KI 7340 Series
Two Way Test Set + ORL

KI 7740 Series
Two Way Loss Test Set

OPERATION & MAINTENANCE GUIDE

KINGFISHER INTERNATIONAL

DECLARATION OF CONFORMITY

IN ACCORDANCE WITH ISO/IEC 17050:2004

Manufacturer's Name: Kingfisher International Pty. Ltd.
Manufacturer's Address: 720 Springvale Road, Mulgrave, Victoria 3170, Australia

hereby declares, that the products listed below

Product Name: **Optical Loss Test Set**
Model Number: **KI 7340/7740 Series**
Product Options: *This declaration covers all options of the above product(s)*

comply with the essential requirements of the applicable European Directives:

- Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, amended by 93/68/EEC, and carries the CE marking accordingly
- Directive 2002/95/EC on restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
- Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). The equipment can be disposed of at any local retail shop with WEEE collection point.

and conform to the following standards and specifications:

MIL-PRF-28800F: 1996 Performance specification -Test equipment for use with electrical and electronic equipment, general specification
IEC 60529: 2001/ EN 60529:1993+A1:2003 Degrees of protection provided by enclosures
IEC 61315:2005 Calibration of fiber-optic power meters

EMC	**Limit**
IEC 61326:2002 / EN 61326-1:1997+A1:1998+A2:2001+A3:2003	
IEC CISPR 11: 2004/ EN 55011:1998+A1:1999	Limits applicable to Group 1 Class B equipment
IEC CISPR 16-1:1999	Limits applicable to Class B equipment
IEC CISPR 16-2:1999	Limits applicable to Class B equipment
IEC 61000-3-2: 2005/EN 61000-3-2:2006	
IEN 61000-3-3:2002/EN 61000-3-3:1995	
IEC 61000-4-2:2001 / EN 61000-4-2:1995+A1:1998+A2:2001	4kV CD, 8kV AD
IEC 61000-4-3:2002/ EN 61000-4-3:2002	3V/m, 80-1000MHz
IEC 61000-4-4:2004/EN 61000-4-4:2004	1kV signal lines, 2kV power lines
IEC 61000-4-5:2005/EN 61000-4-5:2006	1kV line-line, 2kV line-ground
IEC 61000-4-6:2004/EN 61000-4-6:1996+A1:2001	3V, 0.15-80 MHz
IEC 61000-4-11:2004/EN 61000-4-11:2004	0.5 cycle/100%/each polarity

ICES-001: 2006 (Canada)
CFR 47 FCC Part 15, Subpart B (Exempted devices) (USA)

Safety

IEC 60825-1:2011 Safety of laser products-Equipment classification, requirements and user's guide
IEC 60825-2:2011 Safety of laser products-Safety of optical fiber communication systems (OFCS)
CFR 21 part 1040.10 (USA) Performance standards for light-emitting products- Laser products

Supplemental Information:
The product was tested in a typical configuration with Kingfisher International test systems.

26 May 2016
Date

Bruce Robertson
Name

Technical Director
Title

For further information, please contact your local Kingfisher International sales office, agent or distributor.

OPERATION MANUAL

KI7340C Series ORL and Two Way Loss Test Set

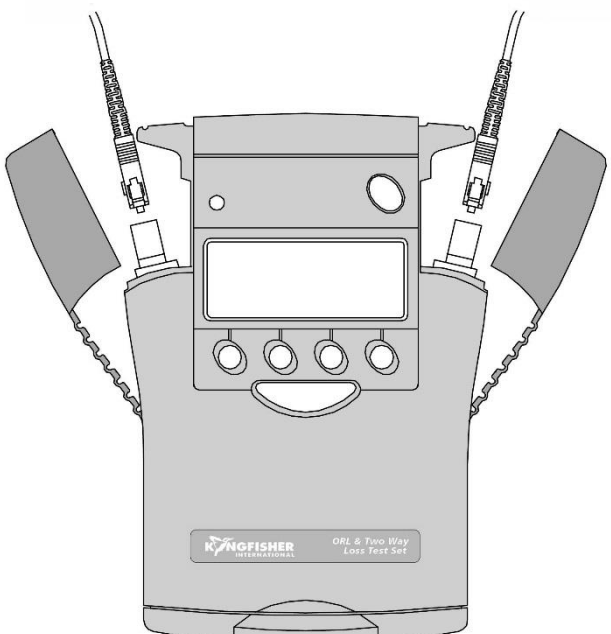
KI7740C Series Two Way Loss Test Set

Congratulations on your purchase of this equipment, engineered to provide excellent performance, convenience and reliability. To get the best use from your instrument and to ensure its safe operation, please spend a few minutes to read this manual.

Worldwide recognized accuracy and quality

ISO 17025

20533



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PLEASE REFER TO THE CONTROL PANEL PICTURE IN THE QUICK REFERENCE GUIDE SECTION OF THIS MANUAL

KI7340C SERIES ORL AND TWO WAY LOSS TEST SET

KI7740C SERIES TWO WAY LOSS TEST SET

SERVICE AND SUPPORT

Applications Support

Please visit www.kingfisherfiber.com to see our comprehensive **Application Notes** written to support instrument users.

Look at www.kingfisherfiber.com to find distributor details from the **Contact Us** section.

Our local agents are able to offer excellent applications advice in your language and time zone.

Please visit our website on www.kingfisherfiber.com for a current list of regional service centres.

Otherwise if you are having difficulties, please feel free to contact sales@kingfisher.com.au for applications support.

Instrument Service

Qualified personnel must perform adjustment, maintenance or repair of this product. To obtain service, please contact your local Kingfisher International distributor or our office in Australia:

Tel: (61) 3-8544-1700
Fax: (61) 3-8544-1793
Email: sales@kingfisher.com.au

If returning equipment to us for service or calibration, please download and complete the **Return Material Authorization Form** located on the **Support** page on our web site.

To avoid delays and minimise disruption for our customers, we offer a fixed price repair service.

For the staff at our fully equipped service and calibration centre, it is their pleasure to keep your equipment performing at its very best.

INTRODUCTION AND APPLICATIONS

These instruments incorporate traceable Power Meter, multi wavelength Light Source and Optical Return Loss Meter (KI7340C Series only) in one unit and are the industry fastest bi-directional loss testers. Calibration is ISO 17025 traceable. In addition to the usual light source and power meter functions, KI7340C/7740C Series provide optimum performance for testing of installed cable systems and components by automatic bi-directional multi wavelength attenuation measurement in Autotest.

Two Way Loss Test Sets can also be used as tone generator and detector. Instruments feature very high productivity and accuracy, large memory and instant pass/fail indication for bi-directional testing. Compact, robust, reliable and simple to operate, this is the ideal equipment for field or laboratory use by installers, technicians and engineers.

Typical applications:

- Attenuation testing
- System power testing
- Continuity testing with the test tone features
- Quality assurance and acceptance testing
- Telecom construction and maintenance, CATV, LAN and R&D applications
- Optical Return Loss (ORL) testing (KI7340C Series only)

Both series have options for high performance single mode/ multimode fiber testing and are compatible with all other instruments with Autotest mode.

A convenient menu-driven interface guides the user through operational sequences with hidden keypad access to advanced functions.

In addition, the KI7340C Series test sets feature zero warm up light sources, over 22 calibrated CWDM/DWDM wavelengths and an integrated ORL testing function.

The interchangeable optical connectors are protected by a snap on cover and are easily disassembled for cleaning. A wide variety of connector styles are available as an option.

The design of the instrument includes shock absorbing corners for drop protection and tough polycarbonate housing. The latest materials and methods have been used to produce an elegant, yet rugged instrument.

These instruments feature very long battery life of 360 hours for the meter, and 190 hours for the source. Alternatively, instruments can be used with optional external power supply OPT103B or powered via USB cable.

Automated testing using external PC software

KITS™ reporting software allows real-time instrument control and data download and, is easily customised to suit most languages and reporting requirements. Real time display, data logging and label printing functions are included. KITS™ enables merging of test results from multiple instruments and supports bi-directional testing for one-way equipment using successive measurements.

Two Way Loss + ORL testing features

Two Way + ORL loss at both ends can be tested at up to 4 wavelengths in one operation, providing major operational savings. The ORL function includes user selectable offset and residual compensation functions, which are typically used in component test applications.

The real time display update in this mode is unique, and typically offers genuine time saving for users.

Optical Power Meter:

Superior measurement confidence is achieved with a unique Total Uncertainty Specification, which covers the full temperature, measurement and connector range. A NATA/ILAC traceable calibration certificate is supplied.

Warm up period, range-changing delays and user dark current zeroing all eliminated.

The sensitive optical tone detector displays the actual measured tone frequency in Hz. If a standard tone is detected, the buzzer sounds, which is useful for fiber identification and continuity testing.

Power stability testing can be performed using the max/min recording function. The display can show dBm, dB and linear units, and can be put on hold for convenient data recording.

Standard power meters work with fiber core diameter up to 200 microns, with both PC and APC polish connectors.

Various detector options include Indium Gallium Arsenide (InGaAs), Silicon (Si) and various attenuated versions.

The InGaAs detector is the most common detector for general use.

InGaAs detectors give much improved absolute accuracy compared to Ge detectors, which are excessively sensitive to wavelength uncertainty and temperature above 1580 nm. This affects DWDM and CWDM applications.

Power meter calibration options are available from 600 nm to 1650 nm, which cover all popular application wavelengths, including CWDM calibrations from 1270nm to 1610nm in 20 nm increments. Power range is from +27dBm to -70 dBm.

Optical Light Source:

Multi- wavelength sources have switchable wavelengths through one port, which makes operation faster.

Laser sources at 1310/1390/1490/1550/1610/1625 are used for testing single mode fiber systems.

LED sources at 850 / 1300 nm are used for testing multimode fiber systems.

The 1300 nm LED can also perform short distance single mode testing. Light source features re-connection repeatability of 0.1dB. Combined with their excellent stability, this provides more accurate measurement results.

GENERAL SAFETY SUMMARY

The following safety signs and symbols specify general safety precautions which must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the instrument. Kingfisher International assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and user manual for safety instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

WARNING!

The **WARNING!** sign denotes a hazard. It calls attention to a procedure, practice or the like, which, if not correctly performed or adhered to, could result in injury. Do not proceed beyond a **WARNING!** sign until the indicated safety conditions are fully understood and met.

CAUTION!

The **CAUTION!** sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part, or all, of the product. Do not proceed beyond a **CAUTION!** sign until the indicated conditions are fully understood and met.

The apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.

Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically. If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Sales/Service Office.
To check instrument performance, please refer to **Performance Verification Tests** section of this manual.

WARNING! You must return malfunctioning instrument to an authorised Service Centre for repair and calibration.

Operating Environment

The range of Kingfisher equipment covered by this manual can be operated at temperatures between -15 °C and +55 °C and at relative humidity of <95%.

Storage & Shipment

The range of Kingfisher equipment covered by this manual can be stored or shipped at temperatures between -25 °C and +70 °C and at relative humidity of less than 95%. Protect the units from temperature extremes that may cause condensation within it.

Safety

When using this equipment, optical safety precautions should be observed commensurate with the maximum available source power, since most of this power can also be coupled out of the instrument.

WARNING! Observe optical safety when using high power.

Optical safety requirements at high power levels **MUST** be observed or eye damage is likely. Organisations and users operating optical equipment with these power levels **MUST** determine and observe relevant safety precautions, which are beyond the scope of this manual.

Line Power Requirements

This equipment operates at line power, when applied to the optional external power supply OPT103B.

