Provision Reconfigurable Optical Add/Drop Cards

This chapter describes the Reconfigurable Optical Add or Drop (ROADM) cards used in Cisco NCS 2000 SVO and its related tasks.

The following table lists the package support for the reconfigurable optical add/drop cards.

Card	SSON Package (12.xx-xxxx-xx.xx-S-SPA)	MSTP Package (12.xx-xxxx-xx.xx-L-SPA)
9-SMR17FS	✓	
9-SMR24FS	✓	
9-SMR34FS	✓	
20-SMRFS	✓	
20-SMRFS-CV	✓	
80-WXC-C		✓
40-SMR1-C		✓
40-SMR2-C		✓

9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV Cards

In this chapter, "9-SMRFS" refers to the 9-SMR17FS, 9-SMR24FS, and 9-SMR34FS cards. "20-SMRFS" refers to the NCS2K-20-SMRFS card. "20-SMRFS-CV" refers to the NCS2K-20-SMRFS-CV card.

The 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards are tunable over 96 channels in the C-band, at 50-GHz spacing on the ITU-T grid. The cards provide the flex spectrum capability, which gives the flexibility to allocate channel bandwidth, to increase the network scalability. With flex capability, the channel bandwidth is not fixed, but can be defined arbitrarily, with a specified granularity and within a given range. For each subrange, attenuation and power values are defined. The central frequency ranges from 191350 GHz (1566 .72 nm) to 196100 GHz (1528.77 nm).

The 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards are single-slot cards that integrate two cross-connect blocks (multiplexer and demultiplexer), a variable gain EDFA pre-amplifier, and a variable gain EDFA booster amplifier. The 9-SMR17FS, 9-SMR24FS, and 9-SMR34FS, cards support up to 9 directions for each ROADM node. The 20-SMRFS and 20-SMRFS-CV cards support up to 20 directions for each ROADM node. The cards can be installed in any service slot in the Cisco NCS 2000 Series chassis. The cards can be used in point-to-point, ring, multi-ring, or mesh topologies.

The 20-SMRFS-CV card has a dedicated laser source at the demultiplexer section, and a photodiode at the multiplexer section. The 20-SMRFS-CV card provides the connection verification capability using a connectivity check signal. The correctness and the quality of the interconnections determined by measuring the insertion loss of the external passive path can be validated with the connection verification feature. For more information about connection verification, see the Connection Verification and Verify Connections in Optical Cables sections.

Note   When the user pre-provisions the 20-SMRFS-CV card in the SVO web interface and inserts the 20-SMRFS card physically and conversely, the system automatically updates with the card that is physically inserted.

The EDFA pre-amplifiers in 20-SMRFS and 20-SMRFS-CV cards have switchable gain ranges. The following table describes the gain ranges and extended gain ranges of an EDFA pre-amplifier in the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards.

Table 1: Gain Ranges and Extended Gain Ranges of EDFA Pre-Amplifier

Card	Gain Range	Extended Gain Range
9-SMR17FS	0–17 dB with controlled tilt	20 dB with uncontrolled tilt
9-SMR24FS	12–24 dB with controlled tilt	27 dB with uncontrolled tilt
9-SMR34FS	20–34 dB with controlled tilt	40 dB with uncontrolled tilt
20-SMRFS and 20-SMRFS-CV	Gain Range 1: 0–17 dB with controlled tilt	20 dB with uncontrolled tilt
	Gain Range 2: 12–24 dB with controlled tilt	35 dB with uncontrolled tilt

For more information, such as the block diagrams and the card specifications of the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards, see the data sheet.

20-SMRFS and 20-SMRFS-CV Ports

The 20-SMRFS and 20-SMRFS-CV cards have these ports:

- [EXP 1–8]-1...8-TX, [EXP 9–16]-1...8-TX and [EXP 17–20]-1...4-TX ports send the split-off optical signal that contains pass-through channels to the other side of the NE.

- [EXP 1–8]-1...8-RX, [EXP 9–16]-1...8-RX and [EXP 17–20]-1...4-RX port receive the optical signal from the pass-through channels.

- OSC-TX—The OSC-TX port transmits the Optical Service Channel signal that is received from the LINE-RX port signal to the controller card, separating it from the C-Band signals.

- OSC-RX—The OSC-RX port receives Optical Service Channel signal from the Controller Card and transmits it to the LINE-TX port.

