

Template for submitting comments/inputs on new draft Test Guide on “PON Optical Time Domain Reflectometer (For FTTH Applications)”

Name of Manufacturer/Stakeholder:

Organization:

Contact details:

Clause No. (of the draft Standard)	Clause	Comments	Other Remarks, if any

Note: The comments/inputs on the draft Test Guide (Draft Test Guide No. TEC 88321:2026) may be provided in the above format vide email to **dirt2-tec-dot@gov.in**, **amit.beniwal98@gov.in** and **ratx.tec-dot@nic.in**



परीक्षण निर्देशिका
टीईसी ८८३२१:२०२६

TEST GUIDE
TEC 88321:2026

पोन ऑप्टिकल टाइम डोमेन रिफ्लेक्टोमीटर
(एफटीटीएच एप्लिकेशन के लिए)
(मानक सं.: टीईसी ८८३२०:२०२६)

PON OPTICAL TIME DOMAIN REFLECTOMETER
(For FTTH Applications)
(Standard No.: TEC 88320:2026)



ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र
खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत
TELECOMMUNICATION ENGINEERING CENTRE
KHURSHIDLAL BHAWAN, JANPATH, NEW DELHI-110001, INDIA
www.tec.gov.in

© टीईसी, २०२६

© TEC, 2026

इस सर्वाधिकार सुरक्षित प्रकाशन का कोई भी हिस्सा, दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली की लिखित स्वीकृति के बिना, किसी भी रूप में या किसी भी प्रकार से जैसे - इलेक्ट्रॉनिक, मैकेनिकल, फोटोकॉपी, रिकॉर्डिंग, स्कैनिंग आदि रूप में प्रेषित, संग्रहीत या पुनरुत्पादित न किया जाए ।

All rights reserved and no part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form and by any means - electronic, mechanical, photocopying, recording, scanning or otherwise, without written permission from the Telecommunication Engineering Centre, New Delhi.

Release 1:,2026

FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Test Guide of testing pertains to test schedule and procedure for evaluating conformance/functionality/requirements/performance of Standard for Generic Requirements of PON Optical Time Domain Reflectometer for FTTH applications.

CONTENTS

<i>Section</i>	<i>Item</i>	<i>Page No.</i>
A	History Sheet	5
B	Introduction	6
C	General information	7
D	Testing team	7
E	List of the test instruments	8
F	Equipment Configuration Offered	8
G	Equipment/System Manuals	9
H	Clause-wise Test Type and Test No.	10
I	Summary of test results	64

A. HISTORY SHEET

<i>Sl.No.</i>	<i>Test Guide / Document No.</i>	<i>Title</i>	<i>Remarks</i>
1.	TEC 88321:2026	Test Guide for Standard for Generic Requirements of PON Optical Time Domain Reflectometer for FTTH applications	Release 1

B. INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance/ functionality / requirements / performance of PON Optical Time Domain Reflectometer for FTTH applications as per TEC Standard No. TEC 88320:2026.

Draft

C. General information:

Sn.	General Information	Details <i>(to be filled by testing team)</i>	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of TEC Standard/Applicant's Spec. against which the approval sought		
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. Testing team: *(to be filled by testing team)*

S. no.	Name	Designation	Organization	Signature
1.				
2.				

E. List of the Test Instruments:

Sno.	Name of the test instrument	Make /Model <i>(to be filled by testing team)</i>	Validity of calibration <i>(to be filled by testing team)</i>
1.			dd/mm/yyyy
2.			
3.			

F. Equipment Configuration Offered: *(to be filled by testing team)*

(a) <Equipment/product name> Configuration:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

(b) <Other equipment name> Configuration:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product.

G. Equipment/System Manuals: *(to be filled by testing team)*

Availability of Maintenance manuals, Installation manual, User Manual etc. (Y/N)

Draft

H. Clause-wise Test Type:

Chapter 1

<i>Clause No.</i>	<i>Clause</i>	<i>Type of Test / Test No. etc. *</i>
1.0	<p>Introduction :</p> <p>This document describes the Standard for Generic requirements of PON optimised Optical Time Domain Reflectometer for FTTH applications. The instrument allows the testing of fibre through splitters with overall split ratios of upto 1:128. It should be capable of detecting and displaying optical splitters used in FTTH networks. It should support distributed PON architectures, including balanced and un-balanced splitters. The instrument shall be capable of dark fibre testing of FTTH networks as well as live fibre testing of FTTH networks. The instrument is intended to be used for locating faults and irregularities on single mode optical fibre cable during Installation and service activation of Fibre to the Home networks etc. at 1310nm and 1550nm. The instrument is intended to also be used for troubleshooting &</p>	Check as per the requirement of the clause.

	<p>maintenance of live Fibre (in-service troubleshooting) of FTTH networks at 1625nm/1650nm. The instrument is essentially used to measure Splice loss, Connector loss, Fibre attenuation, Reflectance of points, Link optical return loss and distance to fibre events through the active and passive network elements. It can also be used for estimating the length of O.F. cable and attenuation attributed by the same. This instrument is envisaged to be handy and lightweight.</p>	
2.0	Functional Requirements:	
2.1	<p>The instrument shall be equipped with controls that enable the signature (fibre trace) to be expanded with respect to the return power and distance axis. It shall be able to locate an event easily. There shall be provision for zoom on event and full span zoom of the fibre on X and Y Axis.</p>	<p>It shall be checked by connecting 5Kms (approx) length of the fibre and expanding the fibre trace in X axis for distance and for return power in Y axis</p>
2.2	<p>The instrument shall be capable of "Real-time" operation during which it shall display the current fibre trace and the current 2-point loss between two user selected points. The instrument shall be capable of saving multi-wavelength traces.</p>	<p>It shall be checked by connecting 5Kms (approx) length of the fibre having minimum one splice. Check for the splice loss and loss between two selected points in real time mode</p>

	<p>There shall be provision for comparison of a main trace with the respective reference trace. The instrument must have the possibility to save trace under Bellcore 2.0 format for universal use. Apart from this, the OTDR shall have onboard report generation feature in user-desired format.</p>	
2.3	<p>The instrument shall provide controls, processing and output to determine the reflectance of fibre events such as connectors and splices and to determine the optical return loss of the user selected portion of the fibre link to which the OTDR is connected.</p>	<p>The requirement shall be checked by connecting 5Kms (approx) length of the fibre having minimum one splice and one mated optical connector through suitable adopter. The control points shall be checked for:</p> <ul style="list-style-type: none"> i) The reflectance of fibre events: <ul style="list-style-type: none"> (a) connectors (b) splice ii) Optical return loss of the selected portion of the fibre link to which the OTDR is connected.
2.4	<p>On connecting the fibre by the user and by actuating a single control to start the measurement, the test set shall automatically measure the attenuation coefficient of all continuous sections of fibre separated by discrete loss discontinuities plus sum of the cumulative loss to each discontinuity for the entire span, within the instrument's</p>	<p>The requirement shall be checked by connecting 5Kms (approx) length of the fibre having minimum two splice and one mated optical connector through suitable adopter. The control points shall be checked by actuating single control for the following:</p> <ul style="list-style-type: none"> i) Attenuation coefficient of all continuous sections of fibre separated by discrete loss discontinuities plus sum the