LIGHT SOURCE SAFETY SUMMARY

Laser and LED Safety Information

Laser	Fabry-Perot or DFB semiconductor laser
Wavelength	1310/1390/1490/1550/1625 nm
LED	Surface emitting semiconductor LED
Wavelength	Part number specific
Max CW output power[1]	0.2 mW
Beam waist diameter	9 µm
Numerical aperture	0.1
Laser Class according to IEC 60825-2 (2011) – International	Class 1
21 CFR 1040.10 (2014)	Class 1
Maximum permissible CW output power[2] at 1310nm IEC 60825-2 (2011) - International	25.8mW
Maximum permissible CW output power[2] at 1550nm IEC 60825-1 (2011) - International	10.2 mW
Maximum permissible CW output power[2] at 1310nm 21 CFR 1040.10 (2014) – USA	2 mW
Maximum permissible CW output power[2] at 1550nm 21 CFR 1040.10 (12014) – USA	8.1 mW

Note 1: Maximum CW output power is defined as the highest possible optical power that the source can produce at its output connector. Refer to specification sheet for actual operating power

Note 2: Maximum permissible CW output power is the highest optical power that is permitted within the appropriate laser class. Refer to specification sheet for actual operating power

WARNING!

Optical power levels in fiber optic systems can cause permanent eye injury and damage to eyesight.

Never look into the end of an optical cable or connector, which might be attached to an active source.

Do not enable a laser when there is no fiber attached to the optical output connector.

Optical magnifying instruments (e.g. microscope) increase eye hazard.

Disconnect the source before using an optical magnifier.

The laser module has a built-in safety circuitry which will disable the optical output in the case of a fault condition, however, this cannot be guaranteed. An equipment assurance program is recommended to check for safe laser operation.

BATTERY AND EXTERNAL POWER

KI7340/7740C Series instruments are powered by two 1.5V alkaline 'C' size batteries.

About 30 % capacity is obtained when using two 1.5V alkaline 'AA' batteries and supplied 'AA' to 'C' size battery adaptors or 50 % capacity when using two 1.2V rechargeable NiMH 'C' size batteries.

Function	'C' size battery run time in hours:
Optical Power Meter only	360
Source / Two Way tester / ORL	190 (in Autotest)

When the batteries are low, a low-battery indicator is shown on the display. At this stage, there is approximately enough energy for another 10 hours of use.

To save energy, the instrument automatically turns off after 10 minutes without operation.

To change the batteries, open the cover of the battery compartment at the base of the instrument, remove the batteries and insert new ones.

For operation of the instrument by external power, use AC adaptor OPT103B or connect to computer via USB cable.

Suitable external power packs are easily available and must meet the following requirements:

- Comply with safety regulations and rated for local mains supply voltage
- Regulated or unregulated DC output 6-12V at 300mA max
- Connection polarity: + ve pin

Use of the external power supply disconnects the batteries as a safety precaution, since accidental charging of alkaline cells is hazardous. Rechargeable batteries must be removed for charging by an external charger.

CAUTION!

Do not use lithium batteries or other batteries with a nominal voltage greater than 1.8 V. The instrument may be damaged.

Protect our environment! Some batteries contain toxic heavy metals, so please dispose of them by returning to a re-cycling centre. Batteries purchased from Kingfisher agents can be returned to them for appropriate disposal.

OPTICAL CONNECTOR

To access the optical connectors, grasp a top corner of the instrument, and pull off the cover. Do this on both sides of the instrument.

Each optical port is mounted on a swivel, which allows the connector to be angled outwards for accessibility, and then pushed back and covered with the snap cover to provide dirt and drop protection.

Different styles of standard and optional connector adaptors can be easily fitted by the user.

The supplied standard connector adaptors have ceramic sleeves to avoid connector metal dust contamination.

CAUTION! Do not use damaged or incompatible connector adaptors.

When not in use, keep the test ports and connectors covered. To minimize connectors wear, instrument can be stored without removing the test leads. Never touch connector tips with your fingers, since body oils and dirt can impair its performance.

WARNING! Remove batteries before using a microscope to inspect instrument connectors.

Power Meter port:

This port can be used with both PC and APC connector styles.

Bare fiber adaptors must achieve fiber eccentricity of ± 100 microns, and an end tolerance of ± 300 microns relative to the ferrule end. Preferred bare fiber adaptors consist of a connector with fiber retention device or other end stop.

For regular work with bare fibers, it is preferable to use an alternative arrangement such as a multimode pigtail with a v-groove or mechanical splice.

CAUTION! Do not scratch the detector lens with glass fiber end when using bare fiber adaptors, or the instrument will be permanently damaged.

OPTICAL CONNECTOR

Light Source /Two Way/ ORL port:

A Light Source is either PC or APC connector specific. This is determined when ordering the instrument and, can only be changed at the factory.

CAUTION! The use of bare fiber adaptors with the source is not recommended as permanent instrument damage will occur, and very unstable measurements are likely.

How to clean the optical connectors

Always clean the mating connector tip and ferrule before mating, using approved materials.

CAUTION! Never use abrasive cleaners or permanent connectors damage may occur.

Power Meter port:

The glass power meter interface does not make contact with the inserted connector-there is a slight air gap. Therefore, it will not wear, and only needs occasional cleaning.

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First remove interchangeable connector adaptor, then use a soft brush, alcohol, air can or 'Blu Tac' to clean glass interface.

Light Source / Two Way / ORL port:

WARNING! Disable source when cleaning optical interfaces.

To clean the interface without removing the adaptor, use a "stick" style connector cleaner. This cleans both the adaptor and end face in one operation.

Alternatively, first remove the interchangeable adaptor to access the glass interface. Then blow away any dust or dirt with compressed air. If this is not sufficient, then clean the interface by rubbing a lint-free lens cloth over the surface using small circular movements.

GETTING STARTED AND TURNING ON

KI7340C/7740C Series instruments can be used in one of the following modes:

- Autotest
- Power Meter
- Light Source
- ORL Meter (KI7340C Series only)

Operation mode is selected by pressing corresponding button at the bottom of the LCD.

Pull off instrument connector covers. To install a connector adaptor, align the locating slot on the side of the through adaptor with that on the instrument connector, and press it on.

To remove an adaptor, press the release button on the back of the instrument and then pull off the adaptor. It is easier to pull off the adaptor with a test lead in place, since this gives better grip.

Install the batteries or plug in external power into the socket at the top of the instrument or connect instrument to the computer.

To switch on the instruments for permanent operation, press and hold [POWER] for 3 seconds until 'Perm' is displayed. The display will briefly show firmware version. To view all display segments during instrument turn-on, hold down the first button on the left at the bottom of the display. To turn the instrument off, press [POWER] again for 2 seconds. If the battery is low, this will be indicated with a battery symbol on the display.

Should the instrument fail to turn on, the microprocessor may need re-booting. To do this, remove the batteries and any other external power for at least 40 seconds.

Note that hidden keypad is accessed by lifting up the hinged display cover.

To backlight the display temporarily, press light button ☼ (second on the right, bottom row on the hidden keypad). To illuminate continuously, press and hold down light button for 3 seconds.

To disable or enable the buzzer, press and hold down [↵] on hidden keypad, for 3 seconds.

To add the carry strap, slip the end of the strap through the slit on the curved section at the back of the instrument, and secure the buckle.

Power Meter port:

This port is on the right-hand side of the instrument.

After turn-on, Power Meter will perform a self-calibration sequence, and then display absolute power in dBm at the previously set wavelength. If 'HI' or 'LO' are displayed, the input is out of range.

The Power Meter requires no warmup, and no user adjustment of dark current to achieve its specified performance.

Light Source / Two Way / ORL port:

This port is on the left-hand side of the instrument.

After instrument turn-on, press [Source] to enable Light Source or [Return Loss] to enable Return Loss Meter (KI7340C Series only).

On the KI7740C Series instruments, the light source may require a warmup period at the set wavelength for 15 min to achieve specified stability. On the KI7340C Series instruments, the specified stability is achieved with no warmup period.

AUTOTEST OVERVIEW

Autotest mode is used to perform automated loss testing at all source wavelengths:

- bi-directional loss testing with average loss displayed in real time and pass/ fail test function, requires two matching instruments.
- single direction loss testing can be achieved with a single instrument or two instruments as a combination of light source and power meter. Alternatively, two loss test sets are typically used for simultaneous measurements on two fibers.

Autotest remains synchronised for about 8 seconds after disconnection, so the user can change optical connections without re-starting Autotest each time thus achieving productivity gains. Autotest reduces source warm up drift and battery consumption compared to manual operation.

For the KI7340C Series instruments, ORL testing is tightly integrated; ORL Zero Function and User Calibration Mode (UCAL) can be set in Autotest mode.

To realise the full benefit of Autotest, please use the KITS™ software to achieve real-time data acquisition to facilitate acceptance testing and reporting in the field. Free KITS™ software available on our website includes a comprehensive on-line manual with full operating sequences.

Instruments compatibility

Any Kingfisher equipment featuring Autotest is compatible, e.g. any Autotest source / loss test set can be used with any Autotest meter for one direction loss testing as long as both instruments have matching wavelengths. A pair of identical Two-Way Loss Test Sets will provide the most benefit for the user, allowing to measure bi-directional average loss at multiple wavelengths and ORL at each end (KI 7340 Series only).

Initiating Autotest operation:

Turn on the instrument, connect light source to the power meter with test lead and press [AUTOTEST]. The meter automatically sets to the correct wavelengths and displays the absolute power in dBm, with the operating wavelengths shown at the top right.

In Autotest, the display rotates through all source wavelengths. To lock a display, press – side on [-/+]. In this mode, “nm” will be flashing to show that the selected wavelength is locked. The nominal source power transmitted from the source is on the left-hand side of the display. Pressing [Abs/Rel] will make meter to display measured optical power in dB R with the reference value shown on the left side.

To exit Autotest, press [MENU] or disconnect patch lead for more than 8 seconds.

Wavelength selection mode

If the required regular testing uses fewer wavelengths than the instrument has available, then it may be convenient to reduce the number of active Autotest wavelengths. For example, instead of the source rotating through 1310 / 1490 / 1550 / 1610 nm, it can be set to test at 1310/1550 nm only.

To switch wavelengths on/off:

- press [SOURCE] and then [-/+] to select wavelength.
- to check whether selected wavelength is switched on/off, press right hand button below the screen, its status will be indicated as 'IN' or 'OUT'.
- on hidden keypad, press [↱] ('Shift' symbol comes on LCD), then right hand button below the screen to change status of selected wavelength.

To start Autotest with the selected wavelength/s, press [↱] ('Shift' symbol comes on LCD) then [AUTOTEST].
Autotest operates only with wavelengths selected as 'IN'. Selected settings will be retained at the next turn on.

User to user communication

To use this feature, a pair of Two-Way Loss Test Sets must be used. During Autotest, the displays on both instruments can be hold or un-hold from either instrument by pressing the [HOLD] buttons, which also activates the buzzers at each end. Once activated, 'HOLD' symbols will flash on LCDs. This provides users at the ends of a fiber link, a handy communication method to synchronise their work, e.g. while working through successive fibers in multi-fiber systems. See below for an example of practical use of this feature, refer to sequence event, ❶ ~ ❹,

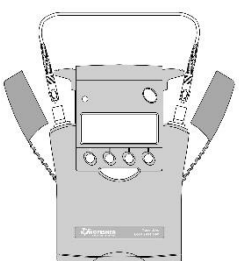
@ "near-end" unit	@ "far-end" unit	Practical uses in the field
❶ Press [HOLD] button on unit.	❷ Unit beeps twice, 'HOLD' symbol blinks.	After recording or saving test data for existing fiber, "near-end" user do this to signal "far-end" user to move on to next fiber.
❹ Unit beeps once, 'HOLD' symbol stops blinking.	❸ Press [HOLD] button on unit.	After reconnecting meter with the next fiber, "far-end" user do this to signal "near-end" user to record or save test data.

