



DWDM Node Reference

This chapter explains the ONS 15454 dense wavelength division multiplexing (DWDM) node types that are available for the ONS 15454. The DWDM node type is determined by the type of amplifier and filter cards that are installed in an ONS 15454. The chapter also explains the DWDM automatic power control, ROADM power equalization, span loss verification, and automatic node setup functions.



Note

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

Chapter topics include:

- [15.1 DWDM Node Configurations, page 15-1](#)
- [15.2 Automatic Power Control, page 15-14](#)
- [15.3 ROADM Power Equalization Monitoring, page 15-18](#)
- [15.4 Span Loss Verification, page 15-18](#)
- [15.5 Automatic Node Setup, page 15-19](#)

15.1 DWDM Node Configurations

The ONS 15454 supports the following DWDM node configurations: hub, terminal, OADM, reconfigurable OADM, anti-ASE, line amplifier, and OSC regeneration line.



Note

The Cisco MetroPlanner tool creates a plan for amplifier placement and proper node equipment.

15.1.1 Hub Node

A hub node is a single ONS 15454 node equipped with two TCC2 (Timing Control Card) cards and one of the following combinations:

- Two 32MUX-O (32-Channel Multiplexer) and two 32DMX-O (32-Channel Demultiplexer) or 32DMX cards
- Two 32WSS (32-Channel Wavelength Selective Switch) and two 32DMX or 32DMX-O cards

**Note**

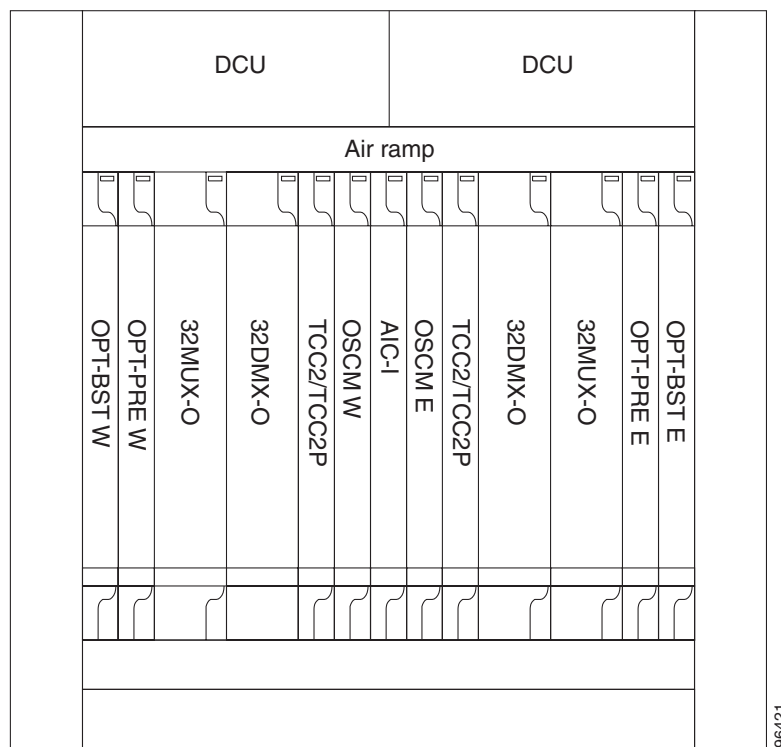
The 32WSS and 32DMX are normally installed in reconfigurable OADM (ROADM) nodes, but they can be installed in hub and terminal nodes. If the cards are installed in a hub node, the 32WSS express (EXP RX and EXP TX) ports are not cabled.

A Dispersion Compensation Unit (DCU) can also be added, if necessary. The hub node does not support both DWDM and time-division multiplexing (TDM) applications since the DWDM slot requirements do not leave room for TDM cards. [Figure 15-1](#) shows a hub node configuration with 32MUX-O and 32DMX-O cards installed.

**Note**

The optical add/drop multiplexing (OADM) AD-xC-xx.x or AD-xB-xx.x cards are not part of a hub node because the 32MUX-O and 32DMX-O cards drop and add all 32 channels; therefore, no other cards are necessary.

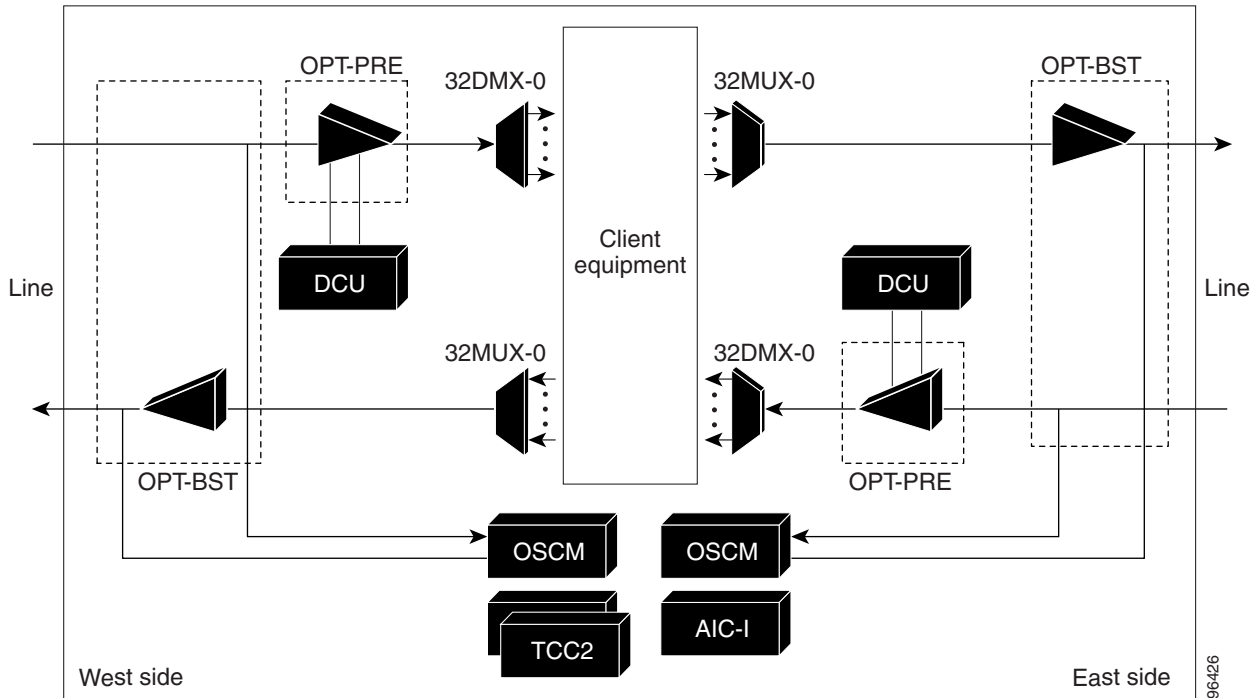
Figure 15-1 Hub Node Configuration Example



[Figure 15-2](#) shows the channel flow for a hub node. Up to 32-channels from the client ports are multiplexed and equalized onto one fiber using the 32MUX-O card. Then, multiplexed channels are transmitted on the line in the eastward direction and fed to the Optical Booster (OPT-BST) amplifier. The output of this amplifier is combined with an output signal from the Optical Service Channel Modem (OSCM) card, and transmitted toward the east line.

Received signals from the east line port are split between the OSCM card and an Optical Preamplifier (OPT-PRE). Dispersion compensation is applied to the signal received by the OPT-PRE amplifier, and it is then sent to the 32DMX-O card, which demultiplexes and attenuates the input signal. The west receive fiber path is identical through the west OPT-BST amplifier, the west OPT-PRE amplifier, and the west 32DMX-O card.

Figure 15-2 Hub Node Channel Flow Example



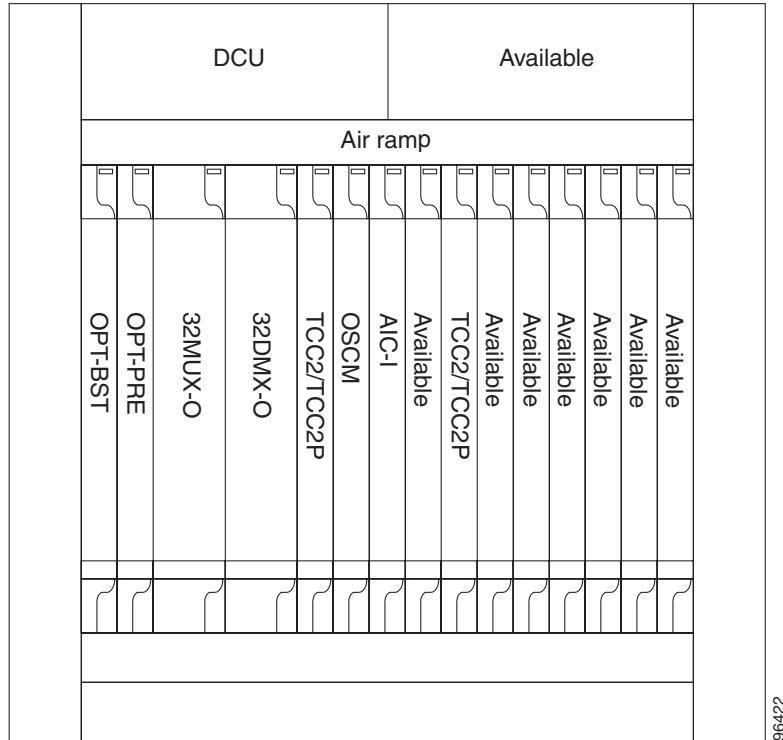
15.1.2 Terminal Node

A terminal node is a single ONS 15454 node equipped with two TCC2 cards and one of the following combinations:

- One 32MUX-O card and one 32DMX-O card
- One 32WSS and either a 32DMX or a 32DMX-O cards

Terminal nodes can be either east or west. In west terminal nodes, the cards are installed in the east slots (Slots 1 through 6). In east terminal nodes, cards are installed in the west slots (Slots 12 through 17).

[Figure 15-3](#) shows an example of an east terminal configuration with a 32MUX-O and 32DMX-O cards installed. The channel flow for a terminal node is the same as the hub node (see [Figure 15-2](#)).

