RADIODETECTION®

Lexxi™ T1660 Time Domain Reflectometer

Operation Manual, Rev 1

Document 90/T1660-OPMAN-ENG/01

SPX®

Before you begin

Thank you for your interest in Radiodetection's LEXXI™ T1660 cable fault locator. Please read this user manual in its entirety before attempting to use the Lexxi T1660 system.

Radiodetection products, including this manual, are under continuous development. The information contained within is accurate at time of publication; however the Lexxi T1660, this manual and all its contents are subject to change.

Radiodetection Limited reserves the right to modify the product without notice and some product changes may have taken place after this user manual was published.

Contact your local Radiodetection dealer or visit www.radiodetection.com for the latest information about the Lexxi T1660 product family, including this manual.

Safety

⚠️ WARNING! Failure to comply with safety warnings can cause serious injury or death

CAUTION!: Failure to comply with safety cautions can result in damage to equipment or property

This equipment shall be used only by qualified and trained personnel, and only after fully reading this Operation Manual.

⚠️ WARNING! Direct connection to live conductors is POTENTIALLY LETHAL. Direct connections to live conductors should only be attempted by fully qualified personnel using the relevant products that allow connections to energized lines.

Description

The Lexxi™ T1660 is a Time Domain Reflectometer, also known as a Cable Radar. Electrical pulses are transmitted into a cable, and a portion of the pulse energy is reflected back from cable imperfections. These can be discontinuities (eg cable joints, changes in cable type or the far end of the cable under test) or faults (typically short circuits, open circuits, or high resistance joints).

The transmitted pulse and the reflected pulse(s) are shown on the display. The time taken by the pulse to travel to the imperfection and back is a measure of the distance to the fault. The distance is displayed after the cursor is positioned at the start of the reflected pulse. The type of imperfection can be assessed by analysing the displayed waveform.

NOTE: The cable must contain at least two conductors or one conductor and screen.

The Lexxi T1660 is shipped with a set of 100Ω crocodile clip Twisted Pair connection cables as standard. Optional plug-in modules are also available to optimise measurements on 100Ω twisted pair, 75Ω coaxial, 50Ω coaxial or 25Ω power cable. The power cable test lead is fused and has a blocking filter to allow working on live cables up to 600V rms or peak DC.

Velocity of Propagation (VOP)

The properties of the cable, mainly the insulation between the two conductors, greatly affect the velocity of the TDR pulses. This velocity is known as the Velocity of Propagation (VOP), or Velocity Factor (PVF). The TDR uses this value to calculate distance, so it is important for this to be as accurate as possible.

The Lexxi T1660 can accept user selectable values between 1 and 99% (or the equivalent value in feet or meters per microsecond).

The VOP values for some common cable types are:

| **Power** | Paper Oil Filled (PILC) | 0.50 to 0.56 |
| | Cross linked poly (XLPE) | 0.52 to 0.58 |

Twisted Pair	Polyethylene	0.67
	Jelly filled poly	0.64
	PTFE	0.71
	Paper (Pulp 0.083µf/mile)	0.72
	Paper (Pulp .072µf/mile)	0.88

Coax	Foam Poly	0.82
	Air Spaced Coaxial	0.94
	Air	0.98
	Solid PE	0.67

Keypad

Select

Left · Right

Up · Down

Power/Escape
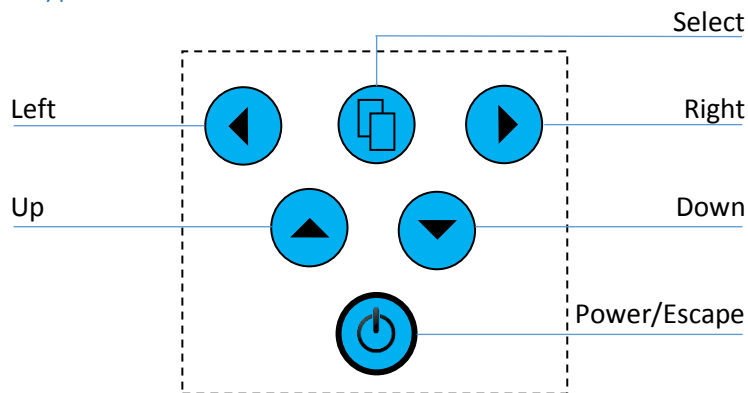
Operation

1. Press ⏻ to power the Lexxi T1660 on
2. At power on, press any key to continue from the Radiodetection screen
3. Use the ▲ and ▼ to select from Measurements or Settings then enter by pressing ⎘

4. In Settings, use (◀) and (▶) to change parameters then press (⏻) to escape to the main menu

5. Select "Measurements" to enter the TDR screen

6. Press (◀) and (▶) to move the cursor

7. "Range" option is highlighted by default. Press (▲) and (▼) to change range scale

8. Press (📇) to scroll to the other parameters such as impedance and VP%, then press (▲) and (▼) to change the selected parameter values to match the cable under test

9. To return to the main menu, press (⏻)

Waveforms

The display of the Lexxi T1660 shows a launch pulse at the left hand side of the display and a reflected pulse if any cable imperfections are within range (see "Description" section).

