



Automatic Power Control

This chapter describes the Automatic Power Control optical application for Cisco NCS 1020.

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Overview of Automatic Power Control

On a fiber, the power level may vary between channels. Over long distances and multiple amplifications, these differences in power levels can result in deterioration of the quality of some channels. Automatic Power Control (APC) corrects the power level differences and ensures that power for different channels is according to the target power profile for the spectrum. APC compensates for the degradation of the network over time. APC is enabled if automatic link bring up is enabled.

APC is a network-level feature that is distributed among different nodes. An APC domain is a set of nodes that is controlled by the same instance of APC at the network level. An APC domain identifies a portion of the network that can be independently regulated. The source OLT node acts as the APC Manager or Domain Manager for all the nodes in the path. The subsequent nodes in the path act as APC agent nodes. The manager node enables APC on agent nodes, monitors DISCREPANCY and initiates regulation if correction is required. To avoid large power fluctuations, APC adjusts power levels incrementally. APC performs power correction in steps of +/-0.8dB. This is applied to each iteration until the optimal power level is reached.

You can use APC as a span level application by using span-mode APC.

APC is direction-specific. You can enable APC for each direction at the transmitting OLT node. The source node enables and controls different parameters in all ILA nodes on the path and the far-end OLT ingress EDFA.

The following table lists the parameters that APC configures and controls in different nodes.

Node	Parameters
Transmitting OLT	EDFA Gain EDFA Tilt VOA Attenuation WSS Attenuation

Node	Parameters
ILA	EDFA Gain EDFA Tilt VOA Attenuation DGE Attenuation
Receiving OLT	EDFA Gain EDFA Tilt WSS Attenuation

When you enable APC, APC controls these parameters. APC overrides any manual configuration. When you disable APC, user configuration is applied.

APC divides the C band spectrum into 32 equal parts. APC uses 33 frequencies across the C band to divide the band. We call these 33 frequencies, **setpoints**. Each setpoint is 150 GHz apart from the adjacent setpoints. You can configure a power profile across the spectrum using these setpoints. You can configure the target PSD for each OLT and ILA node on a link.

APC applies amplification and attenuation as required at channel level and composite signal level to ensure that the channels are at the target power level. You can configure the target power spectral densities for 33 points across the band. If you enable link tuner, link tuner sets the target PSDs for APC on all nodes in the path.

APC performs the following functions:

- APC monitors the current PSD against the target PSD for each channel (ASE and user channel) and changes the amplifier parameters including VOA, WSS, and DGE to achieve the target PSD.
- APC detects optical network changes on the path and alters the amplifier parameters on the nearest nodes to compensate for the changes. APC performs these alterations in multiple steps.
- APC collects measurements from other link nodes at the transmitting OLT to precisely locate optical network changes.

APC regulation begins as soon as it discovers any part of the topology. At a transmitting OLT, it starts power correction at the OLT and subsequent ILA nodes even if the complete OLT-OLT link has not been discovered.



Note

- If the input slice power of a channel is below psd-min and APC is unable to bring the channel above psd-min even after setting the WSS attenuation to 0dB, APC declares the channel as failed.
- After APC regulation, all channel powers must be above psd-min (-24-dBm default) and at least one channel should be within 0.5 dB of psd-min.

View APC Status and Information

Use the **show olc apc** command to view APC status.

The following sample is an output of **show olc apc** command when APC is in Centralized mode.

```
RP/0/RP0/CPU0:OLT1#show olc apc
```

```
Controller      : Ots0/0/0/0
APC Status      : WORKING
```

```
Node RID        : 10.1.1.1
Internal State   : IDLE
```

```
Node RID        : 10.99.1.2
Internal State   : IDLE
```

```
Node RID        : 10.99.2.2
Internal State   : IDLE
```

```
Node RID        : 10.99.4.1
Internal State   : IDLE
```

```
Node RID        : 10.1.1.5
Internal State   : DISCREPANCY
```

The following sample is an output of **show olc apc** command when APC is in span-mode.

```
RP/0/RP0/CPU0:ios#show olc apc
```

```
Controller      : Ots0/0/0/0
APC Status      : MANUAL
```

APC Status is the status of APC in the complete path. The following table lists and describes the APC Statuses.