Figure 15-3 Terminal Node Configuration Example

15.1.3 OADM Node

An OADM node is a single ONS 15454 node equipped with cards installed on both sides and at least one AD-xC-xx.x card or one AD-xB-xx.x card and two TCC2 cards. 32MUX-O or 32DMX-O cards cannot be installed in an OADM node. In an OADM node, channels can be added or dropped independently from each direction, and then passed through the reflected bands of all OADMs in the DWDM node (called express path). They can also be passed through one OADM card to another OADM card without using a TDM ITU line card (called optical pass through) if an external patchcord is installed.

Unlike express path, an optical pass-through channel can be converted later to an add/drop channel in an altered ring without affecting another channel. OADM amplifier placement and required card placement is determined by the Cisco MetroPlanner tool or your site plan.

OADM nodes can be amplified or passive. In amplified OADMs, the OPT-PRE and the OPT-BST amplifiers are installed on the east and west sides of the node. [Figure 15-4](#) shows an example of an amplified OADM node configuration.

Figure 15-4 Amplified OADM Node Configuration Example

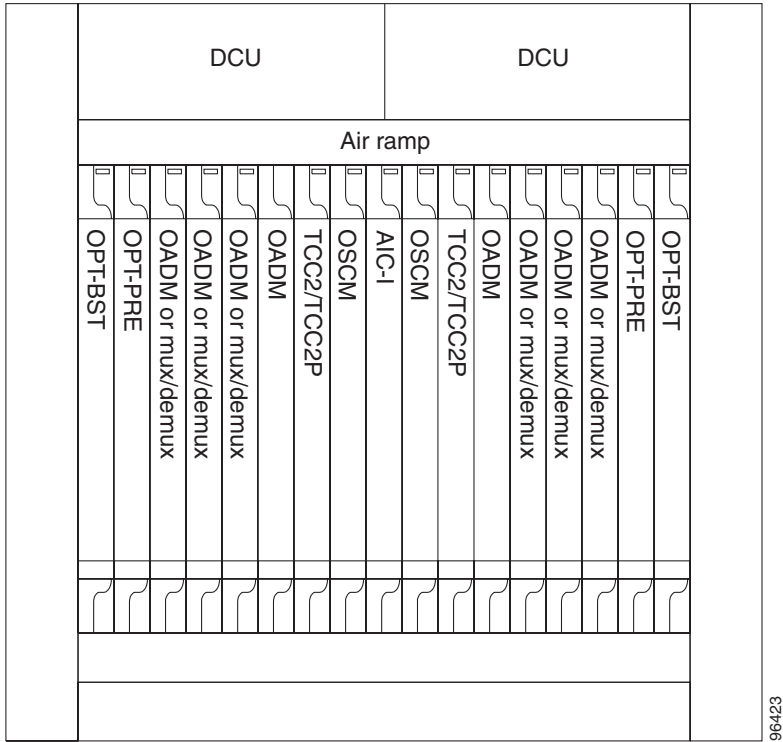


Figure 15-5 shows an example of the channel flow on the amplified OADM node. Since the 32-wavelength plan is based on eight bands (each band contains four channels), optical adding and dropping can be performed at the band level and/or at the channel level (meaning individual channels can be dropped).

Figure 15-5 Amplified OADM Node Channel Flow Example

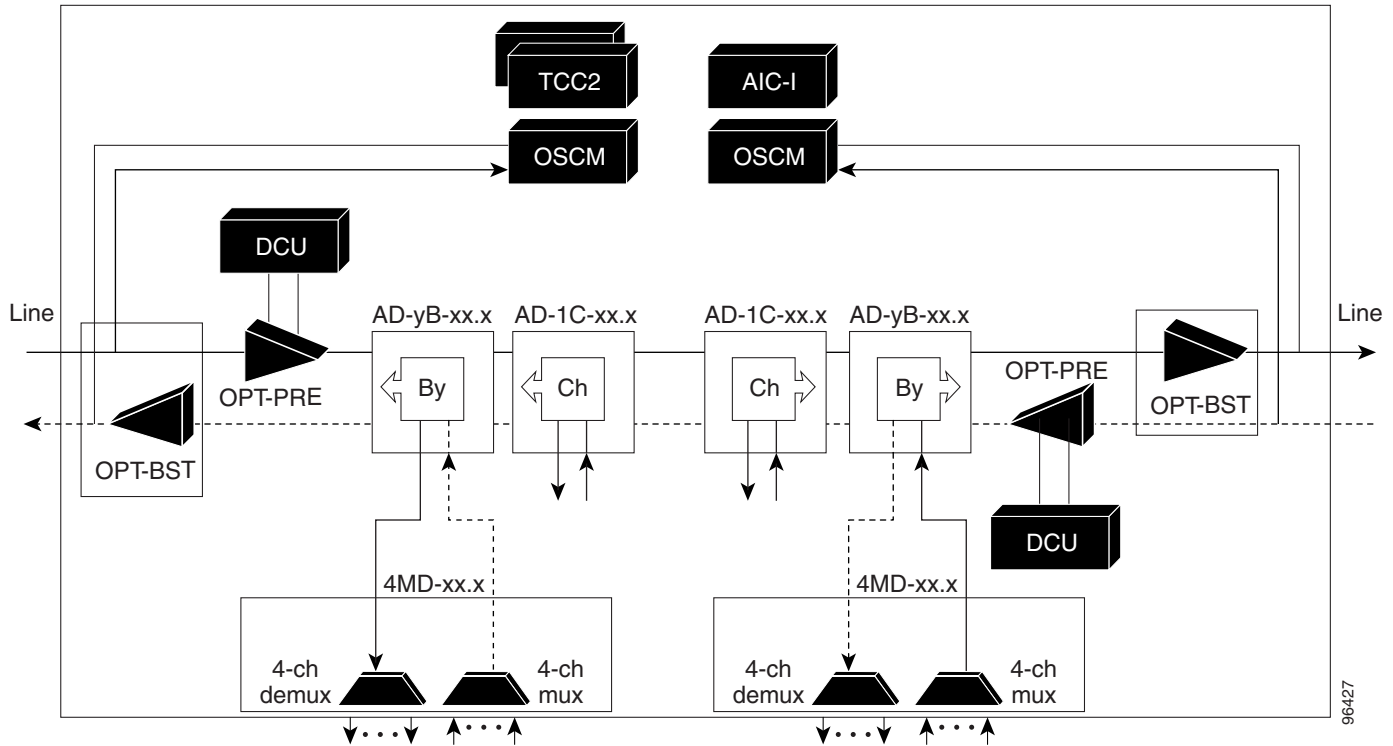


Figure 15-6 shows an example of a passive OADM node configuration. The passive OADM node is equipped with a band filter, one four-channel multiplexer/demultiplexer, and a channel filter on each side of the node.

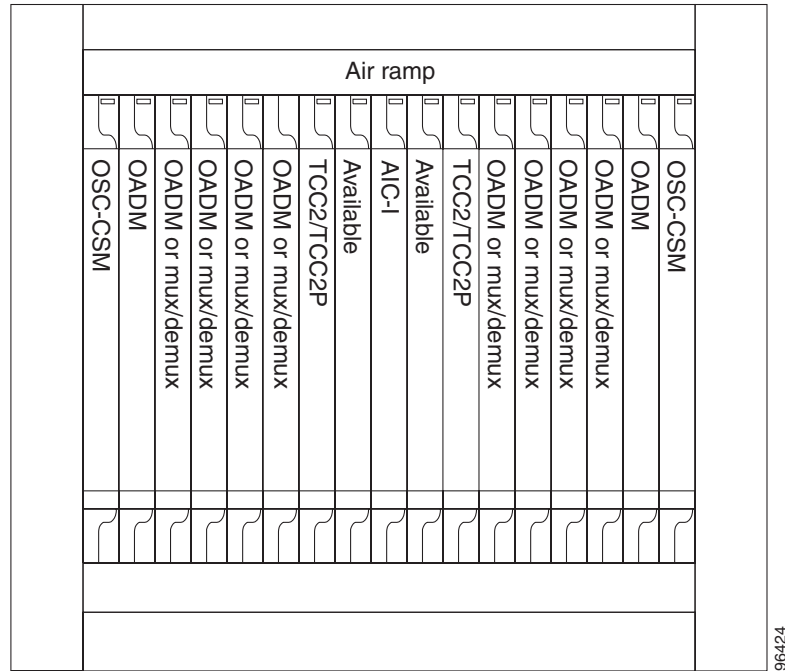
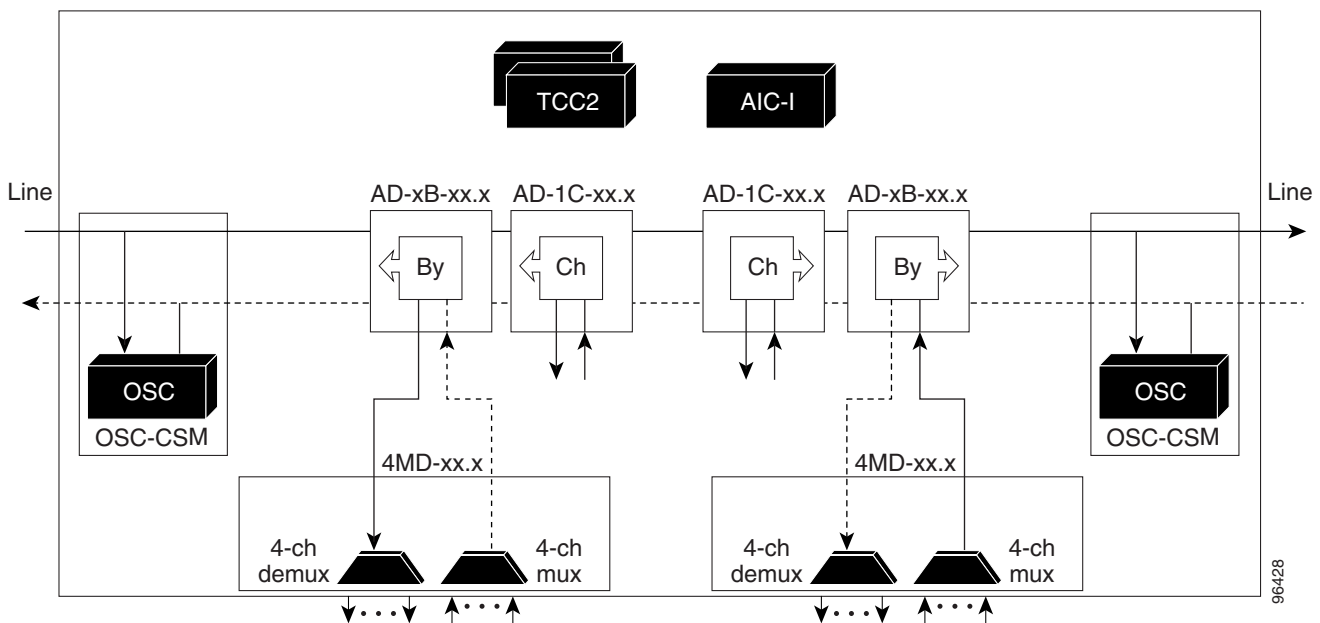
Figure 15-6 Passive OADM Node Configuration Example