This communication feature can be used with KITS™ software too, refer to KITS™ user manual for detailed operating instructions.

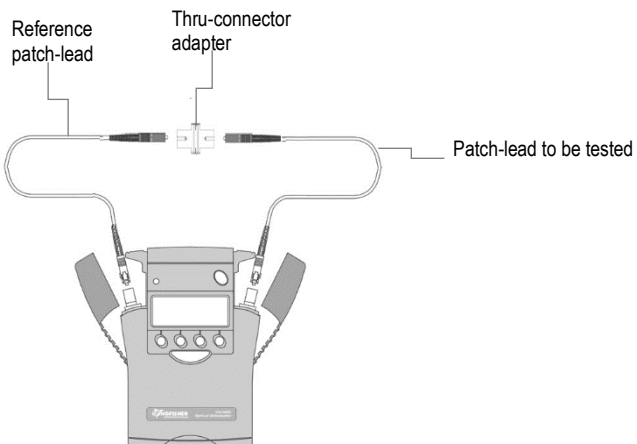
Patch-lead Test Using Loss Test Meter

This section illustrates the instruction to use Loss Test Meter to perform simple IL (Insertion Loss) measurement on a patch-lead.

1. Connect a reference patch-lead (test grade) between the light source and power meter ports of Loss Test Meter as shown below;



2. Switch on the Loss Test Meter and press [AUTOTEST].
3. Set measurement reference: press [Abs/Rel] to enter dB R, then press and hold [Set Ref] for 3 seconds until beeps stop
4. Remove reference patch-lead connection at power meter port, connect reference patch-lead to the patch-lead to be tested via a thru-connector adapter, connect the free end of patch-lead to be tested to power meter port



5. Read IL (in dB R mode) of the respective wavelengths displayed on instrument.

REMOTE AND LOCAL REFERENCE METHODS

Instruments should be referenced prior to making loss measurements. KI7340C/7740C Series support both local and remote reference methods.

The remote reference method is useful for long distance testing. Although this method has slightly lower accuracy compared to local referencing, it is quite adequate for general link loss testing.

The local reference method provides high accuracy and is very efficient for short distance loss testing, where both ends of the system can be accessed readily by one meter, e.g. patch leads testing.

Note: when setting the reference value, use test leads with a similar fiber type to the system under test. This is particularly important for multimode systems. Also, connector loss between the patch lead and source port will be added to the final loss measurement, so care should be taken to use test leads in good condition with clean connectors.

Remote Reference method

For two or one direction testing involving two instruments, referencing should be independently performed on both Loss Test Sets. The following will set reference at all wavelengths:

- Connect the Light Source /Two Way /ORL port to the Power Meter port of the same instrument.
- Select [POWER], [Autotest], [Abs/Rel] and then press [Set Ref] for 3 seconds. Meters will display 'BUSY' and then 0.00 dB R.

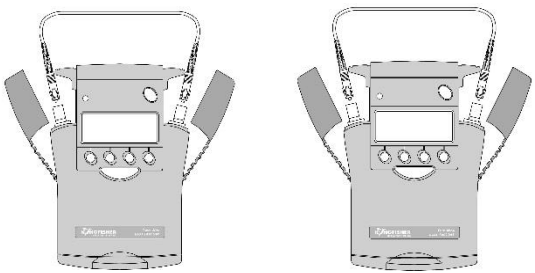


Figure 1. Remote reference set up

Local Reference method

Referencing is performed on one of the instruments, which will set reference at all wavelengths on both Loss Test Sets:

- Connect the Light Source /Two Way /ORL ports of the instruments.
- Select [POWER], [Autotest], [Abs/Rel] and press [Set Ref] for 3 seconds. Meters will display 'BUSY' and then 0.00 dB R.

REMOTE AND LOCAL REFERENCE METHODS

Local Reference method-continued:

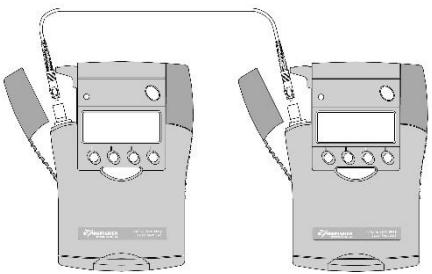
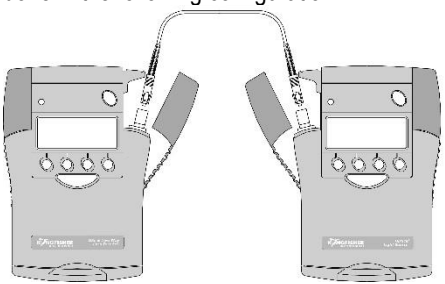


Figure 2A. Local reference set up: Light source ports connected

Alternatively, for single direction loss testing, referencing can be done in the following configuration:



- Connect the Light Source /Two Way /ORL port to the Power Meter port of the second instrument.
- Select [POWER] on both instruments
- On Light source, Press [Auto test]
- On Power meter, press [Abs/Rel] and [Set Ref] for 3 seconds. Meter will briefly display 'BUSY' and then 0.00 dB R.

Note 1: the number of test leads used when taking reference is a function of test requirements.

Figure 2B. Local reference set up: Power meter port is connected to Light source port of the second instrument

MEASURING TWO WAY LOSS AND ORL IN AUTOTEST

This method requires a matched pair of Two-Way Loss Test Sets, which will perform automated bi-directional testing and wavelength detection by data exchange between the instruments.

After Two Way Loss Test Sets have been referenced:

- exit Autotest on both instruments.
- connect the Device Under Test (DUT) to the Two-Way ports
- press [Autotest] on one of the instruments

Both instruments now show the same two-way average loss in dB R and display rotates through all available source wavelengths.

Both units also display 'A ◂ ▸ B'. 'A' will be flashing on the unit where Autotest was initiated, and it has become the A unit. The other unit will flash 'B', and it has become the B unit. In most respects, the units behave the same way, however the A unit will remain in Autotest until the user turns this mode off.

Viewing all measurements on selected wavelength(s):

To display measurements on one wavelength at a time, press – side on [-/+] on either A or B unit. This will lock the display to the selected wavelength on the instrument where this button has been pressed. Repeatedly pressing – side on [-/+] will lock other wavelengths. In this mode, "nm" will flash to show that the selected wavelength is locked.

To step through all measurements on locked wavelength, press [◄►] button on the hidden keypad. Display options include:

- average bi-directional loss
- loss from A to B: A ▸ B
- loss from B to A: A ◂ B
- ORL at A end (KI7340C Series only)
- ORL at B end (KI7340C Series only)

When displaying loss in one direction, the reference value will be shown on the left. Alternatively, selecting [Abs / Rel] displays the actual measured dBm value and source nominal output power.

To return to Autotest, press [Menu].

Note: two loss test sets continue to operate in Autotest when this display function is enabled.

Pass / Fail display mode

The Two-Way Pass / Fail display mode is convenient for quick acceptance testing. It allows performing testing on all available wavelengths.

To enter Pass / Fail mode, press [P/F]. To exit, press [Exit].

To set the loss threshold, press [Power Meter], [P/F] and [-/+] to adjust, then [Set] to save.
Alternatively, the value defaults to 12.00 dB by pressing [↱] on the hidden keypad and then [Default]. Press [Set] to save.

To set the ORL threshold, press [Return Loss], [P/F] and [-/+] to adjust, then [Set] to save.

Alternatively, the value defaults to -25.00 dB RL by pressing [↱] on the hidden keypad and then [Default]. Press [Set] to save.

:

MEASURING ONE WAY LOSS IN AUTOTEST

This method is applicable for loss measurements in the set up where data communication is one way only. Testing on one fiber can be achieved with:

- single Two-Way Loss Test Set
- two instruments used as a combination of Light source and Power meter

Alternatively, two instruments used for simultaneous loss testing on two fibers will ensure higher productivity.

After loss test set(s) have been referenced:

- exit Autotest
- connect the device under test (DUT) to the Light Source/Two Way/ORL port and Power Meter port
- press [Autotest]

Instrument now display insertion loss in dB R at all available source wavelengths.

Simultaneous loss measurements on two fibers.

Two Lost Test Sets will support simultaneous loss testing on two fibers in the set up as below:

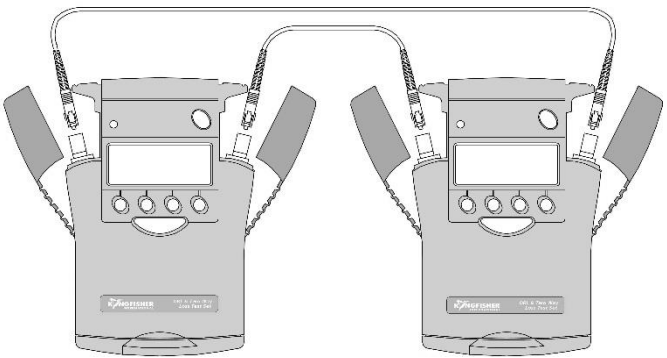


Figure 3. Set up for simultaneous loss testing on two fibers

Note: the results will be stored on both instruments and then merged later, so records management needs extra care.

Power meter section can be operated with external light source or in combination with Light source section of the Loss Test Set to measure Tx / Rx absolute power levels, to perform continuity or loss testing.

The instrument will link Light source and Power meter wavelengths when both sections used in combination.

To measure the operational power level in a fiber optic system, the Power meter is used in dBm or linear modes. To measure optical loss or attenuation, the Power meter is used in dB mode, and the source power is taken as a reference.

- To use Power meter section as individual instrument, turn on Loss Test Set and select [Power Meter]. Power meter will be operational at the last used wavelength.
- To scroll wavelengths, press [-/+]. The display will show nominal wavelength in nm.
- To toggle absolute / relative display mode, press [Abs/Rel]. Measured optical power will be displayed in 'dBm' or 'dB R'.
- To set reference, press [Abs/Rel] and then [Set Ref] for 3 seconds.
- When in relative mode, the reference value is displayed on the left hand side of the display.
- To stop / start display update, press [Hold]. The symbol will flash when the display is on hold.
- To toggle log / linear display mode, press [dB/W] on the hidden keypad.
- To display minimum and maximum recorded power for selected wavelength, press [↱] and then [Max/Min] on the hidden keypad. Press [↱], then [Max/Min] and hold for 3 seconds to re-start the recording process. This function re-sets automatically when instrument parameters are altered, making it handy data logging function for the field use.
- If the meter detects a test tone between 150 Hz and 9999 Hz, the display will change to show the actual measured modulation frequency in Hz.
- If a standard tone is detected (e.g. 270 Hz, 1 KHz, 2 KHz), a buzzer will sound. This is useful for fiber identification and signalling. The meter can also be used to check the actual modulation frequency of test sources (between 150 Hz and 9999 Hz).

This mode of operation is typically used to perform continuity testing with the test tone generator, if an Autotest compatible power meter is not available.

After instrument turn on, the display shows 'Source off'. To turn on the source emitter, press [Source].

The source is scrolled or turned off using [-/+].

The active wavelength is shown on the right-hand side of the display and source power level is at the left-hand side. Press [Source], then [Mod] to display modulation frequency.

To change modulation frequency, press [Source], then [↦] and [kHz] on the hidden keypad. Use [+/-] to scroll available modulation frequencies: 0.27 kHz, 1 kHz, 2 kHz, then press [Set] to store.