- COM-TX—The COM TX port transmits the combined power from all directions or add or drop ports toward the booster amplifier.

- COM-RX—The COM RX port receives the optical signal from the pre-amplifier and sends it to the optical cross connect.

Note The COM-TX and COM-RX ports are not physical ports on the faceplate.

- LINE-TX—This port sends the optical signal from the local node to the far end node.

- LINE-RX—This port receives the optical signal from the far end node.

9-SMR-FS Ports

The 9-SMR-FS card has these ports:

- The nine EXP-TX ports send the optical signal to the other side of the NE based on the configuration of the internal WXC module.

- The nine EXP-RX ports receive the optical signal from the pass-through channels.

- OSC-TX—The OSC-TX port transmits the Service Channel signal that is received from the LINE-RX port signal, separating it from the C-Band signals.

- OSC-RX—The OSC-RX port receives signal from the Service Channel module and transmits it to the LINE-TX port.

- COM-TX—The COM TX port transmits the combined power from all the directions or add drop ports toward the amplifier.

- COM-RX—The COM RX port receives the optical signal from the pre-amplifier and sends it to the optical cross connect.

| Note | The COM-TX and COM-RX ports are not physical ports on the faceplate. |

- LINE-TX—The booster amplifier amplifies the composite signal coming from WXC-MUX toward the LINE-TX port.

- LINE-RX—The pre-amplifier amplifies the composite signal coming from the LINE-RX port toward the WXC-DMX input.

Key Features

The multiplexer section of the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards provide the following features:

- Selection of any arbitrary wavelength range from any EXP-RX*i* ports and routing to the MUX output port.

- Automatic VOA shutdown (AVS) blocking state on each wavelength on the MUX output port.

- Per-channel (closed loop) power regulation on the MUX output port based on OCM block feedback.

- Per-channel (open loop) attenuation regulation on the MUX output port, which is not based on the OCM feedback.

- Amplification of the aggregated C-Band signal toward the LINE-TX port by the variable gain booster EDFA amplifier.

- Combination of C-Band signals with 1510 nm by OSC MUX filter.

- Detection of the connectivity check signal, of wavelength 97 nm, by an embedded photodiode.

The demultiplexer section of the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards provide the following features:

- Selection of any arbitrary wavelength range and routing to any EXP-TX*i* port.

- AVS blocking state on each wavelength, on any of the EXP-TX*i* ports.

- Per-channel (closed loop) power regulation on the EXP-TX*i* output port based on OCM block feedback.

- Per-channel (open loop) attenuation regulation on the EXP-TX*i* output port, which is not based on the OCM feedback.

- Amplification of the C-Band signals entering the LINE-RX port by the pre-amplifier.

- Separation of C-Band signals from 1510 nm by OSC De-MUX filter.

- Generation and transmission of the connectivity check signal into the DE-MUX input port.

80-WXC-C Card

Table 2: Feature History

Feature Name	Release Information	Description
80-WXC-C Card	Cisco NCS 2000 Release 12.2	The double-slot 80-channel Wavelength Cross-Connect C-band (80-WXC-C) card manages up to 80 ITU-T 50-GHz-spaced channels that are identified in the channel plan and sends them to dedicated output ports. Each channel can be selected from any input or output port. The card is an active ROADM module, and provides bidirectional capability. The 80-WXC-C card can be installed in NCS 2006 and NCS 2015 chassis.

The card is optimized for Degree-2 and Degree-N reconfigurable nodes.

The 80-WXC-C card provides the following functionalities:

- When used in the bidirectional mode, the 80-WXC-C card allows selection of a single wavelength or any combination of wavelengths from any of the nine input ports to the common output port.

- When used in the bidirectional mode, the output wavelength from the COM-RX port is split to manage the express and drop wavelengths.

- Automatic VOA shutdown (AVS) blocking state on each wavelength and port.

- Per-channel (closed loop) power regulation on the output port based on OCM block feedback.

- Per-channel (open loop) attenuation regulation on the output port which is not based on the OCM feedback.

For more information, such as the block diagrams and the card specifications, see 80-Channel Wavelength Cross-Connect Card and data sheet.

