Configure OTDR

This chapter describes how to configure the Optical Time Domain Reflectometer (OTDR) module in NCS 1010.

Overview of OTDR

The NCS 1010 OLT and ILA nodes have an in-built bidirectional Optical Time Domain Reflectometer (OTDR) functionality that can run in line with DWDM channels. The OTDR captures real-time measurements of loss and back reflection of the fiber pair linked to the TX and RX ports.

✎

Note   For the OLT device, the OTDR port can switch between LINE-TX and LINE-RX ports, whereas in the ILA device, the OTDR port can switch among LINE-1-TX, LINE-1-RX, LINE-2-TX, and LINE-2-RX ports.

You can use this feature to check the fiber quality during system installation (before traffic is active), especially in case RAMAN is used. It can also be used to monitor the fiber during the system operation (live traffic) and to check the fiber if cable cut and repair events.

You can view the OTDR measurement result in the SOR file that is exported from NCS 1010.

You can determine the following characteristics using OTDR:

- The attenuation (dB) of the whole fiber link and the attenuation of separate sections of fiber.

- The distance and magnitude of insertion loss, reflection loss.

- Fiber events such as concentrated loss events (with value and position), reflection events (with value and position), events at the end of the fiber, and discontinuities or defects on the fiber including loss events.

OTDR Modes

In NCS 1010, you can configure OTDR in the following two modes:

- Auto—The device selects the optimal values for OTDR pulse width, scan duration, capture start time, and capture end time parameters.

- Expert—You must configure all the OTDR scan parameters with valid values required for the OTDR measurement.

Note Automatic adjustments are not performed in the expert mode configuration.

Measurement and Data Processing are the two fully automated internal phases in both auto and expert modes that proceed in sequence.

Configure OTDR

The NCS 1010 device uses the default values for OTDR scan parameters before the OTDR configuration.

You can configure the OTDR on the OTS controller. Use the following commands to configure the various OTDR parameters:

configure

controller ots *R/S/I/P*

otdr scan-mode expert

otdr rx auto reflectance-threshold *value*

otdr rx auto splice-loss-threshold *value*

otdr rx auto excess-reflection-threshold *value*

otdr rx auto back-scattering *value*

otdr rx auto refractive-index *value*

otdr tx auto reflectance-threshold *value*

otdr tx auto raman-setpoint *value*

otdr tx auto excess-reflection-threshold *value*

otdr tx auto splice-loss-threshold *value*

otdr tx auto back-scattering *value*

otdr tx auto refractive-index *value*

otdr rx expert pulse-width *value*

otdr rx expert capture-end *value*

otdr rx expert capture-start *value*

otdr rx expert scan duration *value*

otdr tx expert pulse-width *value*

otdr tx expert capture-end *value*

otdr tx expert capture-start *value*

otdr tx expert scan duration *value*

otdr tx expert scan duration *value*

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto reflectance-threshold -50
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto splice-loss-threshold 200
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx expert pulse-width 6000
RP/0/RP0/CPU0:ios(config-Ots)#otdr tx auto reflectance-threshold -50
RP/0/RP0/CPU0:ios(config-Ots)#otdr tx auto splice-loss-threshold 200
RP/0/RP0/CPU0:ios(config-Ots)#otdr scan-mode expert
RP/0/RP0/CPU0:ios(config-Ots)#otdr scan-mode expert
RP/0/RP0/CPU0:ios(config-Ots)#commit

RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto reflectance-threshold -50
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto splice-loss-threshold 200
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx expert pulse-width 6000
RP/0/RP0/CPU0:ios(config-Ots)#otdr tx auto reflectance-threshold -50
RP/0/RP0/CPU0:ios(config-Ots)#otdr tx auto splice-loss-threshold 200
RP/0/RP0/CPU0:ios(config-Ots)#otdr scan-mode expert
RP/0/RP0/CPU0:ios(config-Ots)#otdr scan-mode expert
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

Table 1: OTDR Configuration Parameters

Parameter	Description	Range	Unit	Default
otdr rx auto reflectance-threshold	Threshold beyond which a reflective anomaly is reported as an event in the RX direction.	−50 to −10	dB	−40
otdr rx auto splice-loss-threshold	Threshold beyond which a loss anomaly is reported as an event in RX direction.	0.2 to 5	dB	0.35
otdr rx auto excess-reflection-threshold	Threshold beyond which a reflective event is reported as an excessive reflection event in the RX direction.	−50 to −10	dB	−20
otdr rx auto back-scattering	The back scattering value in the RX direction.	−90 to −70	dB	−81.87

Parameter	Description	Range	Unit	Default
otdr rx auto refractive-index	The refractive-index value in the RX direction.	1.000 to 2.000	-	1.4682
otdr tx auto reflectance-threshold	Threshold beyond which a reflective anomaly is reported as an event in Tx direction.	-50 to -10	dB	−40
otdr tx auto splice-loss-threshold	Threshold beyond which a loss anomaly is reported as an event in TX direction.	0–2.5	dB	0.35
otdr tx auto excess-reflection-threshold	Threshold beyond which a reflective event is reported as an excessive reflection event in the TX direction.	−50 to −10	dB	−20
otdr tx auto back-scattering	Back-scattering value in the TX direction.	−90 to −70	dB	−81.87
otdr tx auto refractive-index	Refractive-index value in the TX direction.	1.0000 to 2.0000	Unit less	1.4682
otdr rx expert pulse-width	Pulse width to be used during the expert scan in the RX direction.	5 to 2000	nanoseconds	20
otdr rx expert capture-end	OTDR capture endpoint during the expert scan in the RX direction.	15000000	cm	15000000
otdr rx expert capture-start	OTDR capture start point during expert scan in the RX direction	0 to 10000000	cm	0