APC Status	Description
BLOCKED	APC moves to BLOCKED state if: • there is an event in the network which resulted in topology failure • an amplifier safety event like APR or OSRI has been triggered in the network • APC is locally disabled on agent node
PAUSED	APC is paused using the apc-pause command.
IDLE	APC regulation has been completed successfully. All the channels in the network have achieved the target PSD provided by Link-tuner or configured by user
WORKING	APC detected a DISCREPANCY between current and target PSD. APC regulation is in progress to converge the power to target PSD.
DISABLED	APC is disabled.
PARTIAL-TOPOLOGY NODE-BLOCKED	APC has limited visibility. APC manager does not have visibility to the full OLT-OLT topology. APC manager tries to correct the power levels on the agent nodes that are reachable and after the regulation is complete, APC moves to BLOCKED state.
Manual	

Internal State is the state of APC on each individual node. The following table lists and describes the internal states.

APC Internal State	Description
DISCREPANCY	The APC manager flags an agent node which needs correction when there is a discrepancy between target PSD and current PSD. This state is temporary and lasts until APC starts power correction and goes into CORRECTING state.
CORRECTING	APC correction is in progress on the node
OOR	APC-OUT-OF-RANGE condition is raised on an agent node when APC fails to regulate and achieve the target PSD power level because the requested gain or attenuation setpoint cannot be set due to one of the following conditions: • Amplifier gain is exhausted in the current gain range. • WSS range (0-25dB) is exhausted for a single or multiple channels. • DGE range (0-3dB) is exhausted for a single or multiple channels. • Spanloss increased and amplifier gain is insufficient to achieve target PSD
IDLE	APC regulation has been completed successfully. All the channels in the network have achieved the target PSD provided by Link-tuner or configured by user
BLOCKED	APC is unable to perform for the following reasons: • OSRI has shut down the amplifier: AMPLI-SHUT • APC is disabled locally on the node: USER-DISABLED • Gain Estimation is in progress: GAIN-ESTIMATION-IN-PROGRESS • Amplifier auto power reduction is enabled: AMPLI-APR-ENABLED • Amplifier is shut because of loss of input power: AMPLI-SHUT • An event in the network resulted in topology failure.

The following sample is an output of **show olc apc** command when OSRI has shut down an amplifier in the link.

```
RP/0/RP0/CPU0:ios#sh olc apc
Thu Jul 7 13:21:05.807 UTC

Controller      : Ots0/0/0/0
APC Status      : BLOCKED

Node RID        : 10.1.1.1
Internal State   : IDLE

Node RID        : 10.1.1.2
Internal State   : BLOCKED
Blocked Reason   : [ AMPLI-SHUT ]

Node RID        : 10.1.1.3
Internal State   : DISCREPANCY

Node RID        : 10.1.1.4
Internal State   : DISCREPANCY

Node RID        : 10.1.1.5
Internal State   : DISCREPANCY
```

The following sample is an output of **show olc apc** command when APC is disabled locally on a node.

```
RP/0/RP0/CPU0:ios#sh olc apc
Thu Jul 7 13:22:44.145 UTC

Controller      : Ots0/0/0/0
APC Status      : BLOCKED

Node RID        : 10.1.1.1
Internal State   : IDLE

Node RID        : 10.1.1.2
Internal State   : BLOCKED
Blocked Reason   : [ USER-DISABLED ]

Node RID        : 10.1.1.3
Internal State   : DISCREPANCY

Node RID        : 10.1.1.4
Internal State   : DISCREPANCY

Node RID        : 10.1.1.5
Internal State   : DISCREPANCY
```

The following sample is an output of **show olc apc** command when Gain Estimation is in progress on a node.

```
RP/0/RP0/CPU0:ios#sh olc apc
Tue Jun 7 11:43:10.801 UTC

Controller : Ots0/0/0/0
APC Status : BLOCKED

Node RID : 10.1.1.1
Internal State : DISCREPANCY

Node RID : 10.1.1.2
Internal State : DISCREPANCY

Node RID : 10.1.1.3
Internal State : BLOCKED
Blocked Reason : [ GAIN-ESTIMATION-IN-PROGRESS ]
```

The following sample is an output of **show olc apc** command when amplifier auto power reduction is enabled on a node.

```
RP/0/RP0/CPU0:ios#sh olc apc
Thu Jul  7 13:21:49.530 UTC

Controller      : Ots0/0/0/0
APC Status      : BLOCKED

Node RID        : 10.1.1.1
Internal State   : IDLE

Node RID        : 10.1.1.2
Internal State   : BLOCKED
Blocked Reason   : [ AMPLI-APR-ENABLED ]

Node RID        : 10.1.1.3
Internal State   : DISCREPANCY

Node RID        : 10.1.1.4
Internal State   : DISCREPANCY

Node RID        : 10.1.1.5
Internal State   : DISCREPANCY
```

You can view the local status of APC on each node using the **show olc apc-local** command. This command shows if APC is enabled or disabled on the node.