Laser Output Power Adjustment

To adjust laser output power, turn the laser on, then select [↦] and [Level] on the hidden keypad.
Press [-/+] to adjust the level, then [Set] to save. This function does not operate in Autotest mode and is not available on LED sources.

KI7340C Series instruments measure Optical Return Loss (ORL) using the Optical Continuous Wave Reflectometer (OCWR) method, the meter detects the accumulated reverse power at the point of measurement.

This method is accurate and suitable for acceptance testing. However, it cannot locate a reflection source, and has limited optical range.

ORL meter calibrated wavelengths correspond to light source operational wavelengths.

Operation

Note: no warmup needed. Ensure all connectors are clean.

Connect DUT to the left port of instrument, select [Return Loss] to display ORL measurement, and [-/+] to change the wavelengths as required. ORL will now be displayed in dB RL. To improve accuracy, the following offsets may be used:

- ORL Zero Function
- User Calibration Mode (UCAL)

These offsets can be also set in Autotest mode.

To re-set to factory defaults, select [Return Loss], [↦], [Default] then [Set] to store.

ORL Zero Function

This compensates for stray (residual) reflections prior to making a low-level measurement. Using this feature, the instrument can read accurately up to 10 dB below the stray reflection level, however at the expense of increased noise when making low level measurements.

To set up the stray optical condition and to block all light, use a small diameter mandrel wrap.

On the hidden keypad, select [Return Loss], [RL - NF].

To display the stored value, select [↦] and then [Max/Min]. To adjust the stored value, press [-/+], and then [Set] to store.

Perform the zero function whenever the stray ORL condition may have changed.

Note the following limitations:

If the zeroed value is x dB, then

- from x to (x+10) dB, resolution is limited to 0.1 dB.
- from x to (x-10) dB, resolution is limited to 1 dB, which is also the display range limit.

User Calibration Mode (UCAL)

Return loss is affected by twice the forward loss. To compensate for this in a test jig, set up the reference optical condition:

- on the hidden keypad, select [Return Loss] and [RL- Adj]. The offset value will be shown on the left of the display.
- select [RL- Adj] again to show reference only, then press [-/+] to adjust the display to the required value and [Set] to store. A non-zero value is always displayed on left of display.
- The usual ORL value for an unmated PC polish connector is -14.26 dB.

KI7340C/7740C Series instruments provide several options for storing and recording data:

- **Meter Reference Value**

The power meter reference value for each wavelength is stored in non-volatile memory. It is displayed on the left when in relative mode.

- **Meter Display Hold**

To hold the display at its current value, press [Hold]. To continue updating the display, press [Hold] again.

- **Automatic MAX/MIN Recording**

To display the minimum and maximum recorded power meter or ORL value over a period, press [↱] and [Max/Min] on hidden keypad. The display will show the maximum and minimum values in sequence. To re-set, press [↱], [Max/Min] and hold for 3 seconds. This function also re-sets when instrument parameters are altered.

Note: This function records drift but may not be suitable to record transients faster than about 1 Hz, due to the integrating data converter.

- **User Memory**

The non-volatile user memory stores test data, which can then be displayed or downloaded to the spreadsheet in the KITS™ software.

Overview of stored data:

Table below shows data types stored in memory for each wavelength, depending on the operation mode of instrument.

Instrument operation mode	Stored data
2-way Autotest	Serial Number (remote), Measured power (local + remote), reference power (local + remote), ORL (Local + remote)
1-way Autotest, Manual test	Reference power, Measured power
ORL	ORL

Local: Instrument at one end fiber and in which data is stored

Remote: Instrument at the other end of fiber

In KI7340/KI7740 Series instruments the following memory functions are available:

- Recording and storing data
- Recalling stored data
- Over-writing stored data
- Clearing memory

Recording and storing data

To access memory locations, press [◄►]. To exit, press [Exit].

To record, press [M+]. Data will be stored in the next available location. In Autotest, all test data will be stored in one location and 'busy' will be displayed while it is being recorded. If display is in Hold mode, data on selected wavelength will be stored.

RECORDING, STORING AND RECALLING READINGS AND CLEARING MEMORY

To record data at a particular location, press [◄►], then [-/+] to select the location, [Set] and [M+]. This will overwrite any previous data stored there.

Recalling stored data

Note: return to 'Menu' to recall data recorded in Autotest mode. Data recorded in Power meter, Light source and ORL modes can be accessed in one of these modes or via 'Menu'.

To recall data recorded in all modes, press [MR] and [-/+] to specify location.

For data recorded in Autotest, press [-/+] to view measurements at all source wavelengths.

For each wavelength, to step through all available Two-Way Loss and ORL Autotest measurements, select [MR], [-/+] and then press [◄►] repeatedly.

To display recalled value in dB R, press [Abs/Rel].

Over-writing one stored data/result

This is often required when re-testing one item.

i. Note your current memory location: Press [MR] to see the number at the top right corner of the display.
ii. Go to or select the memory location for re-test (memory over-write): Press [-/+] to change to that location, and press [Set].
iii. Do the retest and save the retest data/result: press [M+] to overwrite the memory location selected above with the retest data.
iv. Go back to the current location: Press [-/+] to change back to the current location noted in step i, and press [Set].
v. Continue with testing.

Clearing memory

A full memory is indicated by activated buzzer.
To clear all stored data, press [MR] and [Exit] simultaneously for 3 seconds. The buzzer will sound, and display will show 'clr'.

Memory capacity (in Autotest)

Working memory capacity is determined by the configuration of your instruments. The capacity of one instrument is illustrated in Table 1, the combined capacity of the instrument pair is 'No of readings' x 2:

Mode	Two Way/One Way testing	No of source wavelengths	No of readings
Autotest	One Way testing	2	3,408
Autotest	One Way testing	4	1,962
Autotest	Two Way testing	2	1,269
Autotest	Two Way testing	3	874
Autotest	Two Way testing	4	667

Table 1. Memory capacity of a single Two Way Loss Test Set

PC INTERFACE AND EXTERNAL SOFTWARE

The KI7340C/7740C Series Loss Test Sets feature USB interface and can be remotely accessed and controlled from an external PC. When instrument is controlled from PC, USB symbol will be displayed and auto power-off will be defeated.

KITS™ software

Free KITS™ software available on our website www.kingfisherfiber.com enables instrument control and transfer of live or stored data to an Excel spreadsheet, making it ideal for data logging and reporting in the field. KITS™ is can be easily customised to change language, terminology or to add new reporting features.

Functions currently supported by KITS™ are:

- Live Power Meter display
- Reporting of Two-Way loss measured in Autotest
- Two Way loss reporting by merging one direction data
- ORL reporting
- Spreadsheet to record loss measurements with direct click-and-point data insertion or memory download.
- Data logging with graph and statistical information

CARE OF YOUR INSTRUMENT

- Follow the directions in this manual on optical connectors care.
- During prolonged storage, remove batteries to eliminate the possibility of acid leakage. Use only high quality sealed alkaline or NiMH batteries.
- During storage and transport, keep the instrument in its carry case to protect against crushing, vibration, dust and moisture.
- The instrument is resistant to normal dust and moisture; however it is not waterproof. If moisture gets into the instrument, dry it out carefully before using it again. Where possible, keep instrument away from strong sunlight.
- Clean the instrument case using soft damp cloth. Do not use alcohol or any solvents, otherwise paint will be damaged.
- The instrument housing is made of tough polycarbonate material with impact absorbing rubberised corner features and, is therefore drop resistant.

CAUTION! Input optical power must not exceed the damage level specified for each detector type.

Keep optical connectors clean and in good condition.

To reduce the effect of polarisation changes, the fiber system should be neat, coiled and physically stable.

In multimode systems, modal noise and general uncertainty are much worse than in single mode systems. Optimum measurement repeatability will be obtained by use of a mandrel wrap.

Power Meter

Using an APC connector at the power meter interface will allow to reduce line reflections and to improve measurement stability in the laser based single mode systems. This is important when measuring small connector losses.

Light Source

Light source power may drift. When you have finished a test, go back to the start position to check if the light source power is still within acceptable limits. Note that specifications are for typical drift, warm up period and level of return loss, but the actual drift will vary between instruments and test situations.

With exception of KI7300C/7400 Series, most available laser sources are sensitive to reflections. Varying reflections can induce laser source instability of around 0.3 dB. This is very difficult to verify without a special test system but can cause errors. Reduced reflection will result in improved repeatability.

Due to emitter center wavelength uncertainty (e.g. ± 20 nm), fiber attenuation may vary with different light sources.

DWDM Loss and Power Measurements

The DWDM bands are typically within 1525 ~ 1610 nm band. For this application, an InGaAs detector calibrated at 1550 nm gives good absolute accuracy at all DWDM wavelengths.

Testing optical loss at 1610 or 1625nm is common, since this represents the worst-case attenuation in most systems.

High power InGaAs detectors may be required to measure the system power level.

CWDM Loss and Power Measurements

The CWDM band is from 1270 ~ 1610 nm at 20 nm spacing, however, 1490 ~ 1610 nm is more common since it avoids the water absorption peak at 1383 nm.

The most common operating wavelengths for FTTH PON systems are currently 1310 / 1490 / 1550 nm.

As in DWDM application, an InGaAs detector gives good absolute accuracy.

Because of the broad operating wavelengths encountered, the power meter calibration wavelength needs to be matched to the measured wavelength, or absolute errors may be excessive.

Many systems are measured at 1390 nm to test for the water peak, and at 1625 nm to measure the high-end attenuation limit.

At 1625 nm, the fiber attenuation is actually very sensitive to wavelength, since the silica infra-red absorption zone is reached. So the wavelength tolerance of this particular laser is a major issue, especially since many older source instruments have a tolerance of 30 nm.

ORL Measurements

ORL measurements are typically divided into two classes:

1. Acceptance of installed cable systems, usually 20 ~ 35 dB. This is generally easily accomplished with an ORL meter. In these measurements, the provided ORL terminator may be usefully placed at the far end of the system.

2. Acceptance of components and patch leads, which may involve levels well below this. These measurements require an understanding of sources of reflection and, require additional steps.