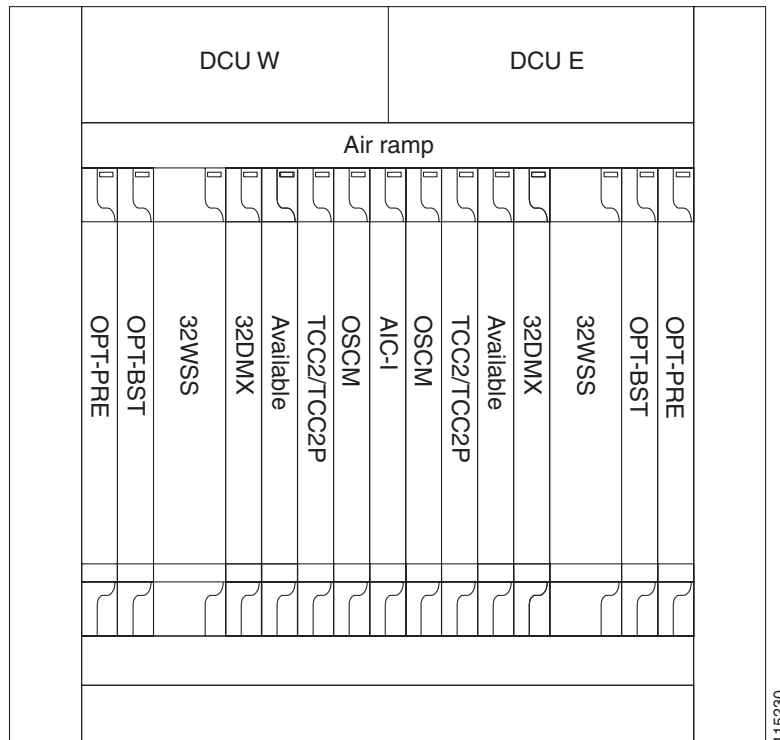
Figure 15-7 shows an example of traffic flow on the passive OADM node. The signal flow of the channels is the same as the amplified OADM, except that the Optical Service Channel and Combiner/Separator Module (OSC-CSM) card is used instead of the OPT-BST amplifier and the OSCM card.

Figure 15-7 Passive OADM Node Channel Flow Example

15.1.4 ROADM Node

A reconfigurable OADM (ROADM) node allows you to add and drop wavelengths without changing the physical fiber connections. ROADM nodes are equipped with two 32WSS cards. 32DMX or 32DMX-O demultiplexers are typically installed, but are not required. Transponders (TXPs) and muxponders (MXPs) can be installed in Slots 6 and 12 and, if amplification is not used, in any open slot. [Figure 15-4](#) shows an example of an amplified ROADM node configuration.

Figure 15-8 ROADM Node with BST-PRE, OPT-BST, and 32DMX Cards Installed



If the ROADM node receives a tilted optical signal, you can replace the single-slot 32DMX card with the double-slot 32DMX-O card to equalize the signal at the optical channel layer instead of the transport section layer. However, if 32DMX-O cards are installed, Slots 6 and 12 cannot be used for TXP or MXP cards. [Figure 15-6](#) shows an example of an ROADM with 32DMX-O cards installed.

Figure 15-9 ROADM Node with BST-PRE, OPT-BST, and 32DMX-O Cards Installed

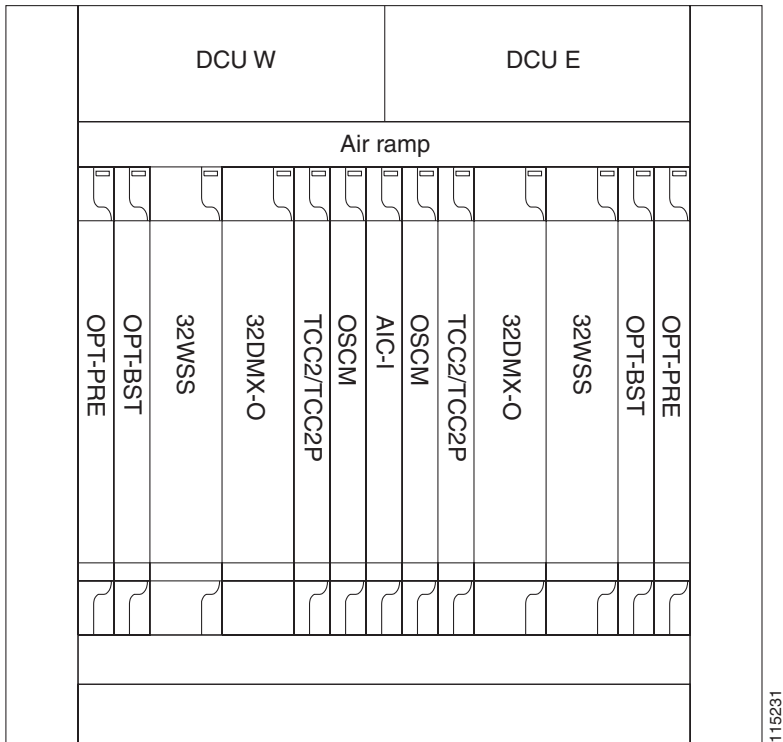
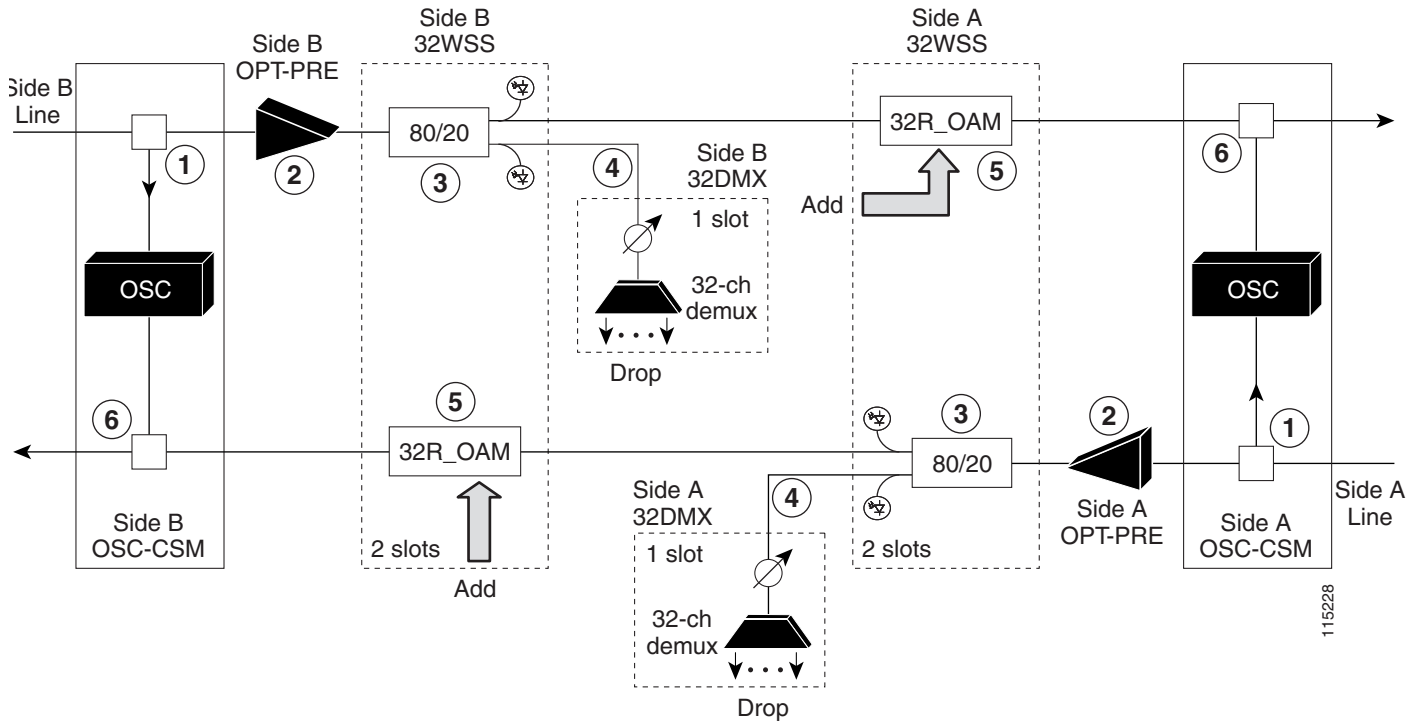


Figure 15-10 shows an example of a reconfigurable OADM east-to-west optical signal flow. The west-to-east optical signal flow follows an identical path through the west OSC-CSM and west 32WSS modules. In this example, OSC-CSM modules are installed so OPT-BST modules are not needed.

Figure 15-10 ROADM East to West Optical Signal Flow Example



1	The OSC-CSM receives the optical signal. It separates the optical service channel from the optical payload and sends the payload to the OPT-PRE module.
2	The OPT-PRE compensates for chromatic dispersion, amplifies the optical payload, and sends it to the 32WSS.
3	The 32WSS splits the signal into two components, one is sent to the DROP-TX port and the other is sent to the EXP-TX port.
4	The drop component goes to the 32DMX where it is attenuated, de-multiplexed, and dropped.
5	The express wavelength set goes to the 32WSS on the other side where it is de-multiplexed. Channels are stopped or forwarded based upon their switch states. Forwarded wavelengths are multiplexed and sent to the OSC-CSM module.
6	The OSC-CSM combines the multiplexed payload with the OSC and sends the signal out the transmission line.