The following sample is an output of **show olc apc-local** command when APC is in centralized mode.

```
RP/0/RP0/CPU0:ios#show olc apc-local
Mon Apr 11 06:59:14.679 UTC

Controller : Ots0/0/0/0

TX Status : ENABLED
RX Status : ENABLED
```

The following sample is an output of **show olc apc-local** command when APC is in spam mode.

```
RP/0/RP0/CPU0:SOLN-OLT-1#show olc apc-local
Tue Jun 11 10:57:00.797 IST

Controller : Ots0/0/0/0

Tx Status : SPAN-MODE
Rx Status : SPAN-MODE
```

You can view the target PSDs configured for all setpoints using the **show olc apc-local target-psd-profile** command. The output shows the source of the PSD configuration also. The target PSD source can be Link Tuner or Configuration.

The following sample is an output of **show olc apc-local target-psd-profile** command.

```
RP/0/RP0/CPU0:ios#show olc apc-local target-psd-profile
Tue Apr 26 10:19:24.910 UTC
Controller      : Ots0/0/0/0
Target PSD source : Configuration
```

Setpoint	Frequency (THz)	Target PSD (dBm/12.5 GHz)
01	191.337494	15.0
02	191.488678	15.0

03	191.639847	-4.1
04	191.791016	-4.1
05	191.942184	-4.1
06	192.093353	-4.1
07	192.244537	-4.1
08	192.395706	-4.1
09	192.546875	-4.1
10	192.698044	-4.1
11	192.849213	-4.1
12	193.000397	-4.1
13	193.151566	-4.1
14	193.302734	-4.1
15	193.453903	-4.1
16	193.605072	-4.1
17	193.756256	-4.1
18	193.907425	-4.1
19	194.058594	-4.1
20	194.209763	-4.1
21	194.360931	-4.1
22	194.512115	-4.1
23	194.663284	-4.1
24	194.814453	-4.1
25	194.965622	-4.1
26	195.116791	-4.1
27	195.267975	-4.1
28	195.419144	-4.1
29	195.570312	-4.1
30	195.721481	-4.1
31	195.872650	-4.1
32	196.023834	-4.1
33	196.175003	-4.1

You can view the detailed information about APC on each node using the **show olc apc-local regulation-info** command. This command provides the following information:

- Controller
- APC Domain Manager
- Internal Status
- Minimum PSD
- Last correction timestamp
- Gain range
- Amplifier and attenuation parameters: Configured and current values and available ranges
- Detailed information on the channels

The following details are available:

- Center frequency of each channel
- Channel width
- Channel ID
- Channel Source (ASE or user channel)
- Slice number of the center frequency of the channel in the WSS
- PSD of the channel at the input of the amplifier

- Target PSD for the channel
- Current PSD of the channel
- Discrepancy between current and target PSD
- The configured attenuation on the WSS (OLT) or DGE (ILA) for the channel

You can view the APC information for only the Tx or Rx direction using the **tx|rx** keyword with the **show olc apc-local regulation-info controller ots R/S/I/P** command.

The following sample is an output of **show olc apc-local regulation-info** command.

```
RP/0/RP0/CPU0:ios#show olc apc-local regulation-info controller ots 0/0/0/0 tx
Wed Jul  6 05:01:45.177 UTC
Controller           : Ots0/0/0/0
Domain Manager       : 10.1.1.1
Internal Status      : OOR
Direction            : TX
PSD Minumum          : -24.0 (dBm/12.5 GHz)
Gain Range           : Normal
Last Correction       : 2022-07-06 05:01:28
```