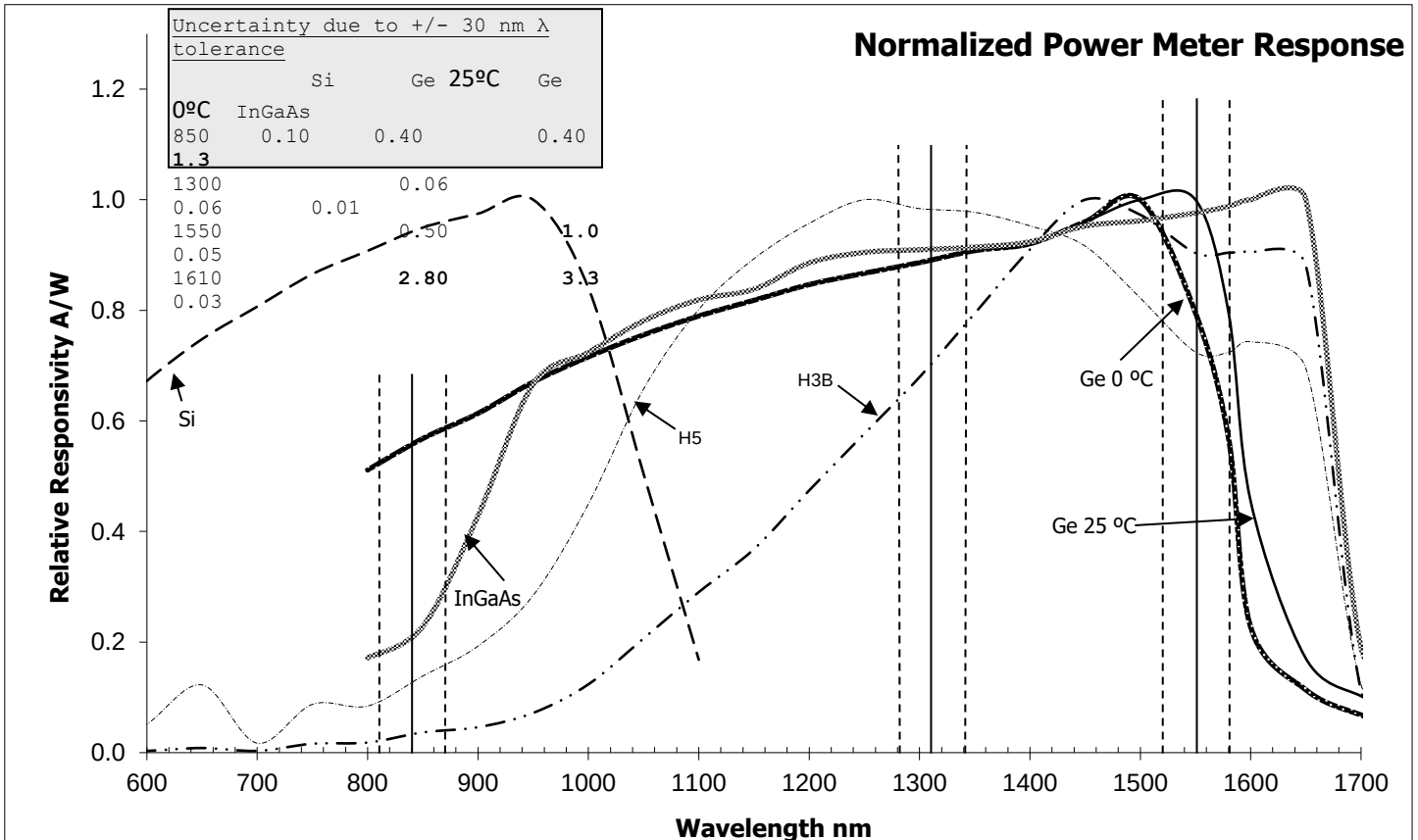
In Two Way mode, the port isolation can be an important contributor to the noise floor. A special instrument version has higher isolation for component acceptance testing. Using this equipment, very high throughput can be achieved in a factory environment.

When setting up ORL testing, a strong understanding of both PC and APC connector reflection effects may be required.

Use of ORL Zero function

This function is very useful since it extends the practical linear measurement range by about 14 dB.

For typical mid-range measurements, it has a negligible effect on measurement noise. For low level measurements, it can cause up to 0.5 dB noise. If this happens, the solution is to reduce the residual light level further and, re-set the zero function.


Normalized Power Meter Response
Uncertainty due to +/- 30 nm λ tolerance
Si Ge 25ºC Ge
0ºC InGaAs
850 0.10 0.40 0.40
1.3
1300 0.06
0.06 0.01
1550 0.50 1.0
0.05
1610 2.80 3.3
0.03
Relative Responsivity A/W
Wavelength nm
Si
InGaAs
H5
H3B
Ge 0 ºC
Ge 25 ºC
0.0
0.2
0.4
0.6
0.8
1.0
1.2
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700

DEFINITION OF TERMS

Power Meter

Power Range: The range of input powers for which the instrument can be used.

Maximum Input Power: The input power not to be exceeded to avoid destroying the instrument.

Uncertainty at Reference Conditions: The uncertainty for the specified set of reference conditions, including all uncertainties in the calibration chain from the national laboratory to the test meter (connectors and test leads must be absolutely clean and undamaged). Reference conditions are the conditions during the responsivity calibration.

Total Uncertainty: The uncertainty for a specified set of operating conditions, including noise and drift (connectors and test leads must be absolutely clean and undamaged).

Autotest Sensitivity: The power level below which Autotest does not work.

ORL Meter

Range: Display range.

ORL Accuracy: The ORL measurement absolute uncertainty.

Port Isolation: The passive ORL port isolation (when the instrument is turned off) as measured by another ORL meter.

Source

Output Power: The CW output power at the specified wavelength, at the end of a reference cable.

Power Uncertainty / Repeatability: Uncertainty in power level at the end of a reference cable.

Short / Long Term (Power) Stability: In CW mode, the uncertainty of the power level observed over a given time, compared to the mean power during this time. Measured with an averaging optical power meter, a 9/125µm fiber, at constant temperature, within a specified temperature window, and at line voltage.

Center wavelength: The wavelength representing the centre of mass of the selected peaks:

λ CW = (1/ Po)Σ(P_i λ_i),

where Pi and λi are the power and wavelength of each spectral component and Po is the total power.

Spectral Bandwidth: FWHM (full width at half the maximum) describes the spectral width of the half-power points of the laser, assuming a Gaussian envelope of the spectral power distribution. The half-power points are those where the power-spectral density is one half of the peak amplitude of the Gaussian curve:

$$\Delta\lambda_{RMS} = \left(\frac{\Sigma P_i \lambda_i^2}{P_{total}} - \lambda_{center}^2 \right)^{1/2}$$

and $$\Delta\lambda_{FWHM} = M \Delta\lambda_{RMS}$$

where: λ_{center}= center wavelength of laser diode (in vacuum)

$P_{total} = \Sigma P_i$ = total power, in watts

P_i = power of i^{th} longitudinal mode

λ_i = wavelength of i^{th} longitudinal mode (in vacuum)

M = multiplication factor; for a source with a Gaussian envelope M = 2.35; for other types of spectra, use M = 2.35 as well

GENERAL SPECIFICATIONS

Size:	190 x 130 x 70 mm, 7.5" x 5.1" x 2.8".
Weight:	500 gm, 1.1 lb. Shipping 1.5 Kg, 3.3 lb.
Operating/ Storage:	-15 to 55 °C / -25 to 70 °C.
Power:	2 alkaline C cells (7.6 A/Hour); External DC 9V with ID2.5mm(+ve)/OD5.5mm plug or via USB port. Selectable auto-off, low battery indicator, backlit display.
Battery life:	360 hrs Power Meter/190 hrs laser in Autotest
Case:	Polycarbonate, 1-meter drop tested.
Display:	4-digit high contrast LCD
Resolution:	Log: 0.01 dB. Linear: 3 digits (100 – 999) or 0.01 nW.
Tone detection:	150 ~ 9999 Hz ±1%.

.

SPECIFICATIONS: LIGHT SOURCE

KI7340C Series Light Source section

	1310 / 1550 nm	Other lasers	LED	Comments
2 λ source, dBm 3 or 4 λ, dBm	-7 -10	-7 -10	-26 dBm to 62.5µm -41 dBm to 10µm	± 1 dB for laser ± 3 dB for LED (@ 62.5um only)
Short term stability, dB	0.03[1]	0.05[1]	0.01	15 min, max no warmup, Δ 3°C
Stability over temp, dB	0.2	0.2	0.35	Max, over temperature
λ tolerance, nm	20	6.5		At 25 °C
λ width, nm	3	< 1		FWHM, typical
λ nm/°C	0.4	0.1	0.4	typical
Mode Controlled Source	N/A	N/A	Mode controlled[2]	
Reconnection repeatability, dB	0.1		0.05	95 % confidence
Modulation	270 Hz, 1KHz, 2 KHz, ± 2 %			
Laser output	Adjustable over 6 dB in 0.01 dB steps			

Note 1: For ORL < -25 dB.
Note 2: Multimode source distribution @ 50/125 is compliant with the following standards: IEC 61280-4{Ed.1.0}, TIA/EIA 526-14A and TIA TSB-178

KI7740C Series Light Source section

	1310 / 1550 nm	LED	Comments
2 λ source power, dBm 3 or 4 λ power, dBm	-7 -10	-26 dBm to 62.5µm	± 1 dB ± 3 dB for LED (@ 62.5um only)
Short term stability, dB	0.03[1]	0.01	For 15 min, typ, Δ 3°C, after warm-up
Stability over temp, dB	0.6	0.35	Typical, over temperature
λ tolerance, nm	20		At 25 °C
λ width, nm	3		FWHM, typical
λ nm/°C	0.4	0.4	typical
Mode Controlled Source	N/A	N/A	Mode controlled
Reconnection repeatability, dB	0.1	0.05	95 % confidence
Modulation	270 Hz, 1 KHz, 2 KHz, ± 2 %		
Laser output	Adjustable over 6 dB in 0.01 dB steps		

SPECIFICATIONS: POWER METER

KI7340C Series Power Meter section

Detector Type	Response λ nm	Damage Level, dBm	Calibration wavelengths, nm	Power Range dBm	Autotest Sensitivity dBm	Midrange Linearity[1] dBm	Calibration Accuracy[2] %	Polarisation Sensitivity dB	Total Uncertainty[3] dB
InGaAs	600 ~ 1700	+15	*780, 820, 850,* 980, **1270, 1290, 1300, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625**, 1650	*+5 ~ -60* +5 ~ -70	*-45* -50	0.04	1 % (0.06 dB)	<0.05	0.3
H3B (InGaAs)	800 ~ 1700	+30[4]	820, 850, 980, **1270,1290,1300, 1310, 1550, 1270, 1290, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1570, 1590, 1610, 1625,** 1650	+27 ~ -40 +27 ~ -50	-25 -30	0.04	1 % (0.06 dB)	<0.05	0.35
H5 (InGaAs)	800 ~ 1700	+25	820,850,980, **1270, 1290, 1300, 1310,1330,1350,1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1570, 1590, 1610, 1625**,1650	+15 ~ -50 +15 ~ -60	-35 -40	0.04	1 % (0.06 dB)	<0.05	0.3
Si	350 ~ 1100	+15	**635, 650, 660, 780, 850, 980**	+0 ~ -70	-50	0.04	1 % (0.06 dB)	<0.05	0.3
					typical	typical		Typical	max

KI7740C Series Power Meter section

Detector type	Response wavelengths, nm	Damage level, dBm	Calibration wavelengths, nm	Power range, dBm	Autotest Sensitivity, dBm	Mid range linearity[1] dBm	Calibration accuracy[2] %	Polarisation sensitivity, dB	Total uncertainty[3] dB	Wavelength sensitivity ± 30 nm[5] dB
InGaAs	600 ~ 1700	+15	*780, 820, 850, 980, **1270, 1290, 1300, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625**, 1650*	*+5 ~ -60* +5 ~ -70	*-45* -50	0.04	1 % (0.06 dB)	<0.05	0.3	0.03
H3B (InGaAs)	800 ~ 1700	+30[4]	820, 850, 980, **1270, 1290, 1300, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625,** 1650	+27 ~ -40 +27 ~ -50	-25 -30	0.04	1% (0.06 dB)	<0.05	0.3	0.03
H5 (InGaAs)	800 ~ 1700	+25	*820, 850, 980, **1270, 1290, 1300, 1310, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610, 1625,** 1650*	*+15 ~ -50* +15 ~ -60	*-35* -40	0.04	1 % (0.06 dB)	<0.05	0.3	0.03
Si	350 ~ 1100	+5	**635, 650, 660, 780, 850, 980**	+0 ~ -70	-50	0.04	1 % (0.06 dB)	<0.05	0.3	0.03
					typical	typical		typical	max	typical

Note 1: Midrange linearity @ 1550 nm for InGaAs & Ge, or 850 nm for Si. Non-coherent light, with APC connector. Excludes top 5 dB and bottom 10 dB of range.
Note 2: Calibration condition: non-coherent light, -35 ± 5 dBm, 21 ± 3 °C, ± 1 nm, 10 ± 3 nm FWHM, PC ceramic connector, 100 μ m fiber
Note 3: Includes contributions of: varying optical connector types, calibration uncertainty, linearity over temperature & range, and fiber core diameter up to 200 μm.
Note 4:H3B can sustain the damage level for 2 minutes **Note 5:** At calibration wavelengths in bold type

SPECIFICATIONS: ORL METER

KI7340C Series ORL Meter section

	Laser		LED
	1~ 2 wavelengths	3~4 wavelengths	
Range[1]	0 ~ 65 dB	0 ~ 60 dB	0 ~ 40 dB (@ 62.5 µm) 0 ~ 37 dB (for 50 µm)
Port Isolation	Standard > 30 dB Optional > 50 dB		> 22 dB
ORL accuracy	0 ~ 50 dB: 0.5 dB 50 ~ 65 dB: 1 dB after zero offset	0 ~ 45 dB: 0.5 dB 45 ~ 60 dB: 1 dB after zero offset	0 ~ 30 dB: 0.5 dB 30 ~ 45 dB: 1 dB after zero offset
Resolution	0 ~ 50 dB: 0.01 dB 50 ~ 65 dB: 0.1 dB	0 ~ 45 dB: 0.01 dB 45 ~ 60 dB: 0.1 dB	0 ~ 30 dB: 0.01 dB 30 ~ 45 dB: 0.1 dB
Wavelength	See source options		See source options

Note 1: Range is less for PC connector. After a zero offset, range is 10 dB better than the residual level.