	<p>measurement range. It shall list all events of the fibre under measurement and shall provide the results in tabular form, which shall include distance to events, splice position, splice loss, return loss, end of fibre distance, fault position, section loss, total span ORL, macro-bend location and other items including total loss calculation etc.</p>	<p>cumulative loss to each discontinuity for the entire span within the measurement range of the instrument.</p> <p>ii) Listing of the all events on a fibre including a) distance to events b) splice position c) splice loss d) Return loss e) end of fibre distance f) Fault position g) Section loss, h) Total loss calculation etc.</p>
2.5	<p>If the instrument encounters a case for which the reflectance is clipped (the reflective pulse saturates the test set detector), the test set shall report the measurement as the lower bound reflectance for the point.</p>	<p>This shall be checked by creating condition on the connected fibre so that the reflective pulse saturates the test set detector. In such case the indication (message) to appear on the screen of the instrument.</p>
2.6	<p>The instrument shall provide an indication that the end of the fibre has been found if it detects a break in the fibre or if the attenuation at a point exceeds a user- selectable loss threshold. The instrument shall be able to detect a reflective end of the fiber even if the noise ratio is too high for user information only. The analysis must be performed in a range where the SNR is sufficient in order to provide valuable results.</p>	<p>It shall be checked by connecting minimum 2 length of fibres connected by connector. One measurement shall be taken in through condition the second measurement shall be taken by disconnecting at the connector, the instrument shall show the disconnection as fibre break.</p>

2.7	The manufacturer shall provide the calibration report of the instrument which covers all the essential optical performance parameters. The manufacturer shall also provide the detail method to check the level of optical power launched into the fibre.	Check as per the requirement of the clause. A test certificate may be obtained from the manufacturer.
2.8	All Software (Emulation software) shall be provided for all applications of personal computers for recalling stored trace information and doing trace analysis.	Check as per the requirement of the clause.
2.9	The instrument should locate all fibre events with respect to convenient reference and relative marking facility.	It shall be checked by actual measurement by splicing no. of spools of fibres. The marking of the events shall be possible
2.10	Data storage system should be available for the instrument, to store in internal as well as external memory the complete trace information and settings. The instrument shall allow cloud file storage to enable instant sharing of measurement reports.	Check as per the requirement of the clause.
2.11	The instrument should be equipped with the necessary software, and/or hardware to read, write, and interact with the OTDR data standard as per Telecordia document No.SR-4731 (latest issue).	A test certificate may be obtained from the manufacturer for complying the OTDR data standard as per Telecordia document No.SR-4731 (latest issue).

2.12	Equipment suppliers should provide supplementary software to the end user of the test set that will convert files from the suppliers existing file output format to the OTDR data standard as per Telecordia document No.SR-4731 (latest issue).	A test certificate may be obtained from the manufacturer for complying the OTDR data standard as per Telecordia document No.SR-4731 (latest issue).
2.13	The software function shall provide waveform display; manual measurement, auto search auto zoom, event editing, printing, waveform comparison, waveform difference and both end measurements.	Check as per the requirement of the clause.
2.14	It shall have facility to measure splice loss in Auto and Manual modes.	The splice loss shall be checked in both Auto and manual modes.
2.15	The instrument shall have its own simple GUI and menu-driven setup for performing measurements.	Check as per the requirement of the clause.
2.16	It shall have facility to label the characteristic of the fibre traces on the screen and file name, titles, header and event comments and calendar, clock etc.	It shall be checked for the full requirement of the clause by actual labelling the fibre trace such as file name, title, header and event comments and calendar, clock etc. This shall be checked also from the print taken.
2.17	The instrument shall provide a help menu or troubleshooting facility.	Check as per the requirement of the clause.
2.18	It shall have the facility to compare the traces of all the selectable wavelengths.	Check as per the requirement of the clause.

2.19	It shall have sufficient number of markers for marking the events, distance and loss measurements.	The current and the stored waveform of the fibre trace shall be possible to be displayed on the screen simultaneously for comparison.
2.20	It shall protect the detector overload and fast ageing of detector resulting in high accuracy and improved resolution. It shall warn the user of a possible damage to the detector in case the tests are performed on live fibre to protect the input port.	Check as per the requirement of the clause. A certificate from the manufacturer shall be acceptable.
2.21	All controls shall be clearly marked or labelled with an easy to understand symbol or key word to indicate its intended use.	Marking on all the controls shall be checked
2.22	Spectral width for each source shall be specified by manufacturer.	Check as per the requirement of the clause.
2.23	The OTDR shall be capable to measure the distance between two events on the fibre trace.	Check as per the requirement of the clause.
2.24	The instrument shall be capable of dark fibre testing of FTTH networks as well as live fibre testing of FTTH networks.	Check as per the requirement of the clause.
2.25	The instrument should have the function to automatically find and locate macro-bend to speed up construction (splicing) and troubleshooting.	Check as per the requirement of the clause.
2.26	The instrument shall be able to perform multi-pulses acquisitions.	Check as per the requirement of the clause.

2.27	The instrument's test solution shall be able to convert OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy.	Check as per the requirement of the clause.
2.28	The instrument shall be able to detect and identify the PON splitter types. The instrument shall be able to detect all events before and after the splitter.	Check as per the requirement of the clause.
2.29	The user shall be able to create and save any specific test set-up configuration for recalling it in the subsequent testing. The instrument may support some pre-installed dedicated FTTH setup menus, as well.	Check as per the requirement of the clause.
2.30	The OTDR should have pre-set thresholds for pass/fail detection of the events.	Check as per the requirement of the clause.
2.31	The instrument should support facility to transfer the records of traces/data.	Check as per the requirement of the clause.
3.0	Technical Requirements of PON OTDR:	
3.1	Type of Fibre : Single Mode as per ITU-T G.652.B, G. 652.D, G.655, G.656 & G.657	Check and record the kind of fibre/fibres for which the measurements can be made from the instrument & a certificate from the manufacturer shall be accepted.
3.2	Central Wavelength : a) 1310 ± 20nm b) 1550 ± 20nm	Reference Test Method: Procedure No.1.

	<p>c) 1625/1650 ± 20nm</p> <p>Note: The instrument shall be switch-able to any of these wavelengths.</p>	
3.3	<p>Dynamic Range :</p> <p>a) ≥40 dB at 1310nm</p> <p>b) ≥40 dB at 1550nm</p> <p>c) ≥39 dB at 1625nm/1650nm</p> <p>Note: The dynamic range shall be as measured at SNR = 1. Pulse width is to be defined by manufacturer for PON optimized OTDR which have high dynamic range at short pulse width.</p>	<p>The dynamic range at other available pulse width shall also be recorded.</p> <p>Reference Test Method: Procedure No.2.</p>
3.4	<p>Pulse Width: 3ns to 20µs</p>	<p>Check and verify as per the requirement of the clause.</p>
3.5	<p>Near end Dead Zone (Back Scattered Dead Zone) :</p> <p>≤4m (at -45dB reflectance)</p> <p>(To be decided by purchaser)</p> <p>(pulse width to be defined by manufacturer)</p>	<p>Near end Dead Zone at other pulse widths shall also be checked.</p> <p>Reference Test Method: Procedure No.4.</p>
3.6	<p>Event Dead Zone (Fresnel reflection): ≤0.8 m (at -45dB reflectance)</p> <p>(pulse width to be defined by manufacturer)</p>	<p>Event Dead Zone at other pulse widths shall also be checked.</p> <p>Reference Test Method: Procedure No.3.</p>
3.7	<p>Splitter Dead Zone or PON Dead Zone: To be defined by manufacturer.</p>	<p>Check as per the requirement of the clause. Record the observations.</p>