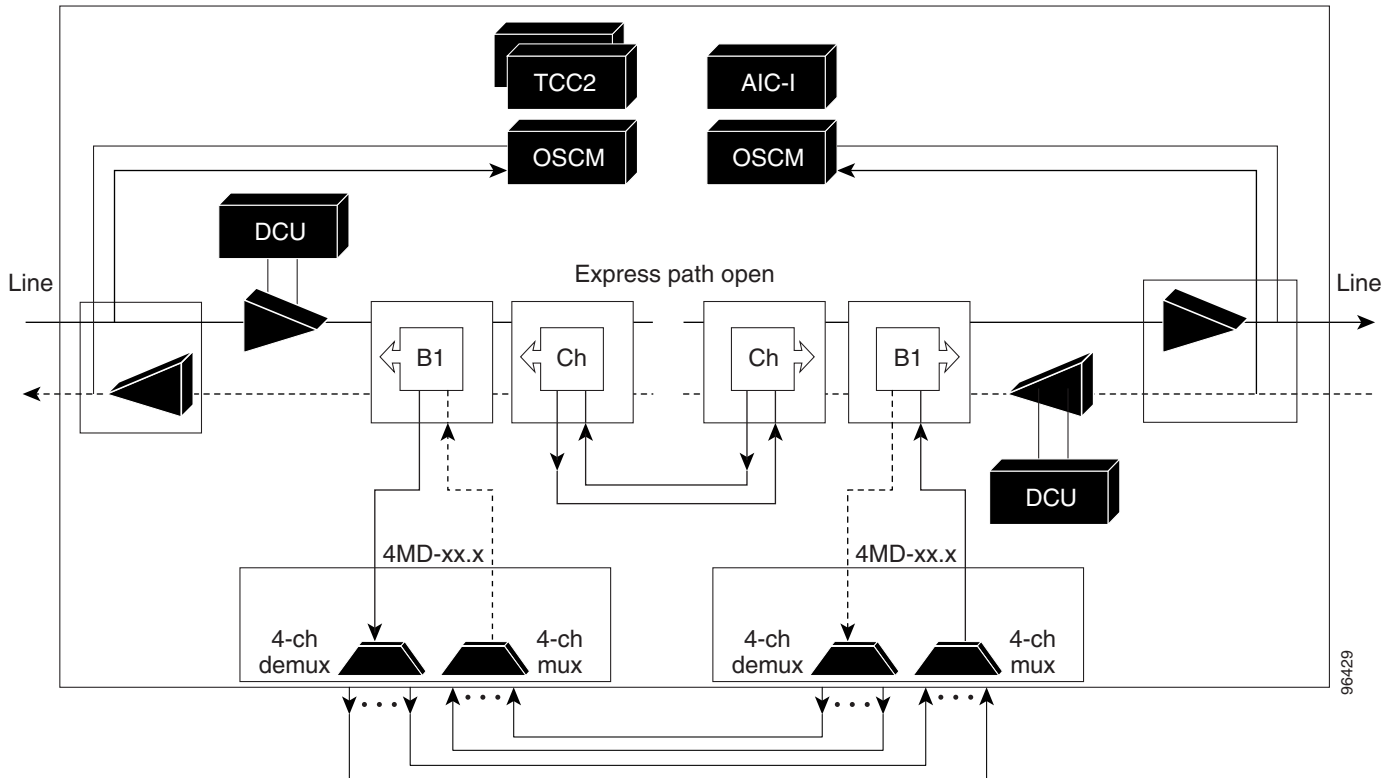
15.1.5 Anti-ASE Node

In a meshed ring network, the ONS 15454 requires a node configuration that prevents amplified spontaneous emission (ASE) accumulation and lasing. An anti-ASE node can be created by configuring a hub node or an OADM node with some modifications. No channels can travel through the express path, but they can be demultiplexed and dropped at the channel level on one side and added and multiplexed on the other side.

The hub node is the preferred node configuration when some channels are connected in pass-through mode. For rings that require a limited number of channels, combine AD-xB-xx.x and 4MD-xx.x cards, or cascade AD-xC-xx.x cards. See [Figure 15-5 on page 15-6](#).

[Figure 15-11](#) shows an anti-ASE node that uses all wavelengths in the pass-through mode. Use Cisco MetroPlanner to determine the best configuration for anti-ASE nodes.

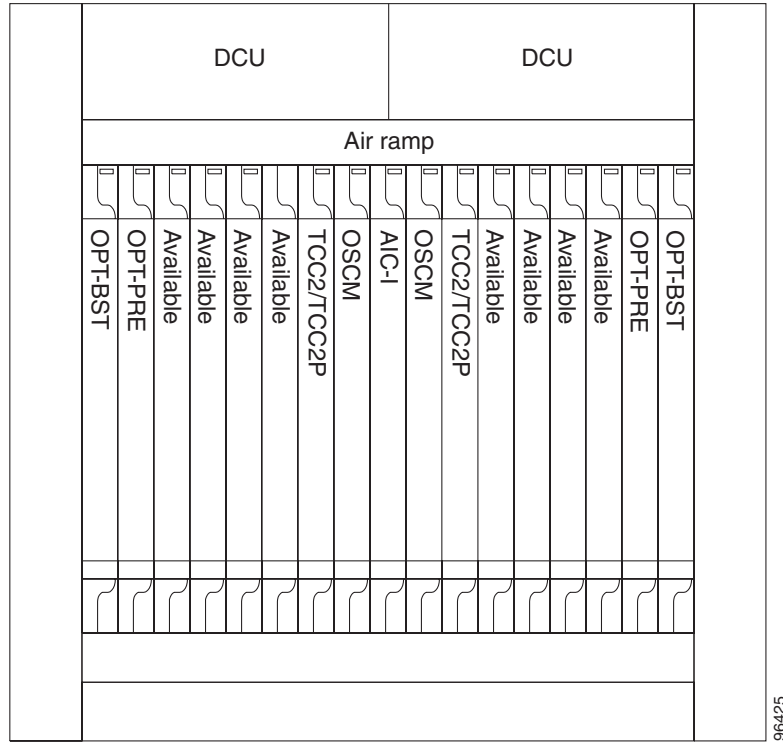
Figure 15-11 Anti-ASE Node Channel Flow Example



15.1.6 Line Amplifier Node

A line amplifier node is a single ONS 15454 node equipped with OPT-PRE amplifiers or OPT-BST amplifiers and TCC2 cards. Attenuators might also be required between each preamplifier and booster amplifier to match the optical input power value and to maintain the amplifier gain tilt value.

Two OSCM cards are connected to the east or west ports of the booster amplifiers to multiplex the optical service channel (OSC) signal with the pass-through channels. If the node does not contain OPT-BST amplifiers, you must use OSC-CSM cards rather than OSCM cards in your configuration. [Figure 15-12](#) shows an example of a line node configuration.

Figure 15-12 Line Amplifier Node Configuration Example

15.1.7 OSC Regeneration Node

The OSC regeneration node is added to the DWDM networks for two purposes:

- To electrically regenerate the OSC channel whenever the span links are 37 dB or longer and payload amplification and add/drop capabilities are not present. Cisco MetroPlanner places an OSC regeneration node in spans longer than 37 dB. 31 dB is the longest span between the OSC regeneration node and the next DWDM network site.
- To add data communications network (DCN) capability wherever needed within the network.

OSC regeneration nodes require two OSC-CSM cards, as shown in [Figure 15-13](#).

Figure 15-13 OSC Regeneration Line Node Configuration Example

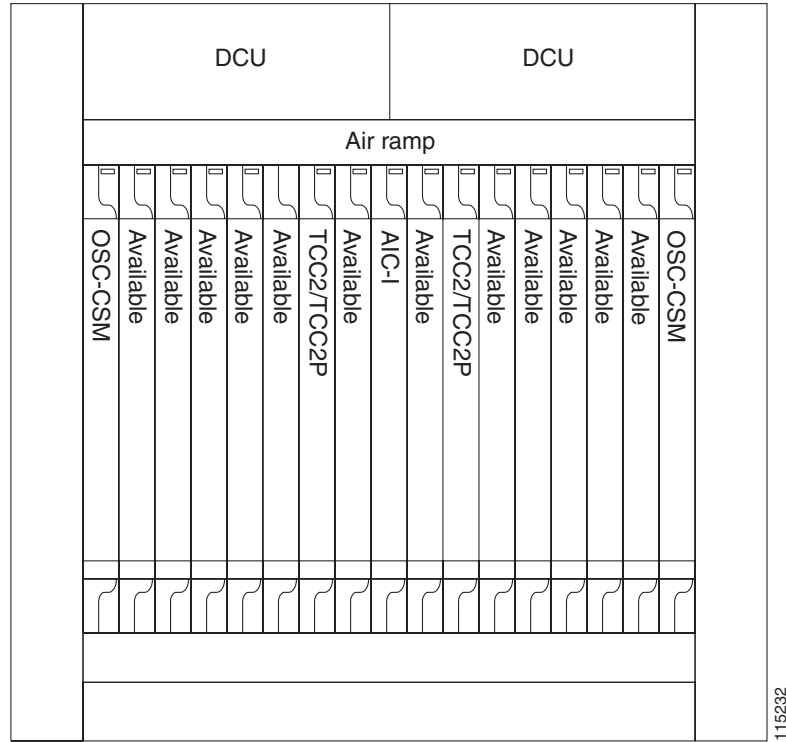
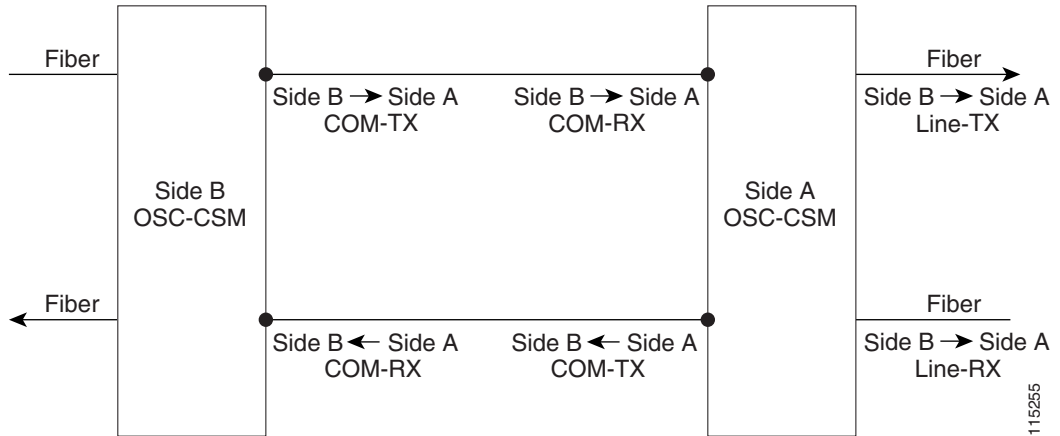


Figure 15-14 shows the OSC regeneration node OSC signal flow.