40-SMR1-C and 40-SMR2-C Cards

Table 3: Feature History

Feature Name	Release Information	Description
40-SMR1-C or 40-SMR2-C Cards	Cisco NCS 2000 Release 12.3	The 40-channel single-module ROADM with integrated optical pre-amplifier (40-SMR1-C) combines the OSC add/drop filter, a pre-amplifier, and a 2x1 wavelength selective switch (WSS)-based ROADM core into a single-slot unit. This unit is optimized for Degree-2 reconfigurable nodes. The 40-channel single-module ROADM with integrated optical pre-amplifier and boost amplifier (40-SMR2-C) includes the OSC add/drop filter, pre- and boost amplifiers, and a 4x1 WSS-based ROADM core. This unit provides an effective way to support multi-degree nodes up to Degree-4, allowing in-service upgrade from Degree-2 up to Degree-4 at a very competitive price point. Both cards optimize and increase the MSTP's throughput density.

"40-SMR1-C" refers to the _15454-40-SMR1-C card and "40-SMR2-C" refers to the _15454-40-SMR2-C card.

The 40-SMR1-C or 40-SMR2-C cards integrate the following functional blocks onto a single line card:

- Optical preamplifier
- Optical booster amplifier
- Optical service channel (OSC) filter
- 2x1 wavelength cross-connect (WXC) or a 4x1 WXC
- Optical channel monitor (OCM)

Key Features

The optical amplifier units in the cards provide the following features:

- Embedded gain flattening filter

- Mid-stage access for dispersion compensation unit (only applicable for preamplifier erbium-doped fiber amplifier [EDFA])

- Fixed output power mode

- Fixed gain mode

- Nondistorting low-frequency transfer function

- Amplified spontaneous emissions (ASE) compensation in fixed gain and fixed output power mode

- Fast transient suppression

- Programmable tilt (only applicable for preamplifier EDFA)

- Full monitoring and alarm handling capability

- Optical safety support through signal loss detection and alarm at any input port, fast power down control, and reduced maximum output power in safe power mode.

- EDFA section calculates the signal power, by taking into account the expected ASE power contribution to the total output power. The signal output power or the signal gain can be used as feedback signals for the EDFA pump power control loop.

The 40-SMR1-C card includes a 100GHz 1x2 WXC unit with integrated preamplifier unit (single EDFA). The card provides the following features:

- Selection of individual wavelength of the aggregated 100GHz signal from either the EXP-RX or ADD-RX ports

- Automatic VOA shutdown (AVS) blocking state on each wavelength and port

- Per-channel power regulation based on external OCM unit

- Open loop path attenuation control for each wavelength and port

The 40-SMR2-C card includes a 100GHz 1x4 WXC unit with integrated preamplifier and booster amplifier units (double EDFA). The card provides the following features:

- Selection of individual wavelength of the aggregated 100GHz signal from either the EXPi-RX (where i = 1, 2, 3) or ADD-RX ports

- Automatic VOA shutdown (AVS) blocking state on each wavelength and port

- Per-channel power regulation based on external OCM unit

- Open loop path attenuation control for each wavelength and port

The OCM unit provides per channel optical power monitoring at EXP-RX, ADD-RX, DROP-TX, and LINE-TX ports.

You can install the 40-SMR1-C or 40-SMR2-C card in any service slot in the Cisco NCS 2006 and NCS 2015 chassis.

For more information about the 40-SMR1-C or 40-SMR2-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-578552.html.

Change Optical Amplifier Settings

Use this task to change the optical amplifier settings of cards.

Before you begin

- Log into the SVO Web Interface
- Open the Card View

Procedure

Step 1 Click the **Provisioning** > **Amplifier** tabs.

Step 2 Modify the settings described in the following table. The provisionable parameters are listed in the Options column in the table.

Table 4: Amplifier Options

Parameter	Description	Options
Port	(Display only) Displays the port number, port type, and direction (TX or RX).	—
Total Output Power (dBm)	(Display only) Shows the current power level per port.	—
Output Power Setpoint (dBm)	(Display only) Shows the current output power leaving the amplifier.	—
Working Mode	Sets the working mode.	The available options are: • Channel Power • Total Power • Optimized • Fixed Gain • Start and Hold
Role	Sets the role of the amplifier.	The available options are: • Preamplifier • Booster
Actual Gain (dB)	(Display only) The actual gain of the amplifiers.	—

