node 4, Reference 1 is set to Slot 6 because it is connected to Node 1. At Node 3, Reference 1 could be either trunk card because they are at an equal distance from Node 1.

Figure 16-1 ONS 15454 Timing Example



16.3 Synchronization Status Messaging

Synchronization status messaging (SSM) is a SDH and SONET protocol that communicates information about the quality of the timing source. SSM messages are carried on the S1 byte of the SONET Line layer or on S1 byte of the SDH section overhead. They enable SONET or SDH devices to automatically select the highest quality timing reference and to avoid timing loops.

SSM messages are either Generation 1 or Generation 2. Generation 1 is the first and most widely deployed SSM message set. Generation 2 is a newer version. If you enable SSM for the ONS 15454 or the ONS 15454 SDH, consult your timing reference documentation to determine which message set to use.

Table 16-1 shows the SDH message set.

Table 16-1 SDH SSM Message Set

Message	Quality	Description
G811	1	Primary reference clock
STU	2	Sync traceability unknown
G812T	3	Transit node clock traceable
G812L	4	Local node clock traceable
SETS	5	Synchronous equipment
DUS	6	Do not use for timing synchronization

Table 16-2 and Table 16-3 on page 16-4 show the Generation 1 and Generation 2 message sets for SONET.

Table 16-2 SSM Generation 1 Message Set

Message	Quality	Description
PRS	1	Primary reference source—Stratum 1
STU	2	Synchronization traceability unknown
ST2	3	Stratum 2
ST3	4	Stratum 3
SMC	5	SONET minimum clock
ST4	6	Stratum 4
DUS	7	Do not use for timing synchronization
RES	—	Reserved; quality level set by user

Table 16-3 SSM Generation 2 Message Set

Message	Quality	Description
PRS	1	Primary reference source—Stratum 1
STU	2	Synchronization traceability unknown
ST2	3	Stratum 2
TNC	4	Transit node clock
ST3E	5	Stratum 3E
ST3	6	Stratum 3
SMC	7	SONET minimum clock
ST4	8	Stratum 4
DUS	9	Do not use for timing synchronization
RES	—	Reserved; quality level set by user