<p>3.8</p>	<p>Distance Measurement</p> <p>a) Distance Range (Horizontal Scale settings) : Settable (To be specified by manufacturer)</p> <p>b) Sampling Resolution : ≤ 4 cm</p> <p>c) Accuracy</p> <p>i) Up to 1 Km: $< \pm 1$ Meter</p> <p>ii) Up to 20 Km: $\leq \pm 1.5$ Meter</p> <p>d) Data sampling point : $\geq 256,000$</p>	<p>It shall also be checked for other distance range setting specified by the manufacturer and the same shall be recorded.</p> <p>Reference Test Method: Procedure No.5.</p> <p>The accuracy shall be checked at least for the maximum calibrated length of fibre if other calibrated fibre lengths are not available. 2. Reference Test Method: Procedure No.6.</p> <p>It shall be checked from the settings of the OTDR and shall be recorded.</p>
<p>3.9</p>	<p>Attenuation Measurement : LSA, 2 points</p> <p>a) Vertical scale : Settable (To be specified by manufacturer)</p> <p>b) Readout (Display) resolution : 0.001 dB</p>	<p>This shall be checked by connecting minimum 5 Kms. Length of the fibre having minimum two splices. The measurement for the splice loss and the section loss shall be checked by the LSA and 2 points methods respectively. The printout of the measurement shall be attached.</p> <p>It shall be checked from the specified values as stated by the manufacturer and each settable range shall be recorded.</p>

	c) Accuracy : 0.04 dB/dB	It shall be checked for the readout resolution (maximum) and the printout of the measurement shall be attached in the report. A printout of the measurement shall be attached. Reference Test Method: Procedure No.7.												
3.10	Refractive Index : 1.40000 to 1.60000 (Adjustable in steps of 0.00001)	Check by changing the value of IOR settings as per the requirement and attached the printout.												
3.11	Reflectance measurement accuracy : ± 2.0 dB for reflectance better than -40dB	Measure and attach the printout. Reference Test Method: Procedure No.8.												
3.12	Nominal pulse duration : To be specified by manufacturer	The other available pulse duration shall be recorded & checked. <table border="1"> <thead> <tr> <th>Value specified by manufacturer</th> <th>Observation/ remarks</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>	Value specified by manufacturer	Observation/ remarks										
Value specified by manufacturer	Observation/ remarks													
3.13	Averaging time update : ≤ 180 seconds in auto mode	It shall be checked & recorded. Averaging time selector range shall be recorded. (Minimum to maximum)												
3.14	Auto Measurements Measurements Items : Event distance, Loss, return loss, Loss	In auto mode all display parameters shall be checked and recorded. This shall be checked by connecting spice												

	<p>from near end and total return loss, discovery and detection of splitter and split ratio</p> <p>a) Threshold</p> <p>i) Connection loss : 0.01 to 5.0 dB (in suitable steps)</p> <p>ii) Return loss : 20 to 60 (in suitable steps)</p> <p>b) Automatic setting : Pulse width, distance range averaging times</p> <p>c) Event registration : Registration of event points, section Loss, return loss, splitters etc. for event points shall be measured and shall be used to create the event table.</p> <p>d) Connection check : On / Off switchable</p> <p>e) Testing through Splitters (upto 1:128) : The instrument should be able to test the fiber through splitters without misreading the same as fiber break.</p>	<p>fibre (minimum two splices) and length of 5 Kms. (Minimum). A printout shall be attached.</p> <p>The suitable step as per the requirement shall be checked and noted & attach a print 2. Check and attach the printout.</p> <p>The requirement of the clause shall be checked in auto mode and printout shall be attached.</p> <p>Registration required for event table as per the requirement of the clause shall be checked by connecting the spliced fibre of minimum length of 5kms (Approx). The print out shall be attached.</p> <p>The connection check facility shall be available in the instrument and shall be checked by connecting and disconnecting or by poor connection.</p> <p>The testing of fibre through splitters shall be checked and instrument shall not misread the splitter as fibre break.</p>
--	---	--

	<p>f) Two splice measurement range : It shall allow two splice measurement range for measuring two non-reflective events of 0.5dB loss spaced by 75m even after splitter.</p>	<p>The instrument shall be checked for measuring two events of 0.5dB loss, spaced by 75m, before and after the splitter.</p>
3.15	<p>Manual measurements : Real time sweeping, point to point distance / loss measurement, point to point loss measurement per unit length, Return loss measurement, splitter discovery and detection and split ratio, Splice / connection loss measurement and the total return loss with selectable averaging time.</p>	<p>The measurements shall be taken for the requirement of the clause in manual mode. A print out of the measurement shall be attached.</p>
3.16	<p>Calendar Clock : Display of year, month, day, hour, minute (power back up).</p> <p>Note: The software/hardware in instrument shall not pose any problem in normal functioning of the instrument due to changes in date and time caused by events such as leap year etc.</p>	<p>Check the facilities required as per the clause and attach the printout.</p>
3.17	<p>Distance unit : Meters / Kilometers</p>	<p>The distance units recorded by instruments shall be in meters/Kilometers and a printout shall be attached.</p>

3.18	Display size : ≥ 4 inches (diagonally)	Measure the display screen and record the observations and the type of the screen i.e. Mono or colour shall also be noted.
3.19	<p>Display of Results : It should display :</p> <ul style="list-style-type: none"> - Fibre signature for viewing - Splitter - Attenuation between two selected points - Distance between two selected points - Loss due to connector/connectors in the section - Loss due to splice/splices in the section - Average loss/Km. & total loss in the fibre Reflection of each events & its location, total return loss - A break in fibres & location of break - End of fibre & length of fibre <p>Note: The actual display content should be same as in the stored information and data should be transferred in non-editable format.</p>	Connect the spliced fibre (minimum 2 splices) and measure all the parameters as per the requirement of the clause and record the observation and also attach the printout.
3.20	Optical connector : OTDR Optical connector should be either of PC or APC(with 2.5 mm ferrule diameter) suitable for FC or SC	Check the type of the connector in detail and record the observations.

	<p>adapter as per user requirements or as per order</p> <p>Note: OTDR Optical connector (being factory fitted option) would be either of PC or APC as per order</p>											
3.21	<p>Interface :</p> <p>a) USB</p> <p>b) Wi-Fi</p> <p>c) RJ-45, Bluetooth etc. (optional or if required by the purchaser/user)</p>	<p>It shall be possible to download the information.</p> <p>Check and record the observations.</p> <p>The interface ports shall be checked by actual downloading the information.</p>										
3.22	<p>Storage:</p> <p>Internal Memory : ≥ 1000 traces (printable and in native format)</p>	<p>The capacity of the Internal memory to be examined for recording the required number of traces as per the requirement of the clause.</p>										
3.23	<p>Environment conditions : As per clause 8.0 of this document</p>	<p>The environmental tests shall be conducted as mentioned in the clause 8.0 of this document.</p>										
3.24	<p>Power Supply:</p> <p>a) The instrument shall work, without any degradation from the single phase AC power supply with nominal 230V AC with voltage variation from 100V to 240V at 50Hz \pm 2 Hz.</p> <p>or</p> <p>The instrument shall work, without any degradation from AC/DC adapter with input voltage from 100V to 240V AC, 50Hz \pm 2Hz.</p> <p>The manufacturer shall furnish the</p>	<p>Check as per the requirement of the clause. Performance the OTDR with the variation in power supply and Record the observations.</p> <table border="1" data-bbox="858 1532 1385 1928"> <thead> <tr> <th>Input Voltage (AC)</th> <th>Distance/ Splice loss observed on OTDR</th> </tr> </thead> <tbody> <tr> <td>100 V</td> <td></td> </tr> <tr> <td>150V</td> <td></td> </tr> <tr> <td>230V</td> <td></td> </tr> <tr> <td>240V</td> <td></td> </tr> </tbody> </table>	Input Voltage (AC)	Distance/ Splice loss observed on OTDR	100 V		150V		230V		240V	
Input Voltage (AC)	Distance/ Splice loss observed on OTDR											
100 V												
150V												
230V												
240V												