Device Parameters				Min	Max	Configuration	Operational	
=====								
Egress Ampli Gain (dB)				:15.4	29.4	19.5	19.5	
Egress Ampli Tilt (dB)				:-5.0	3.1	-2.2	-2.2	
TX Ampli Power (dBm)				: -	22.4	-	21.4	
TX VOA Attenuation (dB)				:0.0	20.0	0.0	0.0	
Egress WSS/DGE Attenuation (dB)				:0.0	25.0	-	-	
Channel Discrepancy	Channel Frequency	Channel Width	Channel ID	Channel Source	Spectrum Slice Num	Ampli-Input PSD	Target PSD	Current PSD
		Attn Config						
	(THz)	(GHz)				(dBm/12.5 GHz)	(dBm/12.5 GHz)	(dBm/12.5 GHz)
	(dB)	(dB)						
=====								
191.375000	75.00	1	OCh	13	-23.2	-4.6	-4.9	
0.2	7.1							
191.449997	75.00	-	ASE	37	-23.0	-4.6	-4.7	
0.1	9.2							
191.524994	75.00	-	ASE	61	-23.1	-4.6	-4.7	
0.1	9.3							
191.600006	75.00	4	OCh	85	-23.1	-4.5	-4.7	
0.1	8.0							
191.675003	75.00	-	ASE	109	-23.0	-4.5	-4.5	
0.0	9.1							
191.750000	75.00	6	OCh	133	-23.0	-4.4	-4.6	
0.1	8.0							
191.824997	75.00	-	ASE	157	-23.1	-4.4	-4.6	
0.1	9.3							
191.899994	75.00	8	OCh	181	-23.0	-4.4	-4.4	
0.0	8.0							
191.975006	75.00	-	ASE	205	-23.0	-4.3	-4.5	
0.1	9.1							
192.050003	75.00	10	OCh	229	-23.0	-4.3	-4.5	
0.1	8.2							
192.125000	75.00	-	ASE	253	-22.9	-4.3	-4.3	
0.0	9.0							
192.199997	75.00	12	OCh	277	-22.8	-4.2	-4.3	

0.0	8.3						
192.274994	75.00	-	ASE	301	-22.9	-4.2	-4.4
0.1	9.0						
192.350006	75.00	14	OCh	325	-22.6	-4.2	-4.2
0.0	8.3						
192.425003	75.00	-	ASE	349	-22.8	-4.2	-4.3
0.1	8.7						
192.500000	75.00	16	OCh	373	-22.4	-4.1	-3.9
-0.2	8.1						
192.574997	75.00	-	ASE	397	-22.7	-4.1	-4.2
0.1	8.6						
192.649994	75.00	18	OCh	421	-22.6	-4.1	-4.2
0.1	8.1						
192.725006	75.00	-	ASE	445	-22.7	-4.0	-4.2
0.1	8.6						
192.800003	75.00	20	OCh	469	-22.7	-4.0	-4.1
0.1	7.9						
192.875000	75.00	-	ASE	493	-22.6	-4.0	-4.0
0.0	8.4						
192.949997	75.00	22	OCh	517	-22.6	-3.9	-4.1
0.1	7.6						
193.024994	75.00	-	ASE	541	-22.5	-3.9	-4.0
0.1	8.2						
193.100006	75.00	24	OCh	565	-22.7	-3.8	-4.0
0.1	7.5						
193.175003	75.00	-	ASE	589	-22.7	-3.8	-4.0
0.1	8.2						
193.250000	75.00	26	OCh	613	-22.5	-3.8	-3.9
0.1	7.2						
193.324997	75.00	-	ASE	637	-22.6	-3.8	-4.0
0.2	8.1						
193.399994	75.00	28	OCh	661	-22.7	-3.7	-3.9
0.1	7.2						
193.475006	75.00	-	ASE	685	-22.5	-3.7	-3.8
0.1	8.0						
193.550003	75.00	30	OCh	709	-22.7	-3.7	-3.8
0.1	7.0						
193.625000	75.00	-	ASE	733	-22.7	-3.6	-3.8
0.1	8.1						
193.699997	75.00	32	OCh	757	-22.7	-3.6	-3.7
0.1	6.7						
193.774994	75.00	-	ASE	781	-22.7	-3.5	-3.7
0.1	8.2						
193.850006	75.00	34	OCh	805	-22.7	-3.5	-3.7
0.1	6.6						
193.925003	75.00	-	ASE	829	-22.7	-3.5	-3.6
0.1	8.1						
194.000000	75.00	36	OCh	853	-22.8	-3.5	-3.7
0.2	6.6						
194.074997	75.00	-	ASE	877	-22.8	-3.4	-3.6
0.1	8.3						
194.149994	75.00	38	OCh	901	-22.7	-3.4	-3.5
0.1	10.9						
194.225006	75.00	-	ASE	925	-22.8	-3.3	-3.5
0.1	8.2						
194.300003	75.00	40	OCh	949	-22.9	-3.3	-3.5
0.1	7.1						
194.375000	75.00	-	ASE	973	-22.8	-3.3	-3.4
0.1	8.4						
194.449997	75.00	42	OCh	997	-22.9	-3.2	-3.5
0.2	7.3						
194.524994	75.00	-	ASE	1021	-22.9	-3.2	-3.4
0.1	8.4						
194.600006	75.00	44	OCh	1045	-22.8	-3.2	-3.3