Figure 15-14 OSC Regeneration Line Site Example



15.2 Automatic Power Control

The ONS 15454 automatic power control (APC) feature performs the following functions:

- Maintains constant per-channel power when changes to the number of channels occur.
- Compensates for optical network degradation (aging effects).
- Simplifies the installation and upgrade of DWDM optical networks by automatically calculating the amplifier setpoints.



Note

APC functions are performed by software algorithms on the OPT-BST, OPT-PRE, and TCC2 cards.

Amplifier software uses a control gain loop with fast transient suppression to keep the channel power constant regardless of any changes in the number of channels. Amplifiers monitor the changes to the input power and change the output power according to the calculated gain setpoint. The shelf controller software emulates the control output power loop to adjust for fiber degradation. To perform this function, the TCC2 needs to know the channel distribution, which is provided by a signaling protocol, and the expected per-channel power, which you can provision. The TCC2 compares the actual amplifier output power with the expected amplifier output power and modifies the setpoints if any discrepancies occur.

15.2.1 APC at the Amplifier Card Level

In constant gain mode, the amplifier power out control loop performs the following input and output power calculations, where G represents the gain and t represents time.

$$P_{out}(t) = G * P_{in}(t) \text{ (mW)}$$

$$P_{out}(t) = G + P_{in}(t) \text{ (dB)}$$

In a power-equalized optical system, the total input power is proportional to the number of channels. The amplifier software compensates for any variation of the input power due to changes in the number of channels carried by the incoming signal.

Amplifier software identifies changes in the read input power in two different instances, t_1 and t_2 as a change in the carried traffic. The letters m and n in the following formula represent two different channel numbers. P_{in}/ch represents the per-channel input power:

$$P_{in}(t_1) = nP_{in}/ch$$

$$P_{in}(t_2) = mP_{in}/ch$$

Amplifier software applies the variation in the input power to the output power with a reaction time that is a fraction of a millisecond. This keeps the power constant on each channel at the output amplifier, even during a channel upgrade or a fiber cut.

Amplifier parameters are configured using east and west conventions for ease of use. Selecting west provisions parameters for the preamplifier receiving from the west and the booster amplifier transmitting to the west. Selecting east provisions parameters for the preamplifiers receiving from the east and the booster amplifier transmitting to the east.

Starting from the expected per-channel power, the amplifiers automatically calculate the gain setpoint after the first channel is provisioned. An amplifier gain setpoint is calculated in order to make it equal to the loss of the span preceding the amplifier itself. After the gain is calculated, the setpoint is no longer changed by the amplifier. Amplifier gain is recalculated every time the number of provisioned channels returns to zero. If you need to force a recalculation of the gain, move the number of channels back to zero.

15.2.2 APC at the Node and Network Levels

The amplifier adjusts the gain to compensate for span loss. Span loss changes due to aging fiber and components, or changes in operating conditions. To correct the gain or express variable optical attenuator (VOA) setpoints, APC calculates the difference between the power value read by the photodiodes and the expected power value. The expected power values is calculated using:

- Provisioned per-channel power value
- Channel distribution (the number of express, add, and drop channels in the node)
- ASE estimation

Channel distribution is determined by the sum of the provisioned and failed channels. Information about provisioned wavelengths is sent to APC on the applicable nodes during circuit creation. Information about failed channels is collected through a signaling protocol that monitors alarms on ports in the applicable nodes and distributes that information to all the other nodes in the network.

ASE calculations purify the noise from the power level reported from the photodiode. Each amplifier can compensate for its own noise, but cascaded amplifiers cannot compensate for ASE generated by preceding nodes. The ASE effect increases when the number of channels decreases; therefore, a correction factor must be calculated in each amplifier of the ring to compensate for ASE build-up.

APC is a network-level feature. The APC algorithm designates a master node that is responsible for starting APC hourly or every time a new circuit is provisioned or removed. Every time the master node signals for APC to start, gain and VOA setpoints are evaluated on all nodes in the network. If corrections are needed in different nodes, they are always performed sequentially following the optical paths starting from the master node.

APC corrects the power level only if the variation exceeds the hysteresis thresholds of ± 0.5 dB. Any power level fluctuation within the threshold range is skipped since it is considered negligible. Because APC is designed to follow slow time events, it skips corrections greater than 3 dB. This is the typical total aging margin that is provisioned during the network design phase. After you provision the first channel or the amplifiers are turned up for the first time, APC does not apply the 3 dB rule. In this case, APC corrects all the power differences to turn up the node.

**Note**

Software R4.7 does not report corrections that are not performed and exceed the 3 dB correction factor to management interfaces (Cisco Transport Controller [CTC], Cisco Transport Manager [CTM], and Transaction Language One [TL1]).

To avoid large power fluctuations, APC adjusts power levels incrementally. The maximum power correction is ± 0.5 dB. This is applied to each iteration until the optimal power level is reached. For example, a gain deviation of 2 dB is corrected in four steps. Each of the four steps requires a complete APC check on every node in the network. APC can correct up to a maximum of 3 dB on an hourly basis. If degradation occurs over a longer time period, APC will compensate for it by using all margins that you provision during installation.

When no margin is available, adjustments cannot be made because setpoints exceed ranges. APC communicates the event to CTC, CTM, and TL1 through an APC Fail condition. APC will clear the APC fail condition when the setpoints return to the allowed ranges.

APC automatically disables itself when:

- A HW FAIL alarm is raised by any card in any of the network nodes.
- A Mismatch Equipment Alarm (MEA) is raised by any card in any of the network nodes.
- An Improper Removal alarm is raised by any card in any of the network nodes.

- Gain Degrade, Power Degrade, and Power Fail Alarms are raised by the output port of any amplifier card in any of the network nodes.
- A VOA degrade or Fail alarm is raised by any of the cards in any of the network nodes.

The APC state (Enable/Disable) is located on every node and can be retrieved by the CTC or TL1 interfaces. If an event that disables APC occurs in one of the network nodes, APC is disabled on all the others and the APC state changes to DISABLE - INTERNAL. The disabled state is raised only by the node where the problem occurred to simplify troubleshooting.

APC raises the following standing conditions at the port level in CTC, TL1, and SNMP:

- APC Out of Range—APC cannot assign a new setpoint for a parameter this is allocated to a port because the new setpoint exceeds the parameter range.
- APC Correction Skipped—APC skipped a correction to one parameter allocated to a port because the difference between the expected and current values exceeds the ± 3 dB security range.

After the error condition is cleared, signaling protocol enables APC on the network and the APC DISABLE - INTERNAL condition is cleared. Because APC is required after channel provisioning to compensate for ASE effects, all optical channel network connection (OCHNC) circuits that you provision during the disabled APC state are kept in the Out-of-Service and Autonomous, Automatic In-Service (OOS-AU,AINS [ANSI]) or Unlocked-disabled,automaticInService (ETSI) service state until APC is enabled. OCHNCs automatically go into the In-Service and Normal (IS-NR [ANSI]) or Unlocked-enabled (ETSI) service state only after APC is enabled.

15.2.3 Managing APC

The automatic power control status is indicated by four APC states shown in the node view status area:

- Enable—APC is enabled.
- Disable - Internal—APC has been automatically disabled for an internal cause.
- Disable - User—APC was disabled manually by a user.
- Not Applicable—The node is provisioned to Metro Access or Not DWDM, which do not support APC.

You can view the automatic power control information and disable and enable APC manually on the Maintenance > DWDM > APC subtab ([Figure 15-15](#)).

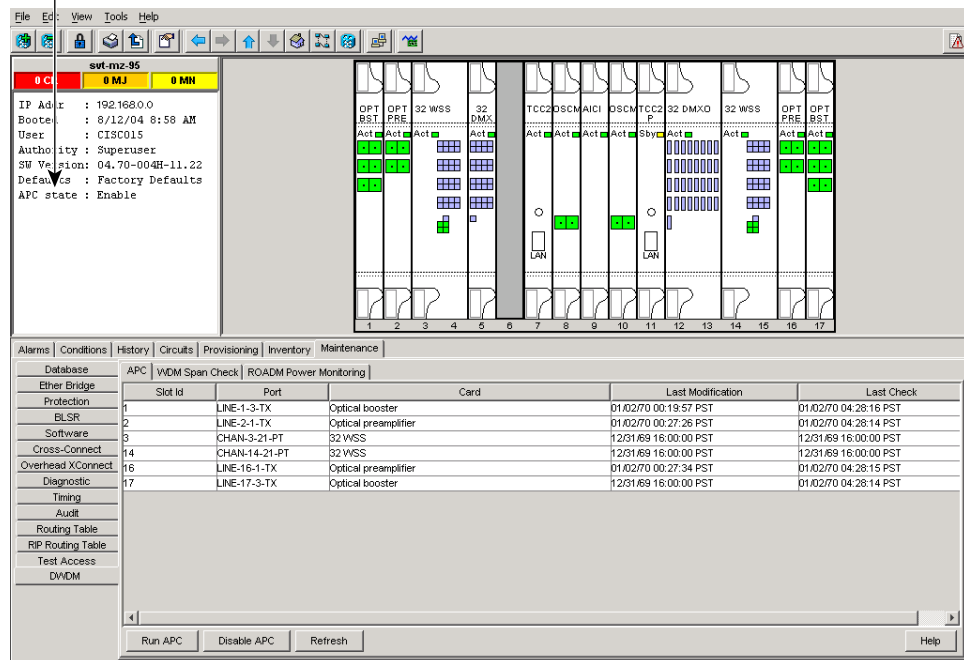


Caution

When APC is disabled, aging compensation is not applied and circuits cannot be activated. Do not disable APC unless it is required for specific maintenance or troubleshooting tasks. Always enable APC as soon as the tasks are completed.

Figure 15-15 Automatic Power Control

APC State



The APC subtab provides the following information:

- Slot ID—The ONS 15454 slot number for which APC information is shown.
- Port—The port number for which APC information is shown.
- Card—The card for which power control information is shown.
- Last Modification—Date and time APC last modified a setpoint for the parameters shown in [Table 15-1](#).
- Last Check—Date and time APC last verified the setpoints for the parameters shown in [Table 15-1](#).