	<p>output DC voltage of the AC/DC adapter and safe operating input voltage for the instrument.</p> <p>Note: High voltage cut-off shall be provided for voltage beyond 240V AC.</p> <p>b) The instrument shall also be operative continuously for a period of minimum Six hours from internal battery and shall have charging facility. Indication of low battery shall be provided at remaining 10% battery capacity. Battery Charge status indicator shall be provided. It shall be protected against battery reversals, overvoltage, short circuit, overload etc.</p> <p>c) The power consumption shall be minimal and its consumption shall be furnished by the manufacturer.</p>	
<p>3.25</p>	<p>Additional measurement tools:</p> <p>a) Fibre inspection Probe: Video inspection probe for inspection of connectors. Screens capture function for documentation</p> <p>b) In-built Visible Light Source : 635nm/650nm ± 20 nm, CW,</p>	<p>Check as per the requirement of the clause. Record the observations.</p>

	<p>Typical Pout : - 3 dBm ± 1 dBm</p> <p>Note: It should have port for visual fault locator for easy fiber identification and macro-bend location.</p>	
4.0	<p>Additional Items to be supplied:</p> <p>a. AC/DC adapter : One no.</p> <p>b. Dummy Fibre /Launch Fibre : 50 metres launch cable</p> <p>c. Universal Connector adapter : Two nos. for each type of connector</p> <p>d. Pen drive / Flash Memory : One no. of at least 16GB</p> <p>e. Carrying case : 1 no.</p>	<p>Check as per the requirement of the clause. Record the observations.</p>

5.0	Engineering Requirements:	
5.1	The instrument shall be manufactured as per latest state of the art technology.	Check as per the requirement of the clause.
5.2	The instrument shall be compact and light weight in order to provide a reasonable degree of portability and simplicity of operation.	Check as per the requirement of the clause.

5.3	The instrument shall be compact and composite in construction. It shall be portable and light weight. The actual dimensions and weight of the instrument shall be furnished by the manufacturer.	Check as per the requirement of the clause. Note and record the actual dimensions and weight of the instrument furnished by the manufacturer.
5.4	All connectors and switches shall be reliable and of standard type to ensure failure free operation over 5000 mating for connectors and 1000 on-off operations for switches under the specified environmental conditions.	Check as per the requirement of clause (It shall checked for 100 mating during the evaluation & for 5000 mating during the bulk procurement)
5.5	All connectors and cables used shall be of low loss type and suitably shielded.	Check as per the requirement of the clause.
5.6	The mechanical design and construction of each unit shall be inherently robust and rigid under all conditions of operation, adjustment, replacement, storage and transport.	Check as per the requirement of the clause.
5.7	The instrument shall have self cooling arrangement including usage of internal fans, if required. On failure of internal fan, if used, an alarm or some status shall be indicated.	Check that provision for self-cooling is available.
5.8	Important Do's and Don'ts about the operation of the instrument shall be clearly indicated at a convenient place on the instrument.	Check that important Do's and Don'ts are clearly mentioned/indicated as per the requirement of the clause.

6.0	Operational Requirements:	
6.1	The instrument shall be designed for continuous operation. The manufacturer shall indicate the period of continuous operation for which it shall be checked.	Check as per the requirement of the clause.
6.2	The instrument shall be able to perform satisfactorily without any degradation at an altitude up to 3000 metres above mean sea level. A Test certificate from the manufacturer shall be acceptable.	Get a test certificate from the manufacturer.
6.3	Power cord shall have molded plugs.	Check as per the requirement of the clause.
6.4	Visual indication to show power ON and OFF status shall be provided.	Verify whether any visual indication is provided to show the power ON/OFF condition.
6.5	Provision for self-check of the instrument shall be provided.	Verify that the instrument supports the provision for self-check.
6.6	The software/hardware in instrument shall not pose any problem in the normal functioning of the instrument due to changes in date and time caused by events such as changeover of leap year etc.	Note and record that the instrument support the requirements specified in this clause.
7.0	Quality Requirements	
7.1	The manufacturer shall furnish the MTBF values. Minimum value of MTBF shall be 10000 hours including fans.	Check MTBF/MTTR values and warranty is provided by manufacturer for period of minimum 1 year with free repair and replacement. Also check

		minimum value of MTBF is 10000 hrs.
7.2	The instrument shall be manufactured in accordance with international quality management system ISO 9001: 2015 or latest issue for which the manufacturer should be duly accredited. A quality plan describing the quality assurance system, being followed by the manufacturer, should be submitted.	Note that the equipment is manufactured in accordance with international quality standards ISO 9001:2015 or latest issue. Also a quality plan describing the quality assurance system followed by the manufacturer should be submitted.
8.0	<p>Environmental Requirements:</p> <p>a) The instrument shall conform to the requirements for Environment specified in TEC document SD:QM-333(or TEC 14016:2010) {latest issue} "Standard for Environmental Testing of Telecommunication Equipment". The applicable tests shall be for environmental category "B2"including Drop, Topple, Vibration tests (instrument kept in carrying case) and Corrosion test.</p> <p>b) The instrument is required to work in Indoor environments like Central offices, equipment huts and outside environments like manhole, open trench and a</p>	<p>Environmental tests as per this clause 8.0 shall be carried out. Test reports from any TEC recognized lab (Conformity Assessment Body(CAB)), shall be acceptable. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p> <p>Check as per the requirement of the clause.</p>

	<p>splicing van. It is required to work in bright sunlight, poorly lit or dark areas.</p> <p>c) The instrument shall comply with Ingress Protection Rating IP 34 as per IEC 60529.</p> <p>d) The instrument shall be able to work without any degradation in performance in coastal areas and should be protected against corrosion.</p>	<p>Get a test certificate from the manufacturer</p> <p>Check as per the requirement of the clause.</p>
9.0	Maintenance Requirements:	
9.1	The instrument shall have facility for power on self-test. All the calibration parameters shall be valid for a minimum calibration period of one year.	
9.2	<p>The instrument shall have easy access for servicing and maintenance. It may be specifically noted that replacement of fuses etc. can be done quickly and conveniently. This is essential as these items may go faulty during operation and quick replacement helps in early restoration.</p> <p>Note: Rating and types of fuses, if used, are to be indicated by</p>	

	the manufacturer.	
10.0	<p>General Electromagnetic Compatibility (EMC) Requirements:</p> <p>The instrument shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report shall be furnished from an accredited test agency.</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>
	<p>a) Conducted and radiated emission:</p> <p>Name of EMC Standard: CISPR 11 (2024) {latest issue} and CISPR 32(2015) {latest issue} – “Limits and methods of measurement of radio disturbance characteristics of Industrial, Scientific, and Medical (ISM) RF equipment : Multimedia equipment (MME)”.</p> <p>Limits:-</p> <p>i) To comply with Class A as per the specific requirement of CISPR 11 (2024) {latest issue} and CISPR 32 (2015) {latest issue}.</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>
	<p>b) Immunity to Electrostatic discharge:</p> <p>Name of EMC Standard: IEC 61000-4-2 (2025) {latest issue} –</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body</p>

