

DLP-014

Perform Optical Performance Tests for OC12 HIF Plug-in

PURPOSE

This procedure describes how to perform optical performance tests for the OC12 HIF plug-in(s).

Procedure

1. **DANGER:** Possibility of personal injury. Exercise caution when handling unterminated fibers. If far-end equipment is active, invisible laser radiation is present at the fiber ends. Avoid direct exposure to beam.
2. **WARNING:** Possibility of damage to equipment. This equipment contains static-sensitive devices. Refer to [DLP-002](#) for special handling instructions.
3. **WARNING:** Possibility of damage to equipment. Do not twist or cross one fiber over another.
4. **WARNING:** Possibility of damage to equipment. Do not bend or dress fibers at less than 1-1/2 inch bend radius.
5. **NOTE:** Perform this procedure only during normal environmental conditions. For environmental requirements, refer to General System Description in the 1603 SM Product Information manual.

Refer to Table [A](#) for list of test equipment required for this procedure.

Table A. Test Equipment

EQUIPMENT	QUANTITY
Fiber-optic Multimeter, Photodyne Model 22XLC, or equivalent	1
2- to 10-meter fiber-optic test jumper cables: FC/PC connector type (HIF601/603/701/703/901/903/905/A01/A03/A05) SC connector type (HIF602/604/702/704/902/904/906/A02/A04/A06) or ST connector type (HIF605/606/705/907/A07/A08)	2
Fiber-Optic Single Mode Variable Attenuator, Photodyne 19XT, or equivalent	1
Copy of Table C for recording measurements	1

1. Verify that the test equipment calibration date is still valid.
2. Determine which HIFs are to be measured.
3. **NOTE:** *Switch is required only if active side is carrying traffic and duplex HIFs are provided.*

If necessary, switch the equipment so the HIF to be tested is not active (ACT LED is not lighted).

 - a. Select the following menu items: **Manual Controls>Switching>Facilities**
 - b. Select Facility tab.
 - c. Click on Retrieve.

If side to be tested is active, perform the following:
 - d. Select active side.
 - e. From Switch Mode, select Manual.
 - f. Click on Send, then Close.
4. If present, disconnect fiber cables from the transmit (OUT) and receive (IN) optical

connector on the HIF.

5. Clean both ends of the test jumper cable, the HIF OUT connector, and the optical meter sensor head connector ([DLP-012](#)).
6. **NOTE:** Figure 1 shows a loop in the test jumper cable. The loop is required (EIA 526) to ensure that the optical modes (coming from the transmitter) are mixed adequately to provide a reasonable simulation of actual mode mixing in a conventional network situation.

Connect the test jumper cable between the HIF OUT connector and the optical meter sensor head.

Figure 1. Output Power Measurement Test Configuration

1. **NOTE:** If the equipment is being initially powered up (cold), allow the system to stabilize (warm up) for at least 30 minutes (EIA/TIA-526-2).

Allow five minutes for system and meter to stabilize before taking a measurement.

2. **NOTE:** If the meter reading varies more than 0.4 dB, the output is not stable; disregard the reading.

Observe the meter reading and ensure the reading does not fluctuate. Record the reading.

3. **NOTE:** Power output is directly affected by the components that make up the optic medium. Any dust or misalignment can be detrimental. Repeat the disconnect, clean and reconnect sequence for ALL optic components to eliminate these factors and provide the best possible measurements.

Disconnect both ends of the test jumper cable. Repeat steps [11](#) through [14](#) until five stable readings are obtained.

4. Calculate the average of the five readings as the Average Effective Transmitter Output Power (AETOP).
5. Verify that the AETOP measured falls within the required Transmitter Output Power (TOP) range specified in Table [B](#).

Table B. OC12 HIF Plug-in Optical Performance Specifications

HIF TYPE	TRANSMITTER OUTPUT POWER (TOP) (dBm)		GUARANTEED RECEIVER SENSITIVITY (dBm)
	MINIMUM	MAXIMUM	
HIF60x	-15.0	-8.0	-27.0
HIF70x	-20.0	-14.0	-25.0

HIF901, HIF902	-3.0	+2.0	-27.0
HIF903, HIF904	-3.0	+2.0	-33.0
HIF905, HIF906, HIF907	-3.0	+2.0	-33.0
HIFA0x	-3.0	+2.0	-27.0

1. Is AETOP reading acceptable?

If yes, go to step [19](#).

If no, go to step [18](#).

2. Replace the HIF with a spare unit (DLP-101) and repeat this procedure from step [11](#).
3. Record measured AETOP in Table [C](#).
4. Remove test jumper from optical meter.
5. Obtain variable attenuator and clean all optical connectors on the HIF, variable attenuator, and optical meter ([DLP-012](#)).
6. Make test connections as shown in Figure [2](#). Allow five minutes for equipment to stabilize.

Figure 2. Initial Configuration for Receiver Test

1. Adjust the attenuator until the optical meter indicates the guaranteed receiver sensitivity level specified in Table [B](#).
2. With no signal present on the HIF IN connector, verify that the HIF SF (signal failure) LED is lighted.
3. **NOTE:** The BERL-LT (degraded failure of BIT error ratio) alarm is used to determine if the unit passes the receiver sensitivity test, since it is the most sensitive alarm threshold available.

Determine the BERL-LT threshold:

- a. Select the following menu items: **Provision>Facilities>OC12>OC12 Facility**
- b. Select PM Thresholds tab; then click on Retrieve.
- c. Determine BERL-LT threshold setting.