Move the cursor so that it is positioned at the start of the reflected pulse. The distance to the imperfection is then displayed in the top right hand corner of the display.

Open circuit and high impedance series faults will result in a positive (upward) reflected pulse. Short circuit and low impedance shunt faults will give a negative (downward) reflection.

Power down

1. Go to the main menu by pressing (⏻)
2. Press (⏻) again for 2 seconds

Operation with the Blocking Filter

NOTE: Refer to the Safety Section at the rear of this Manual

The Blocking Filter optional accessory is designed to allow safe use on cables energised at up to 600V ACrms 50/60 Hz or 600V DC, Installation Category III with a maximum prospective system fault current of 46kA. Connection to energised cables should only be carried out by trained personnel. Whenever possible, the power supply to the cable under test should be disconnected.

A red neon indicates when the test leads are connected to an AC voltage of greater than 100V p-p. The neon should be treated as a visual indicator only and not as an indicator of hazardous live voltages (see IEC 61010-1, EMC BS/EN 61326-1).

Keep hands clear of live conductors when connecting insulated crocodile clips to the cable under test. Always keep fingers behind the crocodile clip protection guards.

When using the 33ft (10m) range, best results are obtained by keeping the leads (from the crocodile clips to the filter box) as close together as possible. However, take great care not to short circuit anything while doing this.

If any part of the Blocking Filter test lead is damaged, then it must not be used. If a test lead fuse has blown it must be replaced with a fuse of the correct type (see NOTE below). Should a fuse blow for a second time then the complete unit should be returned to Radiodetection for investigation.

The Blocking Filter should be tested annually for breakdown, please refer to the Service section of this manual for details.

Blown Test Lead Fuses can be diagnosed as follows:

Remove both crocodile clips from the cable under test prior to inspection of fuses.

Plug the Blocking Filter into the Lexxi T1660, with the range set to 33ft (10m) and ensure it is not connected to a cable.

Short the crocodile clips together and check that the displayed pulse changes. If the pulse is unchanged, a fuse is blown.

NOTE: The fuses fitted are 500mA Quick Action 1.3" (32mm) ceramic with a breaking capacity of at least 46kA at 600V ACrms 50/60Hz or 600V DC.

Specifications

Parameter	Specification	Notes
Ranges	7, 15, 30, 60, 120, 250, 500, 1000, 2000, 3000, 6000	Meters
	23, 49, 98, 197, 394, 820, 1640, 3280, 6560, 9850, 19000	Feet
Range Selection	Manual range control	
Accuracy	1% of selected range*	
Display	320x640 pixel color backlit LCD	
Resolution	Approx 1% of range	
Sensitivity	Min 3 pixel return at 4km (13000') on 0.6mm (0.024") Ø cable	PE Twisted Pair cable
Velocity Factor, VoP	Adjustable from 1% to 99%	
Output Pulse	5V peak to peak	Into open circuit
Output Impedance	Selectable 25, 50, 75 & 100 ohms	
Output Pulse Width	3ns to 3ms	Automatic with range
Scan Rate	2 scans/second	
Batteries	Six AA (LR6/R6) Alkaline or NiMH cells	
Battery Life	12 hours typical, continuous operation	Alkaline batteries
Voltage Protection	600V AC Category III, 300V AC Category IV	Lexxi T1660 with Mains Blocking Filter
	250V AC	Lexxi T1660 with all other connections and Plug-In Module options (see Ordering information)
Power Down	Select 1, 3, 5, 10, 15 minutes or disabled	
Operating Temp	-10° to 50°C, 14° to 122°F	
Storage Temp	-20° to 70°C, -4° to 158°F	
Dimensions	250x100x55mm, 9.8x4x2.2"	
Weight	600g, 1.3lb	
Safety	IEC 61010-1, EMC BS/EN 61326-1	
Water/Dust Proof	IP54	

Measurement accuracy of ±1% assumes accurate setting of Velocity of Propagation (VoP), homogeneity of VoP along the length of the cable and accurate cursor positioning.

Ordering Information

Description	Sales Part Number	Notes
Lexxi T1660 TDR	10/T1660	Lexxi T1660 TDR
100Ω Twisted Pair, Alligator Clips	10/T1660-TP-ALLIG	Connection cables
Mains Blocking Filter, 25Ω, Cat IV	10/T1660-BLOCK-MOD	Plug-in Module, option
50Ω Twisted Pair Plug-In, Croc Clip	10/T1660-TP-CROC-MOD-50	Plug-in Module, option
100Ω Twisted Pair Plug-In, Croc Clip	10/T1660-TP-CROC-MOD-100	Plug-in Module, option
75Ω BNC Plug-In, BNC-F adapter	10/T1660-BNC-MOD-75	Plug-in Module, option
Lexxi T1660 Bag, clear cover	10/T1660-BAG	Bag

Batteries

The unit operates from six 1.5V AA (R6/LR6) batteries which can be either non-rechargeable alkalines or rechargeable NiMH.