Table 15-1 APC-Managed Parameters

Card	Port	Parameters
OPT-BST	LINE-3-TX	• Gain • Total Signal Output Power
OPT-PRE	LINE-1-TX	• Gain • Total Signal Output Power
AD-xB-xx.x	LINE-1-TX BAND-i-TX	VOA Target Attenuation
AD-1C-xx.x AD-2C-xx.x	LINE-1-TX	VOA Target Attenuation

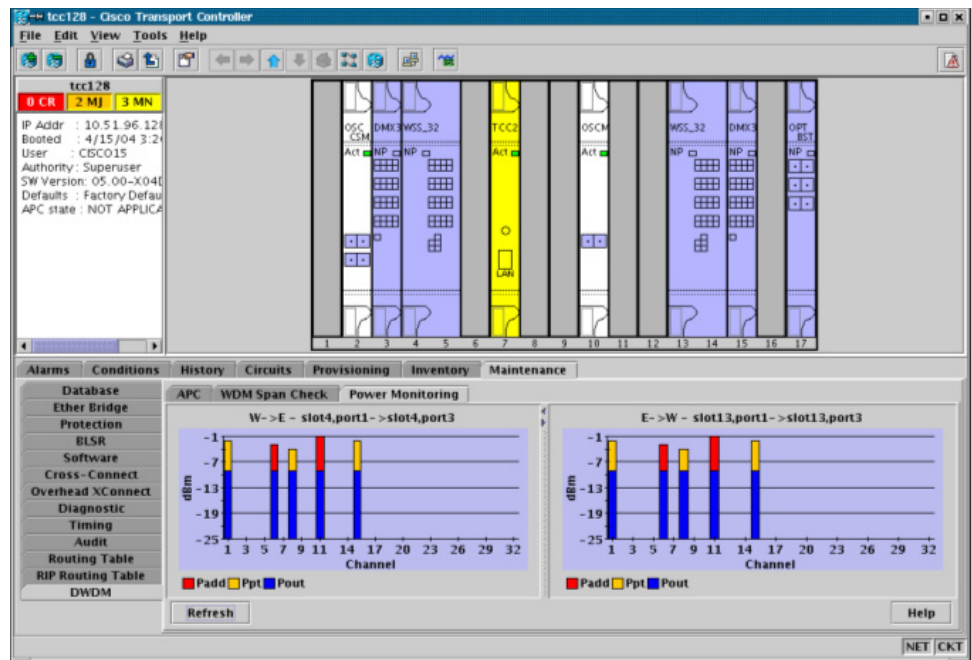
Table 15-1 APC-Managed Parameters (continued)

Card	Port	Parameters
AD-4C-xx.x	LINE-1-TX	VOA Target Attenuation
	CHAN-i-TX	
32-DMX	LINE-1-TX	VOA Target Attenuation

15.3 ROADM Power Equalization Monitoring

Reconfigurable OADM (ROADM) nodes allow you to monitor the 32WSS card equalization functions on the Maintenance > DWDM > Power Monitoring subtab (Figure 15-16). The tab shows the input channel power (Padd), the express or pass-through (Ppt) power and the power level at output (Pout).

Figure 15-16 Power Monitoring Subtab



15.4 Span Loss Verification

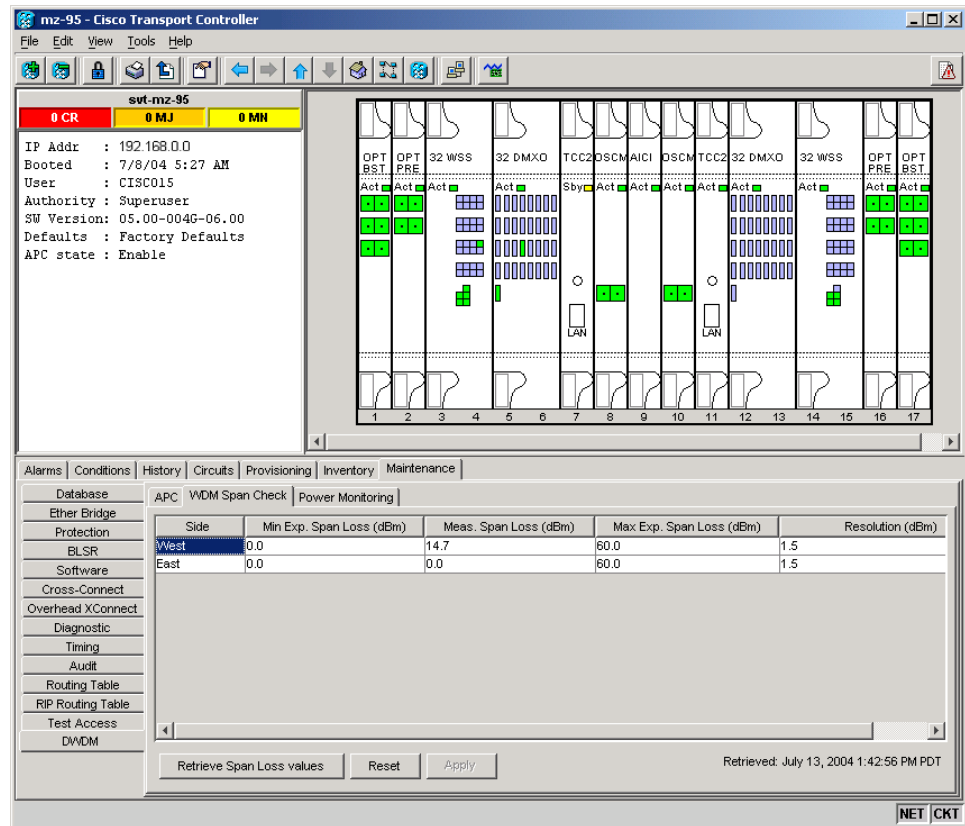
Span loss measurements can be performed from the Maintenance > DWDM > WDM Span Check subtab (Figure 15-17). The CTC span check compares the far-end OSC power with the near-end OSC power. A “Span Loss Out of Range” condition is raised when the measured span loss is higher than the maximum expected span loss. It is also raised when the measured span loss is lower than the minimum expected span loss and the difference between the minimum and maximum span loss values is greater than 1 dB. The minimum and maximum expected span loss values are calculated by Cisco MetroPlanner for the network and imported into CTC. However, you can manually change the minimum and expected span loss values.

CTC span loss measurements provide a quick span loss check and are useful whenever changes to the network occur, for example after you install equipment or repair a broken fiber. CTC span loss measurement resolutions are:

- +/- 1.5 dB for measured span losses between 0 and 25 dB
- +/- 2.5 dB for measured span losses between 25 and 38 dB

For ONS 15454 span loss measurements with higher resolutions, an optical time domain reflectometer (OTDR) must be used.

Figure 15-17 Span Loss Verification



15.5 Automatic Node Setup

Automatic node setup (ANS) is a TCC2 function that adjusts values of the VOAs on the DWDM channel paths to equalize the per-channel power at the amplifier input. This power equalization means that at launch, all the channels have the same amplifier power level, independent from the input signal on the client interface and independent from the path crossed by the signal inside the node. This equalization is needed for two reasons:

- Every path introduces a different penalty on the signal that crosses it.
- Client interfaces add their signal to the ONS 15454 DWDM ring with different power levels.

To support ANS, the integrated VOAs and photodiodes are provided in the following ONS 15454 DWDM cards:

- OADM band cards (AD-xB-xx.x) express and drop path
- OADM channel cards (AD-xC-xx.x) express and add path
- 4-Channel Terminal Multiplexer/Demultiplexer (4MD-xx.x) input port
- 32-Channel Terminal Multiplexer (32MUX-O) input port
- 32-Channel Wavelength Selective Switch (32WSS) input port
- 32-Channel Terminal Demultiplexer (32DMX-O and 32DMX) output port

Optical power is equalized by regulating the VOAs. Based on the expected per-channel power, ANS automatically calculates the VOA values by:

- Reconstructing the different channels paths
- Retrieving the path insertion loss (stored in each DWDM transmission element)

VOAs operate in one of three working modes:

- Automatic VOA Shutdown—In this mode, the VOA is set at maximum attenuation value. Automatic VOA shutdown mode is set when the channel is not provisioned to ensure system reliability in the event that power is accidentally inserted.
- Constant Attenuation Value—In this mode, the VOA is regulated to a constant attenuation independent from the value of the input signal. Constant attenuation value mode is set on the following VOAs:
 - OADM band card VOAs on express and drop paths (as operating mode)
 - OADM channel card VOAs during power insertion startup
 - The multiplexer/demultiplexer card VOAs during power insertion startup
- Constant Power Value—In this mode, the VOA values are automatically regulated to keep a constant output power when changes occur to the input power signal. This working condition is set on OADM channel card VOAs as “operating” and on 32MUX-O, 32WSS, 32DMX-O, and 32DMX card VOAs as “operating mode.”

In the normal operating mode, OADM band card VOAs are set to a constant attenuation, while OADM channel card VOAs are set to a constant power. ANS requires the following VOA provisioning parameters to be specified:

- Target attenuation (OADM band card VOA and OADM channel card startup)
- Target power (channel VOA)

To allow you to modify ANS values based on your DWDM deployment, provisioning parameters are divided into two contributions:

- Reference Contribution (read only)—Set by ANS.
- Calibration Contribution (read and write)—Set by user.

The ANS equalization algorithm requires the following knowledge of the DWDM transmission element layout:

- The order in which the DWDM elements are connected together on the express paths
- Channels that are dropped and added
- Channels or bands that have been configured as pass through

ANS assumes that every DWDM port has a line direction parameter that is either west to east (W-E) or east to west (E-W). ANS automatically configures the mandatory optical connections according to following main rules:

- Cards equipped in Slots 1 to 6 have a drop section facing west.
- Cards equipped in Slots 12 to 17 have a drop section facing east.
- Contiguous cards are cascaded on the express path.
- 4MD-xx.x and AD-xB-xx.x are always optically coupled.
- A 4MD-xx.x absence forces an optical pass-through connection.
- Transmit (Tx) ports are always connected to receive (Rx) ports.

Optical patch cords are passive devices that are not autodiscovered by ANS. However, optical patch cords are used to build the alarm correlation graph. From CTC or TL1 you can:

- Calculate the default connections on the NE.
- Retrieve the list of existing connections.
- Retrieve the list of free ports.
- Create new connections or modify existing ones.
- Launch ANS.