ORDERING INFORMATION

KI7340C Series ORL and Two-Way Loss Test Set

With ORL:

Instrument, LTS-2W ORL 1310-1550 nm u/s, InGaAs	**KI7343C-InGaAs**
Instrument, LTS -2W ORL 1310-1550 nm u/s, APC, InGaAs	**KI7343C-InGaAs-APC**
Instrument, LTS-2W ORL 850-1300 nm LED, 62.5 um, APC, Ge	**KI7344C-Ge-APC**
Instrument, LTS -2W ORL 850/1300 nm LED, 50***** µm,APC, Ge	**KI7344C-GE-APC-50u**
Instrument, LTS-2W ORL 1310-1490-1550 nm u/s, InGaAs	**KI7347C-InGaAs**
Instrument, LTS-2W ORL 1310-1490-1550 nm u/s, APC, InGaAs	**KI7347C-InGaAs-APC**
Instrument, LTS-2W ORL 1310-1550-1625 nm u/s, APC, InGaAs	**KI73410C-InGaAs-APC**
Instrument, LTS-2W ORL 1310-1490-1550-1625 nm u/s, APC, InGaAs	**KI73416C-InGaAs-APC**

***** Multimode 50µm and 62.5µm models are fundamentally the same equipment, but each of the models is calibrated using 50µm and 62.5µm fiber respectively during the manufacturing process.

Without ORL:

Instrument, LTS-2W 1310-1625nm u/s, APC, InGaAs	**KI7345nC-InGaAs-APC**

KI7740C Series Two Way Loss Test Set

Instrument, LTS-2W 1310-1550-1625 nm, APC, InGaAs	**KI77410C-INGAAS-APC**
Instrument, LTS-2W 1310-1550 nm, InGaAs	**KI7742C-INGAAS**
Instrument, LTS-2W 1310-1550 nm, APC, InGaAs	**KI7742C-INGAAS-APC**
Instrument, LTS-2W 850-1300 nm, Ge	**KI7744C-Ge**

ORDERING INFORMATION

Standard Accessories:

ST(for model with LED sources only), LC, SC metal-free optical connector adaptors, KITS™ PC software and USB cable, User manual, C size batteries, 'AA'-to-'C' size battery converter, IALC/ NATA traceable calibration certificates, carry strap, carry pouch and protective holster.

KI7340 Series only: PC Low Reflection Terminator, APC Low Reflection Terminator, PC-APC test lead

Optical Connectors

These instruments have interchangeable optical connectors. The power meter works with both PC and APC connectors. The light source ferrule type is fixed and customer -specified as either PC or APC. Green is associated with APC connectors.

Optional Interchangeable Connector Adaptors

Description	P/N	Description	P/N
E2000/LSH	**OPT060**	SMA 905/906	**OPT082**
E2000/LSH, green	**OPT060G**	Universal 2.5mm	**OPT081**
LSA/DIN 47256	**OPT071**	D4	**OPT055**
LC / F3000	**OPT072**	FC	**OPT051**
MU	**OPT080**	1.25mm Universal	**OPT084**
POF	**OPT077**		

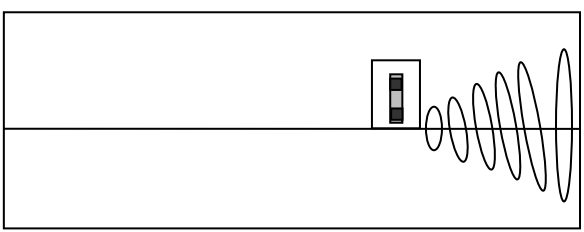
Optional Accessories:

Description	P/N
Option, Carry Case for 2 Instruments	**OPT153**
Option, Carry Case includes Cletop-style cleaner & Cleaning Sticks	**OPT154A**

There are no internal user adjustments. Calibration is performed without opening the instrument.

All Calibrations

To enable calibration mode, open the battery compartment, remove the anti-tamper label, and insert a 2.54 mm (0.1") pitch programming shunt. Manipulation of the shunt is easier with needle nose pliers. The instrument will display 'CAL' and installed options.



View Inside Battery Compartment

Known calibration constants can be re-entered directly without using other equipment. This is useful in case old calibration constants are to be put back.

Before commencing calibration:

- Clean all connectors very carefully.
- Ensure that all devices have been at a stable room temperature for over an hour, and that the light source is fully warmed up at the wavelength to be calibrated.
- Ensure that all installed batteries are in good working condition.
- When calibration is complete, remove the calibration shunt, and place an anti-tamper label over the aperture in the battery compartment.
- Do not forget to update your calibration records and, schedule the next calibration service.

System Rollback (version 5.0 and above)

In the event of wrong calibration constants being entered and stored, or the instrument becoming otherwise corrupted, all factory settings can be restored. To restore all factory settings, first enter 'CAL' mode then press and hold [MR] for 3 seconds.

Power Meter calibration:

Calibration is a transfer process. It is performed by setting up a single mode laser source at a stable, but non-critical power level between -10 and -30 dBm and, adjusting the meter reading to the same value as that shown by a reference meter.

Required are laser light sources with accurately calibrated wavelengths and good stability, a power meter with appropriate calibrated wavelengths, single mode test leads, an anti-tamper label and a 2.54 mm (0.1") programming jumper. Check the calibration certificates on your reference equipment to ensure current validity.

To display existing calibration offsets:

- Put the instrument in calibration mode.
- Press [Power Meter] and [-/+] to set the wavelength, then [↱] and [Max/Min] twice to display the current offset.
- Record the offsets, re-enter or adjust offset values for each wavelength.

To calibrate the meter at the selected wavelengths:

- Measure and record the source power using the reference meter.
- Transfer the same power level to the meter to be calibrated, press [↱] and [Max/Min] to display power, then [-/+] to adjust the reading to match the noted reference reading.

Note: The optical power is measured only when entering this mode. It is not continuously updated. (Firmware version 5.00 and above continuously updates the measured power).

- Press [↱] and [Max/Min] to read and note the new stored calibration offsets, and then [Set] to store and exit, or [Exit] to abandon and exit.
- Check the source power with the reference meter to ensure source drift is within limits.
- Remove the programming shunt and, place a new sticker over the aperture.

Two Way Detector calibration:

The KI7340/KI7740 Series instruments have an internal power meter within the Two-Way port, in addition to the standard power meter port. To perform calibration, follow the Power Meter calibration procedure, except that after pressing [Power Meter], press [-/+] to select the detector. The active detector is indicated by <<< or >>> on the display.

Light Source calibration and Current Check

CAUTION! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

The emitter power level can be re-calibrated, and the current checked as described below. You will need a power meter with appropriate calibrated wavelengths, single mode test leads, an anti-tamper label, and a 2.54 mm (0.1") programming jumper.

Check the calibration certificates on your reference equipment to ensure current validity.

- Put the instrument in calibration mode.
- Connect a calibrated power meter with a known good patch lead (the patch lead loss forms part of the calibration condition).
- Press [Source], leave in, and then press [↱] and [Level]. The display will now show the expected power level, cal factor (main display) and laser current in mA (top right). Note the existing values for future reference. Set meter wavelength to match.
- Adjust the [-/+] button to change the source output level, to match the displayed level on the source display, or to re-enter a known cal factor (The laser current cannot go above a level that has been set for the individual laser during manufacture).
- Note new calibration values and laser currents for future reference, then press [Set] to store settings and exit, or [Exit] to exit without storing settings.
- Remove the programming shunt and, place a new sticker over the aperture.

ORL Calibration

Calibration is performed by setting up a known reflection condition and adjusting the reading accordingly. A convenient calibrated reflection is good clean PC termination, which will have glass/air reflection –14.26 dB for SMF and -14.15 dB for MMF. This can be double-checked easily by measuring more than one termination.

Required: reflections, an anti-tamper label and a 2.54 mm (0.1") programming jumper.

- Put the instrument in calibration mode.
- On the meter to be calibrated, record the existing calibration offsets:

  Select [Return Loss], [-/+] to set the wavelength, then [↱] and [Max/Min] twice to display the offsets. Note them down, or re-enter known offsets at this point.
- Attach the known reflection. You may also want to add an allowance for twice the expected forward loss of the connection to the instrument.
- Set [↱] and [Max/Min] to display power, then [-/+] to adjust the reading to the required value.

Note: The ORL is measured only when entering this mode. It is not continuously updated.

- Set [↱] and [Max/Min] to read and note the new stored calibration offsets, and then [Set] to store and exit, or [Exit] to exit without storing settings.
- Remove the programming shunt and, place a new sticker over the aperture.

Opening the Instrument:

Caution! Do not open unless the warranty has expired, and you are authorised to do so. Opening the unit will invalidate any warranty claim.

- There are no internal user adjustments. All calibration is performed without opening the instrument. The optical sensor / connector assembly is not user serviceable.
- This unit contains static sensitive devices. Anti-static handling procedures should be observed at all times when handling internal circuits.
- Do not open this instrument unless you are familiar with handling optical fibers. Disturbing the optical fiber assembly may result in instrument malfunction or damage.

Procedure:

- Use static protected procedures.
- Remove the batteries, and leave the battery cover open. Pull open the optical connector covers.
- Place the instrument face down on a soft mat and, undo the 6 screws in the rear housing.
- The instrument can now be gently pulled apart.
- The instrument will come into two halves joined by a ribbon cable. The optical section is located in the upper half, with the microprocessor, supply, calibration constants and controls in the lower half.
- The hinged display cover can be removed at this point.
- The ribbon connector can be disengaged to completely separate the instrument halves.
- Further disassembly from this stage should be easily apparent to a technician.
- Re-assembly is the reverse of the previous procedure. Ensure that the ribbon cable connectors are properly secured so they cannot shake loose. This will be either a moulded rubber retainer, or adhesive tape.

General electrical parameters are as follows: Vss to GND = 3V3, -Vss = -3V3, battery power down current about 0.2 mA, active power meter current about 20 mA. The laser current is unpredictable.

PERFORMANCE VERIFICATION TESTS

All tests can be performed without access to the interior of the instrument.

The test procedures described in this section are for performance verification of a KI7343C InGaAs ORL and Two-Way Loss Test Set.