CAUTION: Do not attempt to recharge alkaline batteries

⚠️ WARNING: Disconnect the test leads from any cable before removing the battery cover

To fit the batteries:

- Place the Lexxi T1660 face down
- Undo the battery compartment retainer (¼ turn anti-clockwise)
- Lift off the cover and remove any old batteries, retaining the battery tubes if used
- Insert the batteries into the Lexxi T1660, using the battery tubes if available, ensuring the polarity markings match those in the battery compartment.
- Replace the cover and re-fasten the retainer (¼ turn clockwise). DO NOT OVERTIGHTEN

NOTE: When you turn on your Lexxi T1660 after installing new batteries, it will ask you to choose the battery type. Scroll to the correct type using the "Up" and "Down" arrow keys, then press the "Select" key to choose that option.

Service

The Lexxi T1660 TDR contains no user serviceable items except the batteries. In the unlikely event of failure, please contact your local representative for details of repair or replacement.

In order to maintain the accuracy of this equipment, it is recommended that annual calibration and maintenance is carried out. Please contact your local representative for details.

The Blocking Filter should be tested annually for breakdown between the crocodile clips connected together on one side and the 4 mm banana plugs connected together on the other side. The test voltage

should be raised to 5550V ACrms 50/60Hz within 2s and maintained for 2s. This must only be carried out by trained personnel using the correct equipment. Contact Radiodetection to arrange for this retest.

Care and maintenance

Ensure the unit is switched off before any care and maintenance tasks are carried out.

Cleaning

The Lexxi T1660 may be cleaned with a soft cloth lightly dampened with soapy water. Remove all soap residue then dry instrument with a dry cloth.

Compliance

EU Compliance

This equipment complies with the following EU Directives:

IEC 61010-1, EMC BS/EN 61326-1

Warranty

Subject to the conditions set out herein, Radiodetection Limited expressly and exclusively provides the following warranty to original end user buyers of Radiodetection products.

Radiodetection hereby warrants that its products shall be free from defects in material and workmanship for two years starting from point of sale to end customer. Extensions of this warranty period may be available where the same terms and conditions apply.

Statement of warranty conditions

The sole and exclusive warranty for any Radiodetection product found to be defective is repair or replacement of the defective product at Radiodetection's sole discretion. Repaired parts or replacement products will be provided by Radiodetection on an exchange basis and will be either new or refurbished to be functionally equivalent to new.

In the event this exclusive remedy is deemed to have failed of its essential purpose, Radiodetection's liability shall not exceed the purchase price of the Radiodetection product. In no event will Radiodetection be liable for any direct, indirect, special, incidental, consequential or punitive damages (including lost profit) whether based on warranty, contract, tort or any other legal theory.

Warranty services will be provided only with the original invoice or sales receipt (indicating the date of purchase, model name and dealer's name) within the warranty period. This warranty covers only the hardware components of the Radiodetection product.

Before a unit is submitted for service or repair, under the terms of this warranty or otherwise, any data stored on the unit should be backed-up to avoid any risk of data loss. Radiodetection will not be responsible for loss or erasure of data storage media or accessories.

Radiodetection is not responsible for transportation costs and risks associated with transportation of the product. The existence of a defect shall be determined by Radiodetection in accordance with procedures established by Radiodetection.

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This warranty is in lieu of any other warranty, express or implied, including any implied warranty of merchantability or fitness for a particular purpose.

This warranty does not cover:

a. Periodic maintenance and repair or parts replacement due to wear and tear.

b. Consumables (components that are expected to require periodic replacement during the lifetime of a product such as non-rechargeable batteries, bulbs, etc.).

c. Damage or defects caused by use, operation or treatment of the product inconsistent with its intended use.

d. Damage or changes to the product as a result of:

   i. Misuse, including: - treatment resulting in physical, cosmetic or surface damage or changes to the product or damage to liquid crystal displays.

   ii. Failure to install or use the product for its normal purpose or in accordance with Radiodetection instructions on installation or use.

   iii. Failure to maintain the product in accordance with Radiodetection instructions on proper maintenance.

   iv. Installation or use of the product in a manner inconsistent with the technical or safety laws or standards in the country where it is installed or used.

   v. Virus infections or use of the product with software not provided with the product or incorrectly installed software.

   vi. The condition of or defects in systems with which the product is used or incorporated except other 'Radiodetection products' designed to be used with the product.

vii. Use of the product with accessories, peripheral equipment and other products of a type, condition and standard other than prescribed by Radiodetection.

viii. Repair or attempted repair by persons who are not Radiodetection warranted and certified repair houses.

ix. Adjustments or adaptations without Radiodetection's prior written consent, including:

    a. upgrading the product beyond specifications or features described in the instruction manual, or modifications to the product to conform it to national or local technical or safety standards in countries other than those for which the product was specifically designed and manufactured.

x. Neglect e.g. opening of cases where there are no user-replaceable parts.

xi. Accidents, fire, liquids, chemicals, other substances, flooding, vibrations, excessive heat, improper ventilation, power surges, excess or incorrect supply or input voltage, radiation, electrostatic discharges including lightning, other external forces and impacts.

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Radiodetection is a leading global develop and supplier of test equipment used by utility companies to help install, protect and maintain their infrastructure networks