After you launch ANS, the following status are provided for each ANS parameter:

- Success - Changed—The parameter setpoint was recalculated successfully.
- Success - Unchanged—The parameter setpoint did not need recalculation.
- Not Applicable—The parameter setpoint does not apply to this node type.
- Fail - Out of Range—The calculated setpoint is outside the expected range.
- Fail - Port in IS State—The parameter could not be calculated because the port is in-service.

Optical connections are identified by the two termination points, each with an assigned slot and port. ANS checks that a new connection is feasible (according to embedded connection rules) and returns a denied message in the case of a violation.

ANS requires provisioning of the expected wavelength. When provisioning the expected wavelength, the following rules apply:

- The card name is generically characterized by the card family, and not the particular wavelengths supported (for example, AD-2C for all 2-channel OADMs).
- At the provisioning layer, you can provision a generic card for a specific slot using CTC or TL1.
- Wavelength assignment is done at the port level.
- An equipment mismatch alarm is raised when a mismatch between the identified and provisioned value occurs. The default value for the provisioned attribute is AUTO.

15.5.1 Automatic Node Setup Parameters

All ONS 15454 ANS parameters are calculated by Cisco MetroPlanner for nodes configured for metro core networks. (Parameters must be configured manually for metro access nodes.) Cisco MetroPlanner exports the calculated parameters to an ASCII file called “NE Update.” In CTC, you can import the NE Update file to automatically provision the node. [Table 15-2](#) shows ANS parameters arranged in east and west, transmit and receive groups.

Table 15-2 ANS Parameters

Direction	ANS Parameters
West Side - Receive	• West Side Rx Max Expected Span Loss • West Side Rx Min Expected Span Loss • West Side Rx Amplifier Working Mode • West Side Rx Amplifier Ch Power • West Side Rx Amplifier Gain • West Side Rx Amplifier Tilt • West Side OSC LOS Threshold • West Side Channel LOS Threshold • West Side Rx Amplifier Input Power Fail Th • West Side Add and Drop Stage Input Power • West Side Add and Drop Stage Drop Power • West Side Add and Drop Stage Band (i) Drop Power (i = 1..8) • West Side Add and Drop Stage Channel (i) Drop Power (i = 1..32)
East Side - Receive	• East Side Rx Max Expected Span Loss • East Side Rx Min Expected Span Loss • East Side Rx Amplifier Working Mode • East Side Rx Amplifier Ch Power • East Side Rx Amplifier Gain • East Side Rx Amplifier Tilt • East Side OSC LOS Threshold • East Side Channel LOS Threshold • East Side Rx Amplifier Input Power Fail Th • East Side Add and Drop Stage Input Power • East Side Add and Drop Stage Drop Power • East Side Add and Drop Stage Band (i) Drop Power (i = 1..8) • East Side Add and Drop Stage Channel (i) Drop Power (i = 1..32)

Table 15-2 ANS Parameters (continued)

Direction	ANS Parameters
West Side - Transmit	• West Side Tx Amplifier Working Mode • West Side Tx Amplifier Ch Power • West Side Tx Amplifier Gain • West Side Tx Amplifier Tilt • West Side Fiber Stage Input Threshold • West Side Add and Drop Stage Output Power • West Side Add and Drop Stage By-Pass Power
East Side - Transmit	• East Side Tx Amplifier Working Mode • East Side Tx Amplifier Ch Power • East Side Tx Amplifier Gain • East Side Tx Amplifier Tilt • East Side Fiber Stage Input Threshold • East Side Add and Drop Stage Output Power • East Side Add and Drop Stage By-Pass Power

15.5.2 Viewing and Provisioning ANS Parameters

All ANS parameters can be viewed and provisioned from the node view Provisioning > WDM-ANS > Provisioning subtab, shown in [Figure 15-18](#). The WDM-ANS > Provisioning > Provisioning subtab presents the parameters in the following tree view:

root

+/- East

- +/- Receiving
 - +/- Amplifier
 - +/- Power
 - +/- Threshold
- +/- Transmitting
 - +/- Amplifier
 - +/- Power
 - +/- Threshold

+/- West

- +/- Receiving
 - +/- Amplifier
 - +/- Power
 - +/- Threshold
- +/- Transmitting

15.5.2 Viewing and Provisioning ANS Parameters

- +/- Amplifier
- +/- Power
- +/- Threshold

Figure 15-18 WDM-ANS Provisioning

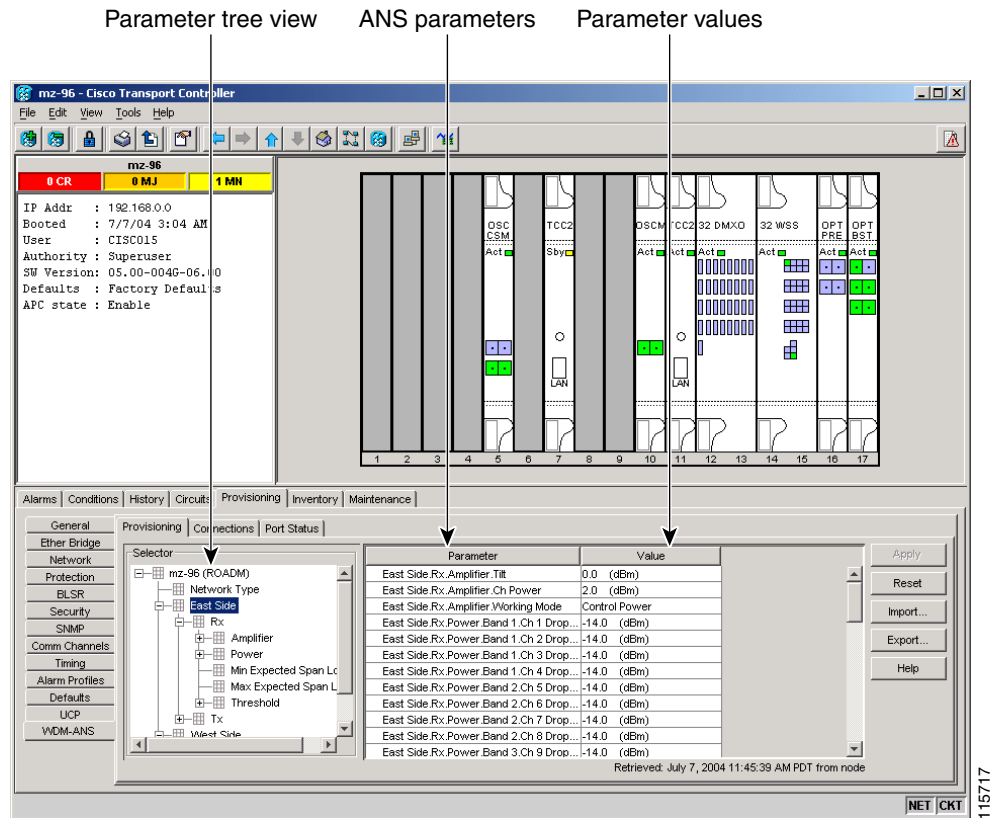


Table 15-3 shows the parameter IDs based on platform, line-direction, and functional group.

Table 15-3 ANS-WDM > Provisioning Subtab Parameters

Tree Element	Parameters
root	Network Type (dwdm)
root +/- East +/- Receiving	East Side Rx Max Expected Span Loss East Side Rx Min Expected Span Loss
root +/- East +/- Receiving +/- Amplifier	East Side Rx Amplifier Working Mode East Side Rx Amplifier Ch Power East Side Rx Amplifier Gain East Side Rx Amplifier Tilt

Table 15-3 ANS-WDM > Provisioning Subtab Parameters (continued)

Tree Element	Parameters
root +/- East +/- Receiving +/- Power	East Side Add and Drop Input Power East Side Add and Drop Drop Power East Side Band n Drop Power (n = 1-8) East Side Channel n Drop Power East (n = 1-32)
root +/- East +/- Receiving +/- Thresholds	East Side OSC LOS Threshold East Side Channel LOS Threshold East Side Rx Amplifier In Power Fail Th
root +/- East +/- Transmitting +/- Amplifier	East Side Tx Amplifier Working Mode East Side Tx Amplifier Ch Power East Side Tx Amplifier Gain East Side Tx Amplifier Tilt
root +/- East +/- Transmitting +/- Power	East Side Add and Drop Output Power East Side Add and Drop By-Pass Power
root +/- East +/- Transmitting +/- Thresholds	East Side Fiber Stage Input Threshold
root +/- West +/- Receiving	West Side Rx Max Expected Span Loss West Side Rx Min Expected Span Loss
root +/- West +/- Receiving +/- Amplifier	West Side Rx Amplifier Working Mode West Side Rx Amplifier Ch Power West Side Rx Amplifier Gain West Side Rx Amplifier Tilt
root +/- West +/- Receiving +/- Power	West Side Add and Drop Input Power West Side Add and Drop Drop Power West Side Band n Drop Power (n = 1-8) West Side Channel n Drop Power (n = 1-32)
root +/- West +/- Receiving +/- Thresholds	West Side OSC LOS Threshold West Side Channel LOS Threshold West Side Rx Amplifier In Power Fail Th
root +/- West +/- Transmitting +/- Amplifier	West Side Tx Amplifier Working Mode West Side Tx Amplifier Ch Power West Side Tx Amplifier Gain West Side Tx Amplifier Tilt
root +/- East +/- Transmitting +/- Power	West Side Add and Drop Output Power West Side Add and Drop By-Pass Power
root +/- West +/- Transmitting +/- Thresholds	West Side Fiber Stage Input Threshold

The ANS parameters that appear in the WDM-ANS > Provisioning subtab depend on the node type. [Table 15-4](#) shows the DWDM node types and their ANS parameters.