Parameter	Description	Options
Target Gain (dB)	(Display only) The target gain of the amplifiers.	—
Tilt Setpoint (dB)	Target output tilt requested by the user.	-5 to 5
PSD Setpoint (dBm/GHz)	Power Spectral Density. Sets the PSD setpoint. Target output power requested by the user for each circuit.	-50 to 1
PSD Optimized (dBm/GHz)	Optimized PSD	—
Gain Setpoint (dB)	The value of the gain that the amplifier must achieve.	Display only or numeric depending on mode setting. When the system is configured as metro core, this field is display only. When the system is configured as metro access, this field can be changed by the user.
Gain Range	Sets the gain range of the amplifier.	• Gain Range 1 • Gain Range 2 • No Gain Range
Power Degrade Threshold High (dBm/GHz)	(Display only) Shows the current value of the optical power degrade high threshold configured in the card. This threshold applies only when the amplifier is active and in constant power mode. Power Degrade High refers to the port's Signal Output Power value and is automatically calculated by the control card when the amplifier is turned up.	—
Power Degrade Threshold Low (dBm/GHz)	(Display only) Shows the current value of the optical power degrade low threshold configured in the card. This threshold applies only when the amplifier is active and in constant power mode. Power Degrade Low refers to the Signal Output Power value of the port and is automatically calculated by the control card when the amplifier is turned up.	—

Parameter	Description	Options
Gain Degrade High (dB)	(Display only) Shows the current value of the gain degrade high threshold configured in the card. This threshold applies only when the amplifier is active and in constant gain mode. Gain Degrade High refers to the Gain value of the port and is automatically calculated by the control card when the amplifier is turned up.	—
Gain Degrade Low (dB)	(Display only) Shows the current value of the gain degrade low threshold configured in the card. This threshold applies only when the amplifier is active and in constant gain mode. Gain Degrade Low refers to the Gain value of the port and is automatically calculated by the control card when the amplifier is turned up.	—

Step 3   Click **Apply** to save the changes.

Provision Interface Parameters

Use this task to change the optical interface parameters of cards.

Before you begin

- Log into the SVO Web Interface

- Open the Card View

Procedure

Step 1   Click the **Provisioning** > **Interface** tabs.

Step 2   Modify the settings described in the following table. The provisionable parameters are listed in the Options column in the table.

Table 5: Interface Options

Parameter	Description	Options
Port	(Display only) Displays the port number, port type, and direction (RX or TX)	All the RX and TX ports
Admin State	(Display only) Displays the administrative state of the port.	From the drop-down list, choose one of the following: • Unlocked (ETSI)/ IS (ANSI) • Locked, disabled (ETSI)/OOS, DSBLD (ANSI) • Locked, maintenance (ETSI)/OOS, MT (ANSI) • Unlocked, automaticInService (ETSI)/ IS, AINS (ANSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State.	• IS-NR/ Unlocked-enabled • OOS-AU,AINS/ Unlocked-disabled, automaticInService • OOS-MA,DSBLD/ Locked-enabled,disabled • OOS-MA,MT/ Locked-enabled,maintenance
Optical Power (dBm)	Displays the optical power for each port.	—
OSC Power (dBm)	(Display only) Displays the service channel power level for each port.	—
Optical PSD Setpoint (dBm/GHz)	Target output PSD requested by the user.	-50 to 10
Attenuator Value (dB)	Sets the attenuator value.	—
Optical Power Threshold Low (dBm)	Fail low threshold used to detect the LOS alarm on the port.	—
OSC Power Threshold Low (dBm)	(Display only) Shows the OSC power level for each port.	— **Note** This is not supported on the 16-AD-CCOFS card.

Parameter	Description	Options
Current Power Degrade High (dBm)	(Display only) Shows the current value of the optical power degrade high threshold configured in the card. Power Degrade High refers to the Signal Output Power value of the port and is automatically calculated by the control card.	—
Current Power Degrade Low (dBm)	(Display only) Shows the current value of the optical power degrade low threshold configured in the card. Power Degrade Low refers to the Signal Output Power value of the port and is automatically calculated by the control card.	—
Current Power Failure Low (dBm)	(Display only) Shows the optical power failure low threshold for the port.	—
VOA Attenuation Setpoint (dB)	(Only for 80-WXC-C, 40-SMR1-C, and 40-SMR2-C cards) Sets the VOA attenuation value	0 to 25
VOA Attenuation Offset (dB)	(Only for 80-WXC-C, 40-SMR1-C, and 40-SMR2-C cards) Sets the offset with respect to the set setpoint	—
VOA Current Attenuation (dB)	(Only for 80-WXC-C, 40-SMR1-C, and 40-SMR2-C cards) (Display only) Shows the VOA current attenuation	—

Step 3   Click **Apply** to save the changes.