<p>“Testing and measurement techniques of Electrostatic discharge immunity test”.</p> <p>Limits: -</p> <p>i) Contact discharge level 2 {±4kV} or higher voltage; Compliance Criteria: Performance Criteria-B</p> <p>ii) Air discharge level 3 {± 8 kV} or higher voltage; Compliance Criteria: Performance Criteria-B</p>	<p>(CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>
<p>c) Immunity to radiated RF:</p> <p>Name of EMC Standard: IEC 61000-4-3 (2020) {latest issue} – “Testing and measurement techniques-Radiated RF Electromagnetic Field Immunity test”</p> <p>Limits:-</p> <p>i) Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz, and Compliance Criteria: Performance Criteria-A</p> <p>ii) Under test level 3 (10 V/m) for protection against digital radio</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>

	<p>telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 to 6.0 GHz.</p> <p>Compliance Criteria: Performance Criteria-A</p> <p>For Telecom Terminal Equipment without voice interface (s)</p> <p>Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz, and for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz.</p>	
	<p>d) Immunity to fast transients (burst):</p> <p>Name of EMC Standard: IEC 61000-4-4 (2012) {latest issue} – “Testing and measurement techniques of electrical fast transients/burst immunity test”</p> <p>Limits:-</p> <p>Test Level 2 i.e. a) 1 kV for AC/DC power lines; b) 0.5 kV for signal / control / data / telecom lines;</p> <p>Compliance Criteria: Performance Criteria-B</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>

	<p>e) Immunity to surges:</p> <p>Name of EMC Standard: IEC 61000-4-5 (2014) {latest issue} – “Testing & Measurement techniques for Surge immunity test”</p> <p>Limits:-</p> <p>i) For mains power input ports : (a) ± 2 kV peak open circuit voltage for line to ground coupling (b) ± 1 kV peak open circuit voltage for line to line coupling</p> <p>ii) For telecom ports : (a) ± 2 kV peak open circuit voltage for line to ground</p> <p>Compliance Criteria: Performance Criteria-B</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>
	<p>f) Immunity to conducted disturbance induced by Radio frequency fields:</p> <p>Name of EMC Standard: IEC 61000-4-6 (2023) {latest issue} – “Testing & measurement techniques-Immunity to conducted disturbances induced by radio-frequency fields.”</p> <p>Limits:-</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>

	<p>Under the test level 2 {3 V r.m.s.}in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines.</p> <p>Compliance Criteria: Performance Criteria-A</p>	
	<p>g) Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any)</p> <p>Name of EMC Standard: IEC 61000-4-11 (2020) {latest issue} – “Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests”</p> <p>Limits:-</p> <ul style="list-style-type: none"> i) A voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500 ms) ii) A voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms (i.e. 40% supply voltage for 200ms) iii) A voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s. 	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab(Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>

	<p>iv) A voltage interruption corresponding to reduction of the supply voltage of >95% for 10 ms</p>	
	<p>h) Immunity to voltage dips & short interruptions (applicable to only dc power input ports, if any) Name of EMC Standard: IEC 61000-4-29:2000: Electromagnetic compatibility (EMC)-Part 4-29: Testing & measurement techniques- voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests</p> <p>Limits:-</p> <p>i) A voltage interruption with 0% of supply for 10ms</p> <p>ii) A voltage interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms</p> <p>iii) A voltage dip corresponding to 40% & 70% of supply for 10ms, 30ms</p> <p>iv) iv) A voltage dip corresponding to 40% & 70% of supply for 100ms, 300ms and 1000ms</p> <p>v) A voltage variation corresponding to 80% and</p>	<p>The manufacturer shall be asked to submit a certificate and the test results from any TEC recognized lab (Conformity Assessment Body (CAB)), for the compliance of EMC standard laid down in this clause. The copy of valid accreditation certificate and scope of accreditation of the respective lab/CAB should also be submitted along with the test reports.</p>

	<p>120% of supply for 100ms to 10s</p> <p>Note-1:The test agency for EMC tests shall be an accredited agency and details of accreditation shall be submitted.</p> <p>Note-2:For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16(or TEC 11016:2016) (or latest release) and the references mentioned therein unless otherwise specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (h) and TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16(or TEC 11016:2016) (or latest release). The details of IEC/CISPR and their corresponding Euro Norms are as follows:</p>	
--	---	--

	IEC/CISPR	Euro Norm	
	CISPR 11	EN 55011	
	CISPR 32	EN 55032	
	IEC 61000-4-2	EN 61000-4-2	
	IEC 61000-4-3	EN 61000-4-3	
	IEC 61000-4-4	EN 61000-4-4	
	IEC 61000-4-5	EN 61000-4-5	
	IEC 61000-4-6	EN 61000-4-6	
	IEC61000-4-11	EN 61000-4-11	
	IEC 61000-4-29	EN 61000-4-29	
11.0	Safety requirements:		
11.1	The operating personnel should be protected against shock hazards as per IS 8437 {1993} "Guide on the effects of current passing through the human body" [equivalent to IEC publication 60479].		Ensure that terminal for grounding the chassis is available (applicable only to metal body).
11.2	The instrument shall conform to the relevant clauses of the IEC 61010-1:2017(latest issue) "Safety requirements for Electrical Equipment for Measurement, Control and laboratory use"		Check and verify as per the requirement of the clause.
11.3	Optical Safety Requirements: The instrument shall meet the optical safety requirements as per IEC 60825-1:2014 Safety of laser products - Part 1: Equipment		Ensure that the protection against short circuit and open circuit in the accessible points for measurements shall be provided

	<p>classification and requirements (latest issue). The instrument shall have visual warnings and controls ensuring danger free operation.</p> <ol style="list-style-type: none"> 1. Markings: (LASER PRODUCT) 2. Controls: It shall have auto-blocking shutter/ blocking cap (attached to the instrument so that it is not lost in any case.) for the optical input / output port when no fibre is connected. 	
11.4	<p>Optical Access Port:</p> <ol style="list-style-type: none"> a) The optical access ports shall be easy to clean by the operator. b) The optical access ports should be designed to protect themselves against the entry of dust when they are not occupied by an external fibre optic connection. c) The optical access ports should be designed with minimum reflectance. 	<p>Check and note down the operating voltage.</p>
12.0	<p>Protection Requirements</p>	
12.1	<p>The instrument panel shall have a terminal for grounding the chassis, if required.</p>	<p>Ensure that terminal for grounding the chassis is available (applicable only to metal body).</p>

12.2	The plug-in units, if provided, shall have suitable protection to allow their removal/ insertion while the instrument is in energized condition.	Check and verify as per the requirement of the clause.
12.3	All switches and controls on front panel shall have suitable safeguards against accidental operation.	Ensure that all switches/controls on front panel are having suitable safeguards against accidental operation i.e., operation of any wrong key would not cause any problem in the functioning of the instrument.
12.4	The instrument shall be adequately safeguarded to prevent entry of even dust, insects etc.	Note that the instrument is compact built and there is no provision of any entry of dust, insects and lizards.
12.5	Protection against short circuit and open circuit in the accessible points for measurements shall be provided.	