Table 15-4 ANS Parameters By Node Type

Node Type	Parameter Group	Parameters
Hub	Network	Network Type
	Span Loss	East and West Expected Span Loss
	Amplifier Tx	East and West Side Transmit Amplifier Working Mode East and West Side Transmit Amplifier Channel Power East and West Side Transmit Amplifier Gain East and West Side Transmit Amplifier Tilt
	Amplifier Rx	East and West Side Receive Amplifier Working Mode East and West Side Receive Amplifier Channel Power East and West Side Receive Amplifier Gain East and West Side Receive Amplifier Tilt
	Thresholds Tx	East and West Side Fiber Stage Input Threshold
	Thresholds Rx	East and West Side Osc Los Threshold East and West Side Channel Los Threshold East and West Side Receive Amplifier Input Power Fail
	Power	East and West Side Add and Drop Input Power East and West Side Add and Drop Output Power East and West Side Add and Drop By-Pass Power East and West Side Channel (n) Drop Power

Table 15-4 ANS Parameters By Node Type (continued)

Node Type	Parameter Group	Parameters
Terminal	Network	Network Type
	Span Loss	East or West Expected Span Loss
	Amplifier Tx	East or West Side Transmit Amplifier Working Mode East or West Side Transmit Amplifier Channel Power East or West Side Transmit Amplifier Gain East or West Side Transmit Amplifier Tilt
	Amplifier Rx	East or West Side Receive Amplifier Working Mode East or West Side Receive Amplifier Channel Power East or West Side Receive Amplifier Gain East or West Side Receive Amplifier Tilt
	Thresholds Tx	East or West Side Fiber Stage Input Threshold
	Thresholds Rx	East or West Side Osc Los Threshold East or West Side Channel Los Threshold East or West Side Receive Amplifier Input Power Fail
	Power	East or West Side Add and Drop Input Power East or West Side Add and Drop Output Power East or West Side Channel (n) Drop Power (n = 1-32)
Flexible Channel Count Terminal	Network	Network Type
	Span Loss	East and West Expected Span Loss
	Amplifier Tx	East and West Side Transmit Amplifier Working Mode East and West Side Transmit Amplifier Channel Power East and West Side Transmit Amplifier Gain East and West Side Transmit Amplifier Tilt
	Amplifier Rx	East and West Side Receive Amplifier Working Mode East and West Side Receive Amplifier Channel Power East and West Side Receive Amplifier Gain East and West Side Receive Amplifier Tilt
	Thresholds Tx	East and West Side Fiber Stage Input Threshold
	Thresholds Rx	East and West Side Osc Los Threshold East and West Side Channel Los Threshold East and West Side Receive Amplifier Input Power Fail
	Power	East and West Side Add and Drop Input Power East and West Side Add and Drop Output Power East and West Side Band (n) Drop Power (n = 1-8)

Table 15-4 ANS Parameters By Node Type (continued)

Node Type	Parameter Group	Parameters
OADM	Network	Network Type
	Span Loss	East and West Expected Span Loss
	Amplifier Tx	East and West Side Transmit Amplifier Working Mode East and West Side Transmit Amplifier Channel Power East and West Side Transmit Amplifier Gain East and West Side Transmit Amplifier Tilt
	Amplifier Rx	East and West Side Receive Amplifier Working Mode East and West Side Receive Amplifier Channel Power East and West Side Receive Amplifier Gain East and West Side Receive Amplifier Tilt
	Thresholds Tx	East and West Side Fiber Stage Input Threshold
	Thresholds Rx	East and West Side Osc Los Threshold East and West Side Channel Los Threshold East and West Side Receive Amplifier Input Power Fail
	Power	East and West Side Add and Drop Input Power East and West Side Add and Drop Output Power East and West Side Band (n) Drop Power (n = 1-8)
Line Amplifier	Network	Network Type
	Span Loss	East and West Expected Span Loss
	Amplifier Tx	East and West Side Transmit Amplifier Working Mode East and West Side Transmit Amplifier Channel Power East and West Side Transmit Amplifier Gain East and West Side Transmit Amplifier Tilt
	Amplifier Rx	East and West Side Receive Amplifier Working Mode East and West Side Receive Amplifier Channel Power East and West Side Receive Amplifier Gain East and West Side Receive Amplifier Tilt
	Thresholds Tx	East and West Side Fiber Stage Input Threshold
	Thresholds Rx	East and West Side Osc Los Threshold East and West Side Channel Los Threshold East and West Side Receive Amplifier Input Power Fail

Table 15-4 ANS Parameters By Node Type (continued)

Node Type	Parameter Group	Parameters
ROADM	Network	Network Type
	Span Loss	East and West Expected Span Loss
	Amplifier Tx	East and West Side Transmit Amplifier Working Mode East and West Side Transmit Amplifier Channel Power East and West Side Transmit Amplifier Gain East and West Side Transmit Amplifier Tilt
	Amplifier Rx	East and West Side Receive Amplifier Working Mode East and West Side Receive Amplifier Channel Power East and West Side Receive Amplifier Gain East and West Side Receive Amplifier Tilt
	Thresholds Tx	East and West Side Fiber Stage Input Threshold
	Thresholds Rx	East and West Side Osc Los Threshold East and West Side Channel Los Threshold East and West Side Receive Amplifier Input Power Fail
	Power	East and West Side Add and Drop Input Power (if 32DMX East/West is installed) East and West Side Add and Drop Output Power East and West Side Add and Drop Drop Power (if 32DMX East/West is installed) East and West Side Channel (n) Drop Power (if 32DMX-O East/West is installed)

Table 15-5 shows the following information for all ONS 15454 ANS parameters:

- Min—Minimum value in decibels.
- Max—Maximum value in decibels.
- Def—Default value in decibels. Other defaults include MC (metro core), CG (control gain), U (unknown).
- Group—Group(s) to which the parameter belongs: ES (east side), WS (west side), Rx (receive), Tx (transmit), Amp (amplifier), P (power), DB (drop band), DC (drop channel), A (attenuation), Th (threshold).
- Network Type—Parameter network type: MC (metro core), MA (metro access), ND (not DWDM)
- Optical Type—Parameter optical type: TS (32 channel terminal), FC (flexible channel count terminal), O (OADM), H (hub), LS (line amplifier), R (ROADM), U (unknown)

Table 15-5 ANS Parameters Summary

General Name	Min	Max	Def	Group	Network Type	Optical Type
Network Type	—	—	MC	Root	MC, MA, ND	U, TS, FC, O, H, LS, R
West Side Rx Max Expected Span Loss	0	60	60	WS, Rx	MC, MA	TS, FC, O, H, LS, R

Table 15-5 ANS Parameters Summary (continued)

General Name	Min	Max	Def	Group	Network Type	Optical Type
East Side Rx Max Expected Span Loss	0	60	60	ES, Rx	MC, MA	TS, FC, O, H, LS, R
West Side Rx Min Expected Span Loss	0	60	60	WS, Rx	MC, MA	TS, FC, O, H, LS, R
East Side Rx Min Expected Span Loss	0	60	60	ES, Rx	MC, MA	TS, FC, O, H, LS, R
West Side Tx Amplifier Working Mode	–	–	CG	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
East Side Tx Amplifier Working Mode	–	–	CG	ES, Rx	MC, MA	TS, FC, O, H, LS, R
West Side Rx Amplifier Working Mode	–	–	CG	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
East Side Rx Amplifier Working Mode	–	–	CG	ES, Rx	MC, MA	TS, FC, O, H, LS, R
West Side Tx Amplifier Ch Power	–10	17	2	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
East Side Tx Amplifier Ch Power	–10	17	2	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
West Side Rx Amplifier Ch Power	–10	17	2	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
East Side Rx Amplifier Ch Power	–10	17	2	WS, Tx, Amp	MC, MA, ND	TS, FC, O, H, LS, R
West Side Tx Amplifier Gain	0	30	0	WS, Tx, Amp	MA	TS, FC, O, H, LS, R
East Side Tx Amplifier Gain	0	30	0	WS, Tx, Amp	MA	TS, FC, O, H, LS, R
West Side Rx Amplifier Gain	0	30	0	WS, Tx, Amp	MA	TS, FC, O, H, LS, R
East Side Rx Amplifier Gain	0	30	0	WS, Tx, Amp	MA	TS, FC, O, H, LS, R
West Side Tx Amplifier Tilt	0	30	0	WS, Tx, Amp	MC, MA	TS, FC, O, H, LS, R
East Side Tx Amplifier Tilt	0	30	0	WS, Tx, Amp	MC, MA	TS, FC, O, H, LS, R
West Side Rx Amplifier Tilt	0	30	0	WS, Rx, Amp	MC, MA	TS, FC, O, H, LS, R
East Side Rx Amplifier Tilt	0	30	0	WS, Rx, Amp	MC, MA	TS, FC, O, H, LS, R
West Side OSC LOS Threshold	–50	30	U	WS, Rx, Th	MC, MA	TS, FC, O, H, LS, R
East Side OSC LOS Threshold	–50	30	U	WS, Rx, Th	MC, MA	TS, FC, O, H, LS, R
West Side Channel LOS Threshold	–50	30	U	WS, Rx, Th	MC, MA	TS, FC, O, H, LS, R
East Side Channel LOS Threshold	–50	30	U	ES, Rx, Th	MC, MA, ND	TS, FC, O, H, LS, R
West Side Fiber State Input Threshold	–50	30	U	WS, Tx, Th	MC, MA, ND	TS, FC, O, H, LS, R
East Side Fiber State Input Threshold	–50	30	U	ES, Tx, Th	MC, MA, ND	TS, FC, O, H, LS, R
West Side Add and Drop Output Power	–50	30	–14	WS, Tx, P	MC	TS, FC, O, H, R
East Side Add and Drop Output Power	–50	30	–14	ES, Tx, P	MC	TS, FC, O, H, R
West Side Add and Drop Input Power	–50	30	–14	WS, Rx, P	MC	TS, FC, O, H, R
East Side Add and Drop Input Power	–50	30	–14	ES, Rx, P	MC	TS, FC, O, H, R
West Side Add and Drop By-Pass Power	–50	30	–14	WS, Tx, P	MC	H
East Side Add and Drop By-Pass Power	–50	30	–14	ES, Tx, P	MC	H
West Side Add and Drop Drop Power	–50	30	–14	WS, Tx, P	MC	R
East Side Add and Drop Drop Power	–50	30	–14	ES, Tx, P	MC	R
West Side Band 1...8 Drop Power	–50	30	–14	WS, Rx, P, DB	MC	FC, O
East Side Band 1...8 Drop Power	–50	30	–14	ES, Rx, P, DB	MC	FC, O

Table 15-5 ANS Parameters Summary (continued)

General Name	Min	Max	Def	Group	Network Type	Optical Type
West Side Channel 1...32 Drop Power	-50	30	-14	WS, Rx, P, DC, B1	MC, MA	TS, H, R
East Side Channel 1...32 Drop Power	-50	30	-14	ES, Rx, P, DC, B1	MC, MA	TS, H, R