0.1	7.2						
194.675003	75.00	-	ASE	1069	-22.8	-3.2	-3.3
0.1	8.4						
194.750000	75.00	46	OCh	1093	-22.9	-3.1	-3.4
0.2	7.3						
194.824997	75.00	-	ASE	1117	-22.8	-3.1	-3.2
0.1	8.2						
194.899994	75.00	48	OCh	1141	-22.8	-3.0	-3.3
0.2	6.9						
194.975006	75.00	-	ASE	1165	-22.9	-3.0	-3.2
0.1	8.3						
195.050003	75.00	50	OCh	1189	-22.8	-3.0	-3.1
0.1	6.6						
195.125000	75.00	-	ASE	1213	-22.9	-3.0	-3.1
0.1	8.3						
195.199997	75.00	52	OCh	1237	-22.9	-2.9	-3.1
0.1	6.3						
195.274994	75.00	-	ASE	1261	-23.0	-2.9	-3.0
0.1	8.1						
195.350006	75.00	54	OCh	1285	-23.1	-2.8	-3.0
0.1	6.4						
195.425003	75.00	-	ASE	1309	-23.2	-2.8	-3.0
0.1	8.3						
195.500000	75.00	56	OCh	1333	-23.1	-2.8	-2.9
0.1	6.2						
195.574997	75.00	-	ASE	1357	-23.4	-2.8	-3.0
0.2	8.2						
195.649994	75.00	58	OCh	1381	-23.4	-2.7	-2.9
0.1	6.4						
195.725006	75.00	-	ASE	1405	-23.4	-2.7	-2.8
0.1	8.5						
195.800003	75.00	60	OCh	1429	-23.6	-2.7	-2.8
0.1	6.6						
195.875000	75.00	-	ASE	1453	-23.7	-2.6	-2.9
0.2	8.7						
195.949997	75.00	62	OCh	1477	-23.7	-2.6	-2.8
0.2	6.9						
196.024994	75.00	-	ASE	1501	-23.6	-2.5	-2.7
0.1	9.0						
196.100006	75.00	64	OCh	1525	-23.7	-2.5	-2.7
0.1	7.1						

ASE - Noise Loaded Channel

OCh - Optical Channel

**Note**

- In the previous sample output, the channel source is ASE for channels that are empty and for channels that failed due to power level dropping below psd-min. For dropped channels, channel ID is present and the channel source is ASE. ASE or Noise loader fills noise across the spectrum with a spacing of 75 GHz for wherever optical cross connects are not present.
- When APC is in span-mode, the apc regulation info output does not show the channel source on ILA nodes

Configure APC

If you enable link tuner, the link tuner sets the target PSDs for APC on all nodes in the path.

You can configure the target power spectral densities for 33 points across the band. The 33 PSD values divide the entire spectrum into 150-GHz steps. APC uses the corresponding PSD value if the channel frequency corresponds to a configured point. If the central frequency is not on a configured position, APC computes the target PSD for a channel by extrapolating from the two adjacent steps.

Use the following commands to set the target PSDs for single-band for each node on a C-band network.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
psd <1-33> value
commit
end
```

The following is a sample configuration that sets the psd to 15 dBm/12.5 GHz for the setpoints 1 and 2.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#psd 1 150
RP/0/RP0/CPU0:ios(config-olc-ots)#psd 2 150
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Disable APC

To disable APC for a link, execute the following commands on the transmitting OLT node.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc disable
commit
end
```

The following is a sample configuration that disables APC.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc disable
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```



Important

- When you disable APC, NCS 1020 sets all setpoints to values in the configuration. If there is no configuration, NCS 1020 sets all setpoints to default values. Disabling APC is traffic impacting.