CHAPTER-2

Clause No.	Clause	Type of Test / Test No. etc. *
13.0	Accessories:	
13.1	<p>The supplier shall provide one complete set of:</p> <p>a) All the necessary interfaces, connectors, connecting cables (including power cord) and accessories required for satisfactory and convenient operation of the instrument. Types of connectors, adapters to be used and the accessories of the approved quality shall be clearly indicated in the operating manuals.</p> <p>b) Software (if any), along with software version and the arrangement to load the software at site. Any updating of software shall be supplied free of cost. (Additional sets may be ordered optionally). This upgrade shall be done at the site via internet, if required.</p>	<p>Note and record that the instrument is provided with the necessary interfaces, connectors, connecting cables and accessories required for satisfactory and convenient operation and that they are of approved quality.</p> <p>Ensure that the arrangement to load the software at site is provided.</p> <p>Ensure that the precautions for setting up, measurements and maintenance are given in the manual.</p>
13.2	<p>Special tools, extender boards, extender cables and accessories essential for installation, operation and maintenance of the instrument shall be clearly indicated and supplied along with the instrument.</p>	<p>Ensure that Special tools, extender boards, extender cables and accessories essential for installation, operation and maintenance of the instrument are provided during supply of the instrument.</p>

13.3	The source of the components/ accessories, from where these have been procured, is also to be submitted by the manufacturers.	Manufacturer shall submit the source of the components/ accessories, from where these have been procured.
13.4	Detailed information for components/module accessories used shall be clearly indicated.	Manufacturer shall clearly indicate detailed information for components/module accessories used.
14.0	<p>Documentation:</p> <p>Technical literature in English language shall be provided in hard copy as well as soft copy. All aspects of installation, operation, maintenance and repair including the illustration of external mechanical parts shall be covered in the manuals. The soft copy or hard copy of the manuals should also be provided in Hindi language for sale/purchase of instrument within India. The manuals shall include the following:</p> <p>i) Installation, operation and maintenance manual - This manual shall include the following in addition to other details:</p>	Check as per the requirement of the clause.
	a) Safety measures to be observed in handling the Testing Instrument.	Ensure that the safety measures have been listed for handling the equipment.
	b) Precautions for setting up, measurements and maintenance.	Ensure that the precautions for setting up,

		measurements and maintenance are given in the manual.
	c) Test equipment required for routine maintenance and calibration including their procedures.	Ensure that the Test equipment required for routine maintenance and calibration including their procedures are given.
	d) Illustration of internal and external mechanical parts.	Internal and external mechanical parts are illustrated.
	e) The detailed description about the operation of the software used in the equipment including its configuration procedure, installation, loading and debugging etc.	Ensure that the detailed description about the operation and procedure for software download, installation and debugging etc. are given.
15.0	Surface finish, Marking, Packaging and Shipping:	
15.1	Marking:	
15.1.1	The carrying case and tool kit of the instrument shall be marked for the following and shall be legible: a) The name of the product, manufacturer's model and serial number. b) The name of the supplier / manufacturer. c) The date of manufacture. d) Any other relevant information	Note that the carrying-case and tools-kits of the instrument are clearly marked with the name of the products, model and serial number, name of the supplier / manufacturer, date of manufacturing etc.

15.2	Surface finish:	
15.2.1	The inside and out side surfaces shall have uniform colour and texture.	
15.2.2	The painted finish on metallic surfaces shall be resistant to impact and shall not exhibit radial cracking when subjected to 2.8 N-meter load and tested as per ASTM D 2794 or any other equivalent International Standard.	
15.2.3	The finish and markings shall adhere to the base metal and shall not show any separation of coats when tested as per ASTM D 2197 or any other equivalent International Standard.	
15.2.4	The surface finish and markings shall be resistant to chemicals that are normally found in the telephone plant and shall not exhibit any perceivable changes when exposed to ultra violet light.	
15.3	Packaging & shipping:	
15.3.1	Packaging of the instrument shall be adequate to ensure that no damage will occur under normal shipping, handling and storage in reasonably dry unheated quarters.	Check as per the requirement of the clause.
15.3.2	Shipping container and packaging of the instrument shall be reusable recyclable and biodegradable.	Check as per the requirement of the clause.
15.3.3	A suitable carrying case (suitable for air, rail & road transport) for the instrument shall be provided	Check as per the requirement of the clause.

<p>16.0</p>	<p>Guidelines for Purchaser:</p> <p>Following guidelines are for the reference of the purchaser only, and are not to be tested during Evaluation/Testing.</p> <p>a) The tenderer may ask the supplier to provide the end user with software that will convert files from the OTDR data standard to the suppliers existing file format as per Telecordia document No.SR-4731 (latest issue), if needed.</p> <p>b) As and when bugs are found/determined in the software, the manufacturer shall provide patches and firmware replacement if involved free of cost for three years. Modified documents wherever applicable shall also be supplied free of cost.</p> <p>c) The manufacturer/supplier shall furnish the list of recommended spares.</p> <p>d) The supplier shall have maintenance/repair with calibration facility in India.</p> <p>e) Supplier shall guarantee the supply of spares so long as the instrument is in service, at least for ten years from the date of supply. The purchaser would like to stock spares as and when the supplier decides to close down the production of the offered instrument. In such an event, supplier shall give a two years notice to the purchaser so as to stock the spares.</p>	<p>Guidelines are for the reference of the purchaser only</p>
--------------------	---	---

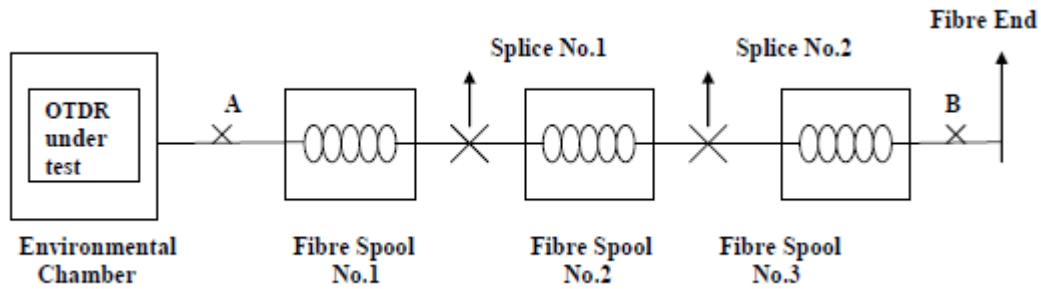
	<ul style="list-style-type: none">f) Purchaser can order additional measurement options separately.g) Purchaser may ask for PON OTDR with in-built PON power meter also.h) Purchaser may ask for additional optional capability for remote accessi) Purchaser may ask for additional optional interfaces, if required	
--	--	--

**Physical Check/Declaration/Documentation/ Report from Accredited test lab/
Functional verification / Information / Test No.*

ENVIRONMENTAL TEST

Checking of Optical time domain reflectometer under different environment conditions as per QM 333 B2 Category including Vibration and Topple test.

Set up for the Environmental Test



1) After Vibration and Topple test

A) Vibration Test:-

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At Ambient	1310 nm				
	1550 nm				
At Ambient (After Vibration)	1310 nm				
	1550 nm				

B) Topple Test:-

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
	1310 nm				

At Ambient	1550 nm				
At Ambient (After Topple)	1310 nm				
	1550 nm				

Note : Attach the printout of the observation.