Due to the large number of possible instrument configurations, it is not possible to give detailed test procedures for all options in this manual, so some parameters may need adjusting to the appropriate specifications.

Required Equipment This is the required equipment for the performance test listed. Any equipment that satisfies the critical specifications of the equipment given in the table may be substituted for the recommended models.

Test Record Results of the performance test may be tabulated on a photocopy of the Test Record provided at the end of this test procedure. It is recommended that you fill out the Test Record and refer to it while doing the test. Alternatively, a soft copy of this manual may be obtained from our web site.

Test Failure If the equipment under test fails any performance test, return the instrument to the nearest Sales/Service Office for repair.

Instrument Specification Specifications are the performance characteristics of the instrument that are certified and, are the limits against which the equipment under test can be tested.

Any changes in the specifications due to manufacturing changes, design or traceability to NATA will be covered in a manual change supplement or revised manual. Such specifications supersede any that were previously published.

General Instructions

Perform each step in the order given, using the corresponding test equipment. Use Tables 1 ~ 3 to record general test details.

The SMF / MMF test lead fiber type and PC / APC connector polish must be matched to the instrument type.

Make sure that all optical connections are dry and clean. **DO NOT USE INDEX MATCHING OIL**. For cleaning, use the cleaning instructions given in the section 'Optical Connector'.

Make sure that all patch cords are fixed to the table so that they won't move during measurements.

Ensure that the ambient conditions are in the following ranges:

Temperature:	21 ± 3 ºC
Relative humidity:	45 to 75 %

Power Meter section

Accuracy Test

1. Connect the equipment as shown in Figure 5:

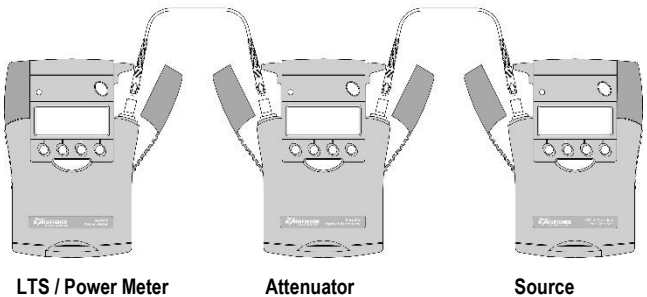


Figure 5. Test set-up for the Power Meter section Accuracy Test

2. Switch on all instruments.
3. Set all instruments to 1310 nm.
4. Change the attenuation of the attenuator until the reference power meter displays -10.00 dBm. Note the attenuator setting in setting 1 of Table 4.

   If the light source is not powerful enough to give -4.00 dBm, set the attenuator to 2.5 dB and correct the appropriate values in the test report.

   Repeat the above for reference power meter readings of -20dBm, -30 dBm, -40 dBm and -50 dBm (last reading is not relevant to H series power meters).
5. Measure the DUT:

   Re-connect the attenuator output cable to the DUT power meter port and, select the 1310nm on DUT.

   Set the attenuator to its value for setting 1. Note the displayed power level of the DUT in the test record.

   Repeat the above for attenuator settings 2~5.
6. Repeat the Power Meter Accuracy Test at 1550 nm.

Light Source section

Output Power (CW) Test

1. Connect the equipment as shown in Figure 6.

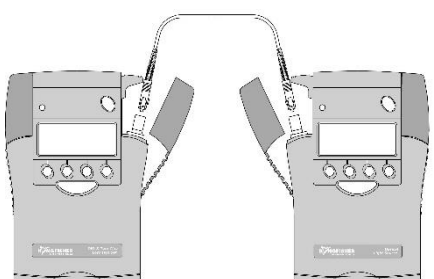


Figure 6. Test set-up for Output Power (CW) and Short Term Stability Tests

2. Switch on the instruments.
3. Set instruments to 1310 nm.
4. Note the measured power level value in the test report in Table 5.
5. Repeat the above on 1550 nm.

Light Source section

Short Term Stability Test (optional)

1. Connect the equipment as in Figure 6.
2. Set instruments to 1310 nm.
3. Let the light source to warm-up for 15 minutes, then note the power.
4. Record the optical power every 30 seconds for 3 minutes.
5. Calculate max – min value (< 0.1 dB).
6. Note this figure in Table 5.

Time	Measured power, dBm	Drift, dB	Tick max / min values
00 sec		0.00	
30 sec			
60 sec			
90 sec			
120 sec			
150 sec			
180 sec			

Alternatively, the instrument max/min recording function can be used to record the data.

Light Source section

Centre wavelength and Spectral Bandwidth (FWHM) Test (optional).

1. Connect the equipment as shown in Figure 7.
2. Switch on the instruments and allow to fully warm up.
3. On Light Source, enable the source and set the wavelength to 1310 nm.
4. On the OSA, press the [Instr Preset] key.

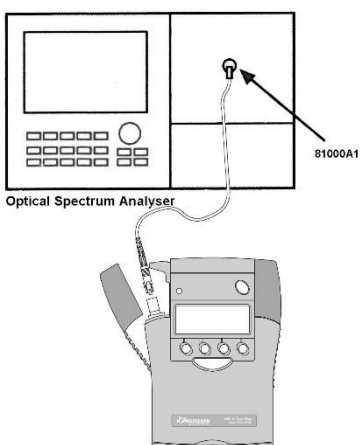


Figure 7.Test set-up for centre wavelength and spectral bandwidth test

5. Press [Auto/Meas] and wait until 'End of Automeasure' is displayed.
6. Choose [User] and select the type of source to be measured (FP for Fabry Perot laser).
7. To show the display in linear mode:
    a. Press [Menu].
    b. Press [Amptd] on the left side of the display.
    c. Press [Linear] on the right side of the display.
8. To ensure interference-free reading of the display it is advisable to stop the repeating calculations.
   - Press [User].
   - Press [Single Sweep].
   If the trace on the display is not clear, you can change resolution by using the span key.
9. From the displayed measurements check and note the values for "Centre wavelength" and "FWHM" (Spectral Bandwidth) in Table 6.
10. Repeat the test with the DUT wavelength set to 1550 nm.

Performance Verification of Two Way Autotest function:

Tests described below allow checking calibration accuracy, range and linearity for the pair of instruments.

Two Way Calibration Accuracy Test

1. Connect the instruments as shown in Figure 8, using one test lead per instrument:

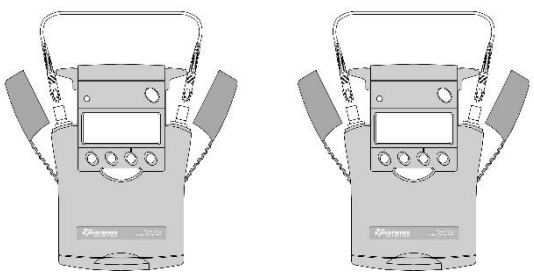


Figure 8. Reference set up for Two Way Calibration Accuracy Test

2. Switch on each instrument and press [Autotest], [Abs / Rel], then [Set Ref] for 3 seconds. The displays should read approximately 0.00 dB
3. To check accuracy, remove the test lead on one instrument and re-connect the other test lead as in Figure 9.
4. The displays should now read between -0.50 and 0.50 dB for all source wavelengths. Note the maximum displayed value for each wavelength in Table 7.

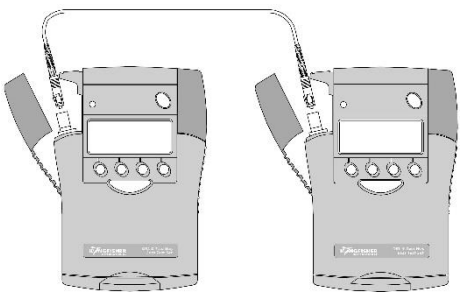


Figure 9. Test set up for Two Way Calibration Accuracy Test

Note: ensure your patch leads are clean and in good working order.

Performance Verification of Two Way Autotest function- continued:

Two Way Range and Linearity Test

1. Connect the equipment as shown in Figure 10.

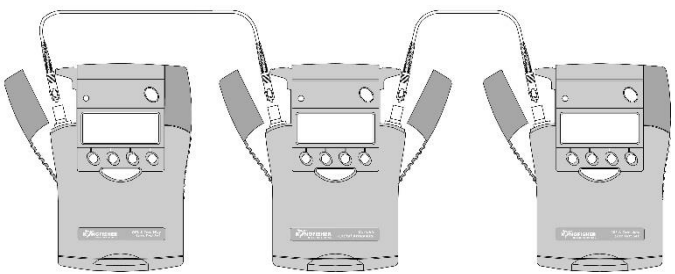


Figure 10. Test set up for Two Way Range and Linearity Test

2. Switch on all instruments.
3. Set the Light Source on one of the instruments to 1310nm and allow to warm up. Press [Autotest].
4. On the attenuator, set the wavelength to1310nm and attenuation to 5 dB.
5. Make sure that Autotest is updating. Note the measured optical power at 1310 nm.
6. For single mode instruments, repeat the power readings for attenuator settings of 15 dB, 25 dB and 35 dB. For instruments with H series meter, repeat the readings for an attenuator setting of 15 dB only.
7. For multimode instruments, repeat the power readings for attenuator settings of 15 dB, 20 dB.
8. Repeat the above for 1550nm as required, however, this test typically only needs performing at one wavelength.

Performance Verification of One Way Autotest function

One Way Range and Linearity Test

Test described below allows checking One Way Autotest range and linearity for one loss test set and also verifies tone detector operation. To test power meter absolute accuracy and linearity, refer to Accuracy Test, Power Meter Section.

1. Connect the equipment as shown in Figure 11. A single LTS can also be used, with connections to both ports.

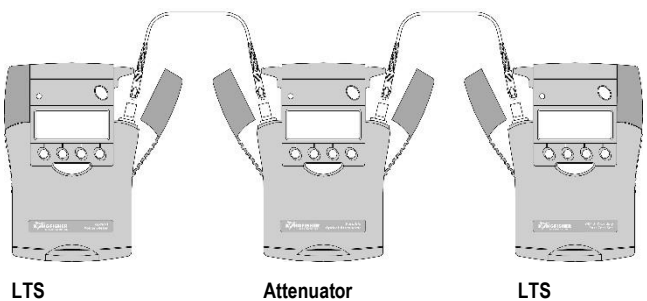


Figure 11. Test set up for One Way Range and Linearity Test

2. Switch on all instruments.
3. Set the Light Source to 1310nm and allow to warm up. Press [Autotest].
4. On the attenuator, set the wavelength to1310nm and attenuation to 5 dB.
5. Make sure that Autotest is updating. Note the measured optical power at 1310 nm.
6. For singlemode instruments, repeat the power readings for attenuator settings of 15 dB, 25 dB and 35 dB. For instruments with H series meter, repeat the readings for an attenuator setting of 15 dB only.
7. For multimode instruments, repeat the power readings for attenuator settings of 15 dB, 20 dB.
8. Repeat the above for 1550nm as required, however, this test typically only needs performing at one wavelength.

ORL Verification Test for KI7340C Series instrument with PC connector, ORL port

For this test you will need standard accessories supplied with the unit:
PC/APC test lead, single mode
PC Low Reflection Terminator
APC Low Reflection Terminator

1. Very carefully, clean all the optical connectors to be used, including ORL port of the instrument.
2. Re-set the meter to factory ORL defaults by selecting [Power], [↵], [Default] and [Set] to store
3. To display ORL, press [Return Loss] and [-/+] to select the active wavelength, e.g. 1310nm.
4. With nothing connected to the ORL port, note the reading:
   reading between -13.76 dB RL and -14.76 dB RL is within calibration specification. This is ORL measured on instrument connector.
   Repeat this step for 1550nm
5. Plug the PC Low Reflection Terminator into the ORL port and note down the reading.
   For single mode instruments, reading between -35 and 'Lo' dB RL indicates terminator and instrument are working correctly.
6. To verify the supplied PC-APC test lead and APC Low Reflection Terminator, plug the PC end of the test lead into the ORL port and the APC terminator into the far end of the test lead.
   The reading should meet limits for single mode instruments specified above.