Provision Thresholds for TCA alarms

Use this task to change the thresholds for TCA alarms raised on cards.

Before you begin

- Log into the SVO Web Interface

• Open the Card View

Procedure

Step 1	Click the **Provisioning** > **Optics Thresholds** tabs.
Step 2	Choose the type of threshold that you want to change, 15 Min or 1 Day.
Step 3	Modify the settings described in the following table. The provisionable parameters are listed in the Options column in the table.

Table 6: Threshold Options

Parameter	Description	Options
Interface Name	(Display only) Displays the port number, port type, and direction (RX or TX)	All the TX and RX ports
PM Type	Type of interface	opticalPowerPMTh
Low	Sets the low power warning level.	Numeric. The default is -50 dBm. Double-click the parameter, enter a value, and press Enter.
High	Sets the high power warning level.	Numeric. The default is 30 dBm. Double-click the parameter, enter a value, and press Enter.

Step 4	Click **Apply** to save the changes.

Provision Optical Safety

Use this task to provision the optical safety parameters for cards.

Before you begin

• Log into the SVO Web Interface

• Open the Card View

Procedure

Step 1	Click the **Maintenance** > **Optical Safety** tabs.
Step 2	Modify required settings described in the following table:

Table 7: Optical Safety Parameters for Cards

Parameter	Description	Options
Interface	(Display only) Displays the port name, port type, and direction.	—
Supported Safety	(Display only) Displays the supported safety mechanism.	• ALS for line cards and control cards. • ALS-OSRI for amplifier cards.
ALS Mode	Automatic laser shutdown mode. The ALS mode is disabled for RX ALS interfaces.	From the drop-down list, choose one of the following: • ALS-Disabled—Deactivates ALS. • Automatic Restart—(Default) ALS is active. The power is automatically shut down when needed, and it automatically tries to restart using a probe pulse until the cause of the failure is repaired. • Manual Restart
OSRI	Optical safety remote interlock. The default value is OSRI-OFF. When set to OSRI-ON, the TX output power is shut down. **Note** OSRI configuration is not supported on the transponder and muxponder cards.	From the drop-down list, choose one of the following: • OSRI-OFF • OSRI-ON
ALS Status	(Display only) ALS status of the device.	• Working • Shutdown
Recovery Pulse Interval	Displays the interval between two optical power pulses.	60 to 300 seconds.
Recovery Pulse Duration	Displays the duration of the optical power pulse that begins when an amplifier restarts.	2 to 100 seconds

Parameter	Description	Options
Manual Restart	Triggers manual restart action for the ALS interface. However, manual restart does not happen if Mode is set to Automatic Restart or Disabled.	—

Step 3   Click **Apply** to save the changes.

Configure Operating Mode

Use this task to change the operating mode of the 80-WXC-C Card.

Before you begin

- Log into the SVO Web Interface

- Open the Card View

Procedure

Step 1   Click **Provisioning** > **Card Mode**.

Step 2   Choose WXC-BIDI from the **Mode** drop-down list.

Note   The 80-WXC-C Card supports only the WXC-BIDI mode. If you configure unsupported card modes (WXC-MUX or WXC-DEMUX), the system raises the PROV-MISMATCH alarm.

Step 3   Click **Apply** to save the changes.

View Insertion Loss Parameters

Use this task to view the insertion loss parameters of cards.

Before you begin

- Log into the SVO Web Interface

- Open the Card View

Procedure

Click the **Maintenance** > **Insertion Loss** tabs to view the insertion loss parameters.

The Insertion Loss tab displays the following information:

- **Insertion Loss Path**—Displays the insertion loss path.

- **IL Value (dB)**—Displays the insertion loss value.

Note   When the card is removed, the last retrieved Insertion Loss values are displayed in the SVO web UI. When the card is replaced, the Insertion Loss values are updated in the SVO web UI.

Collect Failure Logs

Use this task to collect the failure log information for the cards. This task can be used to debug the cards before RMA.

Before you begin

- Log into the SVO Web Interface

- Open the Card View

Procedure

Right-click the card and choose **OBFL** to collect the On Board Failure Logs (OBFL).

The failure log information is displayed in the **Maintenance** > **OBFL Status** tabs.