4. If necessary, reprovision the BERL-LT alarm threshold (per site requirements):
 - a. Select OC12 being tested and click on Modify.
 - b. On Modify PM Thresholds dialog, select 5...9 for BERL-LT (defaults are 7).
 - c. Click on OK.
 - d. Click on Send, then Close.
5. Remove the test jumper from the optical meter (Figure [2](#)) and connect it to the HIF IN connector; see Figure [3](#). Allow five minutes for equipment to stabilize.

Figure 3. Looping Adjusted Power for Receiver Test

1. Is HIF SF LED lighted?

If yes, go to step [29](#).
If no, write YES for Passed RCVR Sensitivity Test in Table [C](#) ; then go to step [31](#).
2. Was this the first attempt to perform receiver test?

If yes, repeat steps [25](#) through [28](#).
If no, go to step [30](#).
3. Replace the HIF with a spare unit (DLP-101) and repeat all tests.
4. ***NOTE: The following are optional tests that can be performed: verify the guaranteed normal operation 10-10 BIT error ratio; measure the signal level at which the unit starts to fail; or determine the operating margin.***

Do you want to perform any optional tests?
If yes, go to step [32](#).
If no, STOP. This completes the basic optical tests.
5. Which optional tests do you want to perform?

If normal operation 10^{-10} BIT error ratio verification, go to step [33](#).
If signal level measurement for unit failure, go to step [38](#).
If operating margin determination, go to step [42](#).

Verify Guaranteed Normal Operation BIT Error Ratio

1. Reset (provision) the CVL counter for zero errors:
 - a. Select the following menu items: **Performance Monitoring>Facilities>OC12**
 - b. Select OC12 Line tab.
 - c. From Group drop-down list, select OC12 being tested.
 - d. Click on Retrieve.
 - e. Click on CVL Near (the row label).
 - f. Click on Set to Zero.
 - NOTE:** If possible, the test should run 24 hours to allow for a more accurate assessment.*
 - g. Allow the equipment to run for 30 minutes (or 24 hours).
 - h. Display the CVL count: select > and 1 for the Monitoring Level.
 - i. Click on Retrieve.
 - j. Note CVL Near reading; then click on Close.

2. Is the CVL count less than or greater than 111 for 30 minutes (5315 for 24 hours)?

If less than 111, go to step [35](#).

If greater than 111, go to step [36](#).

3. Record YES for Passed 10^{-10} BIT ERR Test in Table [35](#).
4. Replace the unit with a spare unit per DLP-101; repeat the test one more time.

5. Is count still exceeded?

If yes, contact Customer Service (TNG-505).

If no, STOP. This procedure is complete.

Measure Signal Level at Which Unit Starts to Fail

1. While observing the HIF SF LED, VERY slowly increase the attenuation using the attenuator until the HIF SF LED lights.
2. Disconnect the fiber from the HIF IN connector and connect it to the optical meter.
3. Allow five minutes for the equipment to stabilize.
4. Record the meter reading for RCVR Fail Level in Table [C](#). This is the signal level where the receiver just starts to fail (BERL-LT threshold is exceeded).

Determine Operating Margin

1. Determine which fiber is connected to the far-end HIF OUT connector, and verify that the far-end HIF is functioning.
2. Clean the optic meter connectors and the fiber connectors ([DLP-012](#)).
3. Connect the IN fiber (from far-end OUT) to the optical meter.
4. Record the meter reading for Level from far-end HIF in Table [C](#).
5. **NOTE:** *Most of the fiber components in any system and/or network experience a certain amount of degradation over time. Therefore, the initial installation operating measurements degrade with time. Since no two NEs experience exactly the same environment and operating situations, there are further variations in future measurements. This margin can be checked periodically to detect system degradation.*

The difference in the levels recorded in step [41](#) and step [45](#) is the operating margin. Record this value for Calculated Operating Margin in Table [C](#).

6. Disconnect the test equipment and fibers.
7. Clean the HIF connectors and the original fiber connectors ([DLP-012](#)).
8. Reconnect the original fibers to the IN and OUT connections on the HIF.
9. For the HIF just tested, release protection switch if switched earlier:
 - a. Select the following menu items: **Manual Controls>Switching>Facilities**
 - b. On Facilities Switching dialog, select Facility tab.
 - c. Click on Retrieve.
 - d. Select OC12 side being tested.
 - e. From Switch Mode, select Release.
 - f. Click on Send, then Close.
10. Repeat the procedure from step [7](#) for the next HIF, as required.
11. After testing is complete, retrieve serial number for HIFs:
 - a. Select the following menu items: **Administration>Inventory**
 - b. Select Hardware tab.
 - c. Click on Retrieve.
 - d. From the response, record in Table [C](#) the serial number of HIF unit tested.

e. Click on Close.

12. Log on to the NE at the far end, obtain serial number for HIF and record it in Table [C](#), per step [52](#).

13. STOP. This procedure is complete.

Table C. Record OC12 HIF Optical Measurements

Date:				
Tester:				
Site Name:				
NE Name (netid):				
RECORDED PARAMETERS	LINE GROUP 1		LINE GROUP 2	
	HIF-A	HIF-B	HIF-A	HIF-B
HIF Type (unit mnemonic)				
Minimum TOP (dBm) (from Table B)				
Maximum TOP (dBm) (from Table B)				
Measured AETOP (dBm)				
Passed RCVR Sensitivity Test (YES or NO)				
Passed 10-10 BIT ERR Test (YES or NO)				
RCVR Fail Level (dBm) (DGBER threshold)				
Level from Far-end NE (dBm)				
Calculated Operating Margin (dB)*				
Unit Serial Number				
Unit Serial Number of Far-end HIF (if available)				
* [Level from Far-end NE (dBm)] minus [RCVR Fail Level (dBm) (DGBER threshold)]				