Remarks :

2) After cold cycle

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At ambient	1310 nm				
	1550 nm				
At - 5 degree (Functional Test)	1310 nm				
	1550 nm				
At 0 degree C	1310 nm				
	1550 nm				
At Ambient	1310 nm				
	1550 nm				

Note : Attach the printout of the observation.

Remarks :

3) After dry heat cycle

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At ambient	1310 nm				
	1550 nm				
At 55 Degree C (Functional Test)	1310 nm				
	1550 nm				
At 50 degree C	1310 nm				
	1550 nm				
At Ambient	1310 nm				
	1550 nm				

Note : Attach the printout of the observation

Remarks :

4) After damp heat cyclic

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At Ambient	1310 nm				
	1550 nm				
After 24 hrs. (Functional Test)	1310 nm				
	1550 nm				
After 48 hrs. (Functional Test)	1310 nm				
	1550 nm				

After 72 hrs. (Functional Test)	1310 nm				
	1550 nm				
At Ambient (After Recovery)	1310 nm				
	1550 nm				

Note : Attach the printout of the observation

Remarks :

5) After Rapid Temperature cycle

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At Ambient	1310 nm				
	1550 nm				
At Ambient (After Recovery)	1310 nm				
	1550 nm				

Note : Attach the printout of the observation.

Remarks :

6) After Steady state cycle

Environmental Conditions	Wavelength	Attenuation for Fixed Distance A & B	Splice Loss		End of Fibre
			1	2	
At Ambient	1310 nm				
	1550 nm				
After 24 hrs. (Functional Test)	1310 nm				
	1550 nm				
At 35 degree C 95 % RH	1310 nm				
	1550 nm				
After 48 hrs. (Functional Test) At 35 degree C 95 % RH	1310 nm				
	1550 nm				
After 72 hrs. (Functional Test) At 35 degree C 95% RH	1310 nm				
	1550 nm				
At Ambient (After Recovery)	1310 nm				
	1550 nm				

Note : Attach the printout of the observation.

Remarks

PROCEDURE

Procedure No.1 : Check of Central wave length and spectral width

Connect the OTDR under test to optical spectrum analyser with a patch cord . Set the Optical spectrum in auto mode . Press the real time key of the OTDR for continuously transmission of optical pluses . Select the RMS mode of the optical spectrum analyser. Check for the central wave length and spectral width of the instrument under test shall be within the limits of the GR. Record the readings and if possible take the printout.

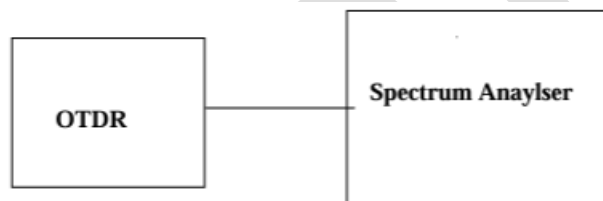


Fig 1

Procedure No. 2: Check of Dynamic Range

Set the measurement wavelength to 1310nm , the distance range to maximum, pulse width to maximum or as specified by the manufacturer and after keeping the averaging mode to averaging ..

The dynamic range can be checked by any one of the method as given below :

Method no 1.

Choose the fibre length shall have loss more than dynamic range. Measure it after creating an event near the far end of the fibre length. Check the loss and distance of the event.



Fig 1

Method no 2.

Connect the light source to power meter as shown in the figure 2. Measure the output of the source with a power meter. Now connect Fibre spool A , Variable attenuator and Spool B as shown in the figure 3 and adjust the variable attenuator so that the output of the set up is equal to the value of dynamic range .

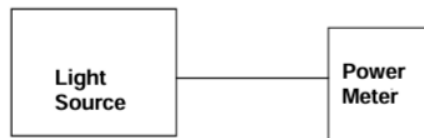


Figure No. 2

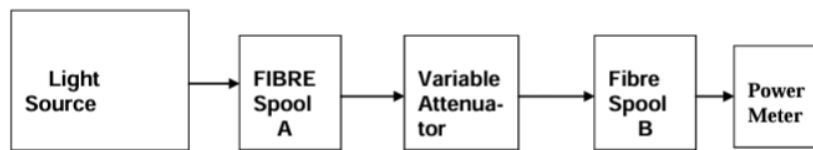


Figure no 3

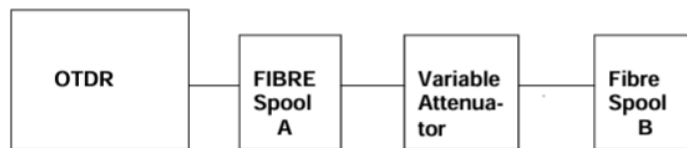


Figure no 4

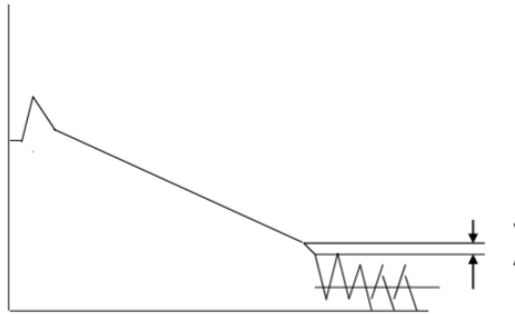


Fig.5

Now without disturbing the set up connect it to the OTDR and start the measurement. Apply grease to the far end of the fibre or terminate it. Set the marker 1 at 0 Km and set the marker 2 above the noise peak level. Measure the loss between marker 1 and marker 2. Measure the Effective dynamic range . (Effective dynamic range : The difference between the level of the point which is 0.3db higher than the peak noise level and the near end back scattering occurs.

Calculate the dynamic range of SNR=1 (of the instrument under test) that is the level difference between the RMS noise level and the level where the near end back scattering occurs (as shown in the figure5).

Perform the test keeping the measurement wavelength to 1550nm .

Sl.No	Pulse Width	Dynamic Range

Procedure No. 3: Check of Event dead Zone (Fresnel Reflection):

Set the measurement wavelength to 1310nm , the reflection index to 1.46000, the pulse width to 10ns or as defined by the manufacturer and the averaging mode to averaging. Connect two spool of fibre length having FC/PC connector to each other as shown in the figureNo.1.

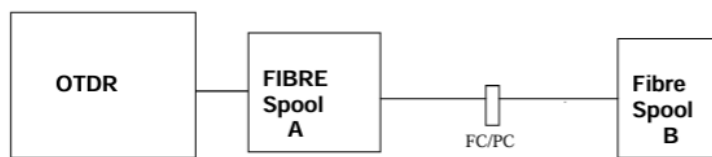


Fig 1

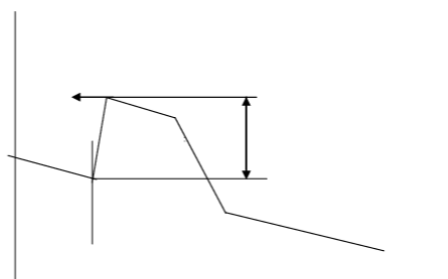


Fig 2

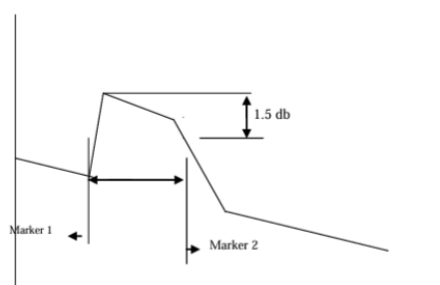


Fig 3

Perform the real time measurement. Set the marker 1 at before the fresnel event and the marker 2 at the top of the fresnel and this will indicate the return loss which shall be 35 to 40db of the connector. See figure 2.