Enable Centralized APC

To enable APC for a link, execute the following commands on the transmitting OLT node.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc enable
commit
end
```

The following is a sample configuration that enables APC.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc enable
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Pause Centralized APC

If you want to modify the network without APC compensating for the changes, you can pause APC. Use the following commands to pause APC.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc-pause
commit
end
```

The following is a sample configuration that pauses APC.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc-pause
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```



Note

- If you run the **apc-pause** command when APC is in idle state, APC remains in the idle state until APC detects changes in the network that requires power correction. APC changes the status to paused after it detects changes, but does not perform power correction.
- Running the **apc-pause** command, does not pause channel startup.

Disable Centralized APC on an ILA Node

If you want to manually disable APC on a particular node. For example, consider a scenario where the headend OLT encounters a headless event. For any power correction required at agent nodes, APC manager is unavailable to initiate regulation. Also, you cannot perform any adjustments as APC is enabled and user-configuration of target-psd does not take effect. This command gives you an option to disable APC locally on an agent node to perform the parameter adjustments manually. Use the **apc-local disable** command to disable APC on an agent node.

Use the following commands to disable APC on an ILA node.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc-local [ RX | TX ] disable
commit
end
```

The following is a sample configuration that disables APC locally.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc-local RX disable
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Configure Target Drop PSD

Link Tuner does not set the target PSD for drop ports. The default target PSD for drop ports is -8.0 dBm/12.5 GHz. The NCS 1020 applies drop PSD configuration for channels with cross connect configurations. Use the **drop-psd** command to set the desired drop-psd.

Use the following commands to set the desired drop-psd.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
drop-psd value
commit
end
```

The following is a sample configuration that sets the target PSD at drop ports to -25 dBm/12.5 GHz.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#drop-psd -250
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
Tue Apr 26 09:50:12.055 UTC
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Configure Minimum PSD

If the PSD of a channel with minimum attenuation at the amplifier input on an OLT is less than the minimum PSD, APC marks the channel as failed and replaces the channel using ASE source. The default minimum PSD is -24 dBm/12.5 GHz. Use the **psd-min** command to set the desired minimum PSD.

Use the following commands to set the desired minimum PSD.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
psd-min value
commit
end
```

The following is a sample configuration that sets the minimum PSD to -25 dBm/12.5 GHz.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#psd-min -250
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
Tue Apr 26 09:50:12.055 UTC
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Configure APC Alarm Hold-off Timer

You can configure an interval before APC-TARGET-PSD-NOT-MET alarm is raised after APC detects a discrepancy. The default value is 90 seconds. Use the following commands to configure the timer.

```
configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc-alarm-hold-off-timer time
commit
end
```

The following is a sample configuration that sets the APC alarm hold-off timer to 45 seconds.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc-alarm-hold-off-timer 45
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
Tue Apr 26 09:50:12.055 UTC
RP/0/RP0/CPU0:ios(config-olc-ots)#end
```

Configure APC Alarm Discrepancy Threshold

You can configure the discrepancy allowed before APC-TARGET-PSD-NOT-MET alarm is raised. The default value is 1dB. Use the following commands to configure the threshold.

```

configure
optical-line-control
controller ots Rack/Slot/Instance/Port
apc-alarm-discrepancy-threshold discrepancy
commit
end

```

The following is a sample configuration that sets the APC alarm discrepancy threshold to 1.5 dB.

```

RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-olc-ots)#apc-alarm-discrepancy-threshold 15
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
Tue Apr 26 09:50:12.055 UTC
RP/0/RP0/CPU0:ios(config-olc-ots)#end

```

Switch Between APC Modes

Switch from Centralized APC to Span Mode APC

1. Configure APC in manual mode on OLT nodes.
2. Configure apc-span-mode on all nodes.
3. Initiate ALC and wait for ALC process to complete.
After ALC baseline is saved, APC switches to span mode.

Switch from Span Mode APC to Centralized APC

You can switch from span-mode APC to centralized APC in two different ways.

- Commit replace
 1. Reset all nodes to default configuration using the **commit replace** command.
 2. Reload all nodes.
 3. Configure the nodes with required configuration for link bring up.
 4. Configure automatic link bringup or enable APC.
APC starts regulation in centralized mode.
- **no** configuration of optical applications
 1. Remove the optical applications configurations using the **no** form of APC, Link Tuner, and Gain estimator.
 2. Configure the nodes with required configuration for link bring up.
 3. Configure automatic link bringup or enable APC.
APC starts regulation in centralized mode.