Parameter	Description	Range	Unit	Default
otdr rx expert scan duration	OTDR scan duration during expert scan in the RX direction.	0 to 180	Seconds	60
otdr tx expert pulse-width	Pulse width to be used during the expert scan in the TX direction.	5 to 20000	ns	20
otdr tx expert capture-end	OTDR capture endpoint during expert scan in the TX direction.	0 to 15000000	cm	15000000
otdr tx expert capture-start	OTDR capture start point during expert scan in the TX direction.	0 to 10000000	cm	0
otdr tx expert scan duration	OTDR scan duration during expert scan in the TX direction.	0 to 180	Seconds	60

Start OTDR

NCS 1010 software does not support automatic start of OTDR scan. You have to start the OTDR scan manually using the **otdr-start controller ots** *R/S/I/P direction* command to perform the following procedures:

1. Identify the defect after the fiber has been cut.

2. Check the fiber quality after correcting the fiber defect.

3. Initiate an OTDR scan at the time of installation.

Example:

```
RP/0/RP0/CPU0:ios#otdr-start controller ots 0/0/0/0 rx
Wed Feb  9 05:49:39.178 UTC
OTS OTDR Scan Started at RX
RP/0/RP0/CPU0:ios#
```

The Raman tuning application locks the OTDR scan at both fiber ends before the tuning starts, and releases the lock after the tuning completes. Therefore, when you try to start the OTDR scan when Raman tuning is running, your request gets rejected. The following example explains the OTDR start request rejection. The OTDR scan request that has been rejected already does not run automatically after the lock is released, so you have to create a new request to start the OTDR again.

```
RP/0/RP0/CPU0:ios#otdr-start controller ots 0/0/0/0 rx
Tue Feb 28 10:25:43.379 UTC
```

```
OTDR Scan cannot be started as it is locked by Another Entity/Application.
RP/0/RP0/CPU0:ios#

RP/0/RP0/CPU0:ios#otdr-start controller ots 0/0/0/0 tx
Tue Feb 28 10:25:53.379 UTC
OTDR Scan cannot be started as it is locked by Another Entity/Application.
RP/0/RP0/CPU0:ios#
```

Stop OTDR

To stop the OTDR scan function, use the following **otdr-stop controller ots** *R/S/I/P direction* command:

Example:

```
RP/0/RP0/CPU0:ios#otdr-stop controller ots 0/0/0/0 rx
Wed Feb  9 06:03:37.406 UTC
OTS OTDR Scan Stopped at RX
RP/0/RP0/CPU0:ios#
```

Display OTDR Scan Measurements

You can use the **show controllers ots** *R/S/I/P* **otdr-info** *direction* command to view the OTDR scan events and the location of the SOR file.

The SOR file contains the fiber trace details such as the distance, reflectance, loss, and fiber attenuation measurements. You can export the SOR file.

Note   To transfer the SOR file from the source to the destination, use the following command: **scp username@device-ip:filename_with_source_location destination-location**

Example:

```
scp test@192.168.0.1:/harddisk:/otdr/ios_OTDR_Ots0_0_0_0_RX_20230301-101927.sor /users/test/
```

OTDR can detect typical fiber events such as loss due to fiber splicing, patch panel, and coupler connections, single and multiple loss events, single and multiple reflective events, fiber pinch, and fiber cut.

The following is the sample to display the OTDR scan information in the RX direction.

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/0 otdr-info rx
Wed Feb  9 05:55:19.791 UTC
     Scan Direction: RX
     Scan Status: Data Ready
     SOR file: /harddisk:/otdr/IOS_NCS1010_OTDR_Ots0_0_0_0_RX_20220209-055045.sor
     Total Events detected: 11
     Scan Timestamp: Wed Feb  9 05:50:45 2022 UTC
    Event Type Legend:  NR:Non-Reflective  R:Reflective  FE:Fiber-End  ER:Excess-Reflection


     Event#  | Detected Event(s) | Location(km) | Accuracy(m) | Magnitude(dB)|
Attenuation/km(dB)
     1       | R                 | 50.4709      | 52.47       | -39.87       |  0.18

     2       | NR                | 50.4709      | 52.47       | 1.17         |  0.18

     3       | R                 | 100.9261     | 102.92      | -37.73       |  0.21
```

4	NR	100.9261	102.92	1.01	0.21
5	R	105.9500	107.94	-38.52	0.24
6	NR	105.9500	107.94	0.85	0.24
7	R	112.7458	114.74	-40.56	0.00
8	NR	112.7458	114.74	1.48	0.00
9	NR	117.9873	119.98	0.66	-0.02
10	R FE	120.1206	122.12	-35.55	0.00
11	NR FE	120.1206	122.12	21.65	0.00

Note   After the FPD upgrade of the line card, the results of previous OTDR scans may not be available using the CLI command **show controllers ots** *Rack/Slot/Instance/Port* **otdr-info** *direction*. However, you can get the results of previous OTDR scans in the form of .SOR files that are stored in the hard disk.