Set the marker 1 at the rising start point of fresnel of the measured waveform and marker 2 at the point at which the level difference from the fresnel peak is at least 1.5 db. (See figure 3)

Note the distance between marker 1 and 2. The distance (Event dead Zone) shall meet the requirement of the GR.

Perform the test keeping the measurement wavelength to 1550nm.

SI.No	Pulse Width	Dynamic Range

Procedure No. 4: Check of Near end dead zone

Set the measurement wavelength to 1310nm , the reflection index to 1.46000, the pulse width to 20ns or as defined by the manufacturer and the averaging mode to averaging. Perform the real time measurement .Set the marker 1 at the rising start point of the initial fresnel of the waveform and marker 3 from 50 m from marker 1 and marker 4 near the far end of the fibre. Use the slope fit function and set the marker 2 at the point from the production of flat waveform within in 0.05db.

Check and ensure that the distance between marker 1 and marker 2 is as per GR

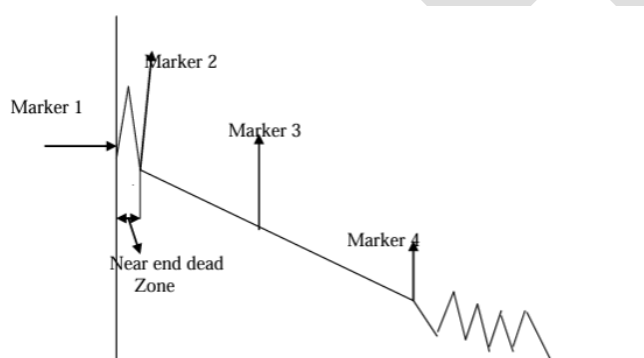


Fig 1

Perform the test keeping the measurement wavelength to 1550nm.

SI.No	Pulse Width	Dynamic Range

Procedure No. 5: Check of Sampling Resolution

Connect 2km fibre spool to the OTDR and perform the measurement after keeping the distance range 10km, pulse width to 1us IOR 1.46000 and set horizontal scale to maximum. Move the cursor by 1division and ensure the change in distance should be less than the requirement of the GR and measured value shall be indicated.

Sl.No	Pulse Width	Remarks

Procedure No. 6: Check of Distance Accuracy

Connect the standard optical fibre whose length (Known) is calibrated to the OTDR under test and perform the measurement. For the different ranges of accuracy ensure that the distance shall be as per the requirement of GR.

(A standard fibre length shall be measured and if it meets the requirement of the range as per GR. The remaining ranges shall be acceptable, if the calibrated fibre length is not available with the vendor or manufacturer)

Sl.No	Observation	Remarks

Procedure No. 7: Check of Accuracy/Linearity

Attenuation Measurement Accuracy/ linearity

Specification : +/- 0.05 dB/dB

Accessories Required: 2 fiber spools of length approximately 2 km, 1 fiber spool of length 1 km, 1 variable attenuator , fusion splicer, optical light source and optical power meter.

Total length of three fiber spools should be less than 6 km.

Before measurement , calibrate the ATT2 to approximately 1 dB. Splice the two fiber spools of length of 2 km together . The splice loss should be minimum.

Connect light source at one end and power meter to the other end and measure the optical power level. Now break the splice point and create a “bad” splice of loss of approximately 1 dB. Again measured the optical output level and difference between two level should be 1 dB.

- 1) Prepare the measuring system fig.1 and set the distance range to 10 km, the pulse width to 100ns and the reflection index to 1.4600.
- 2) Before measurement, calibrate the loss of ATT2 to 1dB .
- 3) Set the ATT1 to minimum, and measure at averaging time to 2^{16} .
- 4) Set the ATT1 to increased 5dB from procedure 3 check the ATT2 and note the value as x_2 . And check to ensure that the loss value is in accordance with specifications.
- 5) Repeat to procedure 4 until the point of ATT2 became 10 dB from noise peak.
- 6) Accuracy/linearity $= (x_2 - x_1) / x_1$ dB/dB

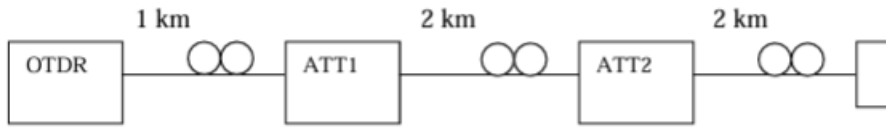


Fig. 1 - Prepare the measuring system for linearity

SI.No	Observation	Remarks

Procedure No. 8 : Check of Reflectance Measurement Accuracy

Specification : +/- 2dB

- 1) Please use fiber length of 2 to 6 km and use both fiber end of FC/PC connectorised.
Note: Make sure the end of the connector is not scratched and has not been used for other purposes. The theoretical value of the return loss by the fresnel event is -14.7 dB.
- 2) Set the OTDR condition of optical pulse width to 500ns, distance range to 10 km , set averaging mode to hi-return, averaging 2^{16} , approximation method to TPA and backscattered level to level to -52 dB for 1550 nm and -50 dB for 1310 nm.
- 3) After measurement of fiber, set marker 1 at the starting point of reflection and marker 2 at peak of reflection and measured the reflection loss and ensure the value is within +/- 4 dB of -14.7 dB.

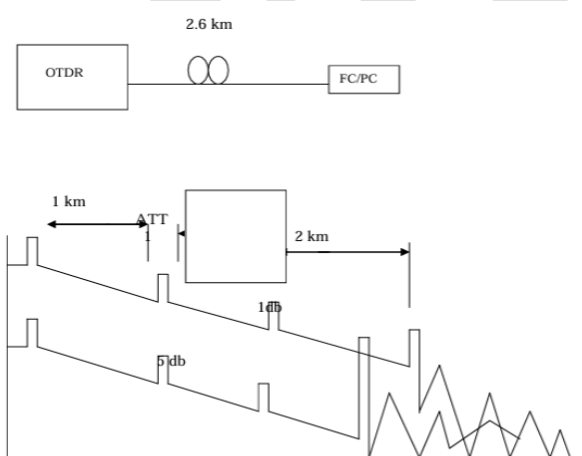


Fig 1

Attenuation Measurement Accuracy

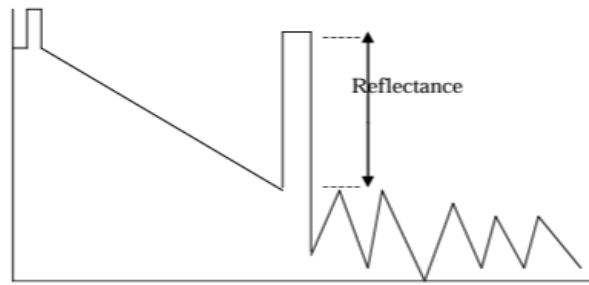


Fig .2
Reference Measurement Accuracy

SI.No	Observation	Remarks

I. SUMMARY OF TEST RESULTS

TEC Standard No. _____

TEC Test Guide No. _____

Equipment name & Model No. _____

Clause No.	Compliance <i>(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)</i>	Remarks / Test Report Annexure No.

[Add as per requirement]

Date:

Place:

Signature & Name of TEC testing Officer /

** Signature of Applicant / Authorized Signatory*

** Section I as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.*