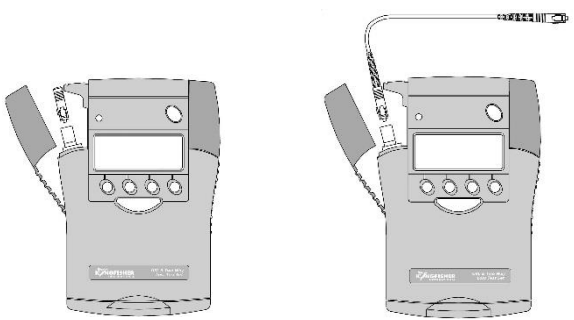


Figure 12A.Test set up for ORL verification test

ORL Verification Test for KI7340C Series instrument with APC connector, ORL port

For this test you will need standard accessories supplied with the unit:
PC/APC test lead, multimode or single mode
PC Low Reflection Terminator
APC Low Reflection Terminator

1. Very carefully, clean all the optical connectors to be used, including ORL port of the instrument.
2. Re-set the meter to factory ORL defaults: select [Power], [↱], [Default] and [Set] to store.
3. Plug the APC end of the patch lead into the ORL port. To display ORL, press [Return Loss] and [-/+] to select the active wavelength, e.g. 1310nm.
4. With patchlead connected to ORL port, note the reading:

   A reading between -13.26 dB RL and -15.26 dB RL for SMF and -13.15 dB RL and -15.15 dB RL for MMF is within calibration specification. This is ORL measured on PC end of the patchlead.

   Repeat this step for 1550 nm.
5. Plug the APC Low Reflection Terminator into the ORL port and, note the reading.

   For single mode instruments, reading between -50 and 'Lo' dB RL indicates terminator and instrument are working correctly.

   For multimode instruments, reading between -35 and 'Lo' dB RL indicates terminator and instrument are working correctly.
6. To verify the supplied PC-APC test lead and PC Low Reflection Terminator, plug the APC end of the test lead into the ORL port and the PC terminator into the far end of the test lead.

   For single mode instruments, reading between -35 and 'Lo' dB RL indicates the terminator, patch lead and instrument are working correctly.

   For multimode instruments, reading between -20 dB and 'Lo' RL indicates the terminator, patch lead and instrument, are working correctly.

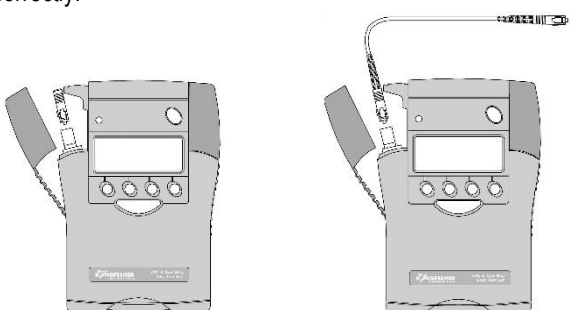


Figure 12B. Test set up for ORL verification test

Instrument / Accessory	Recommended Model	Required Characteristics	Alternative Model
Optical Light Source	KI 2422 or KI 7402C		KI 2822 or KI 7822
Optical Power Meter	KI 2600-InGaAs or KI 7600C-InGaAs		KI 2722-InGaA or KI 7742C-InGaAs
Optical Attenuator	KI 7013B		
Connector adaptors			
SMF patch leads			
For optional test only			
Optical Spectrum Analyser	HP 71450B or equivalent		HP 71452B or equivalent
Connector Adaptors			
SMF patchleads			

Table 1: Required Equipment for KI7340C/7740C Series Performance Verification Tests

Model:	Date:
Serial No.:	Ambient Temperature: °C
Options:	Relative Humidity: %
Firmware Revision:	Line Frequency: Hz
Test Facility:	Customer:
Performed by:	Report No.:

Special Notes:

Table 2. General Test Record for KI7340C/7740C Series

Description	Model No.	Trace No.	Calibration due date
1. Optical Light Source			
2. Optical Power Meter			
3. Optical Attenuator			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Accessories:
SMF patchleads
Connector adaptors

Table 3: Equipment Record for Performance Verification Tests

Model:_____ Report No.:_____ Date:_____

Total Uncertainty / Accuracy Test					
	Test Wavelength = nm				
Setting Number	Power Meter reference value	Attenuator Setting	Minimum specification (-0.3 dB of Ref.)	DUT measurement results	Maximum specification (+0.3 dB of Ref.)
1.	(~-10.00 dBm)	dB	(~-10.30 dBm)	dBm	(~-9.70 dBm)
2.	(~-20.00 dBm)	dB	(~-20.30 dBm)	dBm	(~-19.70 dBm)
3.	(~-30.00 dBm)	dB	(~-30.30 dBm)	dBm	(~-29.70 dBm)
4.	(~-40.00 dBm)	dB	(~-40.30 dBm)	dBm	(~-39.70 dBm)
5.	(~-50.00 dBm)	dB	(~-50.30 dBm)	dBm	(~-49.70 dBm)
		Measurement Uncertainty		_____ dB	

Table 4: Accuracy Test Record for KI7340C/7740C Series, Power Meter section

Note 1: This is for the KI7343C-InGaAs. For the KI7344C- H series instruments, increase by ±0.2 dB.

Model:		Report No.:	Date:
Output Power (CW) Test			
Wavelength	Minimum Specification	Measurement Results	Maximum Specification
1310 nm	-8.00 dBm	_____ dBm	
1550 nm	-8.00 dBm	_____ dBm	
		_____ dBm	
		_____ dBm	
		_____ dBm	
Measurement Uncertainty		dB	
Optional Short-Term Stability Test			
1310 nm		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1550 nm		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
		_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
Measurement Uncertainty		dB	

Table 5. Output Power Test and Short Term Stability Test Record for KI7340/KI7740 Series, Light Source section

Model:	Report No:	Date:

Centre wavelength and Special Bandwidth (FWHM) Test (optional)

Wavelength	Minimum Specification	DUT Measurement Results	Maximum Spec.
Centre wavelength			
1310 nm	1290.00 nm	_____ nm	1330.00 nm
1550 nm	1530.00 nm	_____ nm	1570.00 nm
		_____ nm	
		_____ nm	
		_____ nm	
Spectral Bandwidth			
1310 nm		_____ nm	(6nm) 3 nm typical
1550 nm		_____ nm	(6nm) 3 nm typical
		_____ nm	
		_____ nm	
		_____ nm	
Measurement Uncertainty		dB	

Table 6. Centre wavelength and Special Bandwidth (FWHM) Test Record for KI7340C/7740C Series, Light Source section

Model:	Instrument Connector: APC [ ] PC [ ]	Report No.:	Date:

Calibration Test

Wavelength	Acceptable Range	Measurement Results
1310 nm	-0.5 to +0.5 dB	_____ dB R
1550 nm	-0.5 to +0.5 dB	_____ dB R
		_____ dB R
		_____ dB R
		_____ dB R

Fiber Type: **Singlemode [ ]** **Multimode [ ]**

Linearity and Range Test

No	Attenuator setting	Meter Reading	Linearity Calculation	Acceptable Linearity Range[1]
1	5.00 dB		-	
2	15.00 dB		No 2 – No 1 =	9.50 ~ 10.50
3	20.00 / 25.00 dB		No 3 – No 2 =	4.50 ~ 5.50 / 9.50 ~ 10.50
4	35.00 dB		No 4 – No 3 =	9.50 ~ 10.50

Table 7: Test Record for Two Way /One Way Autotest Performance Verification Tests, KI7340C/7740C Series

Note1: The linearity range here is typically limited by attenuator linearity, rather than instrument performance.

Model:	Instrument Connector APC [ ] PC [ ]	Report No.:	Date:
ORL Calibration Test			
Wavelength	Acceptable Range	Measurement Results	
1310 nm	**PC**: -13.76 ~ -14.76		dB R
1550 nm	**APC**: -13.26~ -15.26		dB R
			dB R
			dB R
			dB R
Residual Light Test			
APC Connector, SMF	-50 ~ 'Lo'		dB R
PC Connector, SMF	-35 ~ 'Lo'		dB R
			dB R
			dB R

Table 8. Test Record for ORL Verification Test, KI7340C Series

QUICK REFERENCE GUIDE - KI7340C/7740C SERIES OPTICAL TWO-WAY LOSS TEST SET

MANUAL OPERATION

- To remove interchangeable connector adaptor, press button on rear of case and pull off adaptor. This may be easier with a test lead attached.
- To defeat auto power-off, hold down [POWER] for 3 seconds at turn on until 'On' and 'Perm' are displayed.
- Low battery is indicated with a battery symbol.
- To access the hidden keypad, pull up display cover.

Light Source mode:

Select [POWER], [Source], then:

- To change wavelength, or turn off, press [-/+].
- To activate modulation, press [Mod]. Modulation is cancelled in power meter mode.
  To change modulation frequency, while source is active press [↱] [kHz] [-/+] [Set] or [Menu].
- To change laser power level, while source is active press [↱] [Level] [-/+] [Set] or [Menu].

Power Meter mode:

- To turn on and select wavelength, press: [POWER] [Power Meter] [-/+]. If source is on, power meter wavelength tracks source wavelength.
- To set reference, press [Abs/Rel] and hold [Set Ref] for 3 seconds. Meter displays about 0.00 dB R.
- To stop / start display update, press [Hold].
- If a test tone is detected, meter will display 'Hz'.
- To display linear mode, press [dB/W].
- To display MAX/MIN values, press [↱] and [Max/Min] repeatedly. Hold [Max/Min] to reset (3 buzzer sounds).

Return Loss Meter (KI7340C Series only):

- To display ORL, select: [POWER] [Return Loss] [-/+] to set the wavelength.
- Set up the residual ORL optical condition. On the hidden keypad select: [RL- NF] and [-/+] to adjust if needed, then [MENU]. To display stored residual reference, hold [RL- NF] key.
- Set up the reference optical condition. On the hidden keypad select [RL-Adj] and [-/+] to adjust the display to the required value, then [Menu]. Offset value is shown on left of display.
- To re-set the residual and reference conditions to default values, select [↱] and [Default].

AUTOTEST OPERATION

- To initiate Autotest, connect Power Meter section to Light Source section and press [Autotest]
- To show one wavelength only, scroll [-/+]. Press [Menu] to exit.
- Press [Hold] to hold / resume display update.
- Autotest remains for 8 seconds after signal loss, to allow quick connection change

Measuring Two Way Loss in Autotest

- **Remote reference:** on each instrument, connect two-way port to power meter port. Select [Autotest], [Abs/Rel]. Press [Set Ref] for 3 seconds. Meters display about 0.00 dB.
- **Local reference:** connect two-way ports of two instruments. Select [Autotest] and [Set Ref]. Meters display about 0.00 dB.
- **Loss testing:** after referencing, connect two-way ports of both instruments to test system. Select [Autotest] on one unit. 'Auto' shows while synchronising, then average loss.
- To show dBm/dB results for each direction, press [◄►] successively on hidden keypad. Press [Menu] to exit.
- **Two Way Communication:** press [Hold] to make remote end beep and flash [Hold]. Then at Remote end, press [Hold] to resume display update. Local end beeps and stops [Hold] flashing.
- To exit Autotest, remove connection, or press [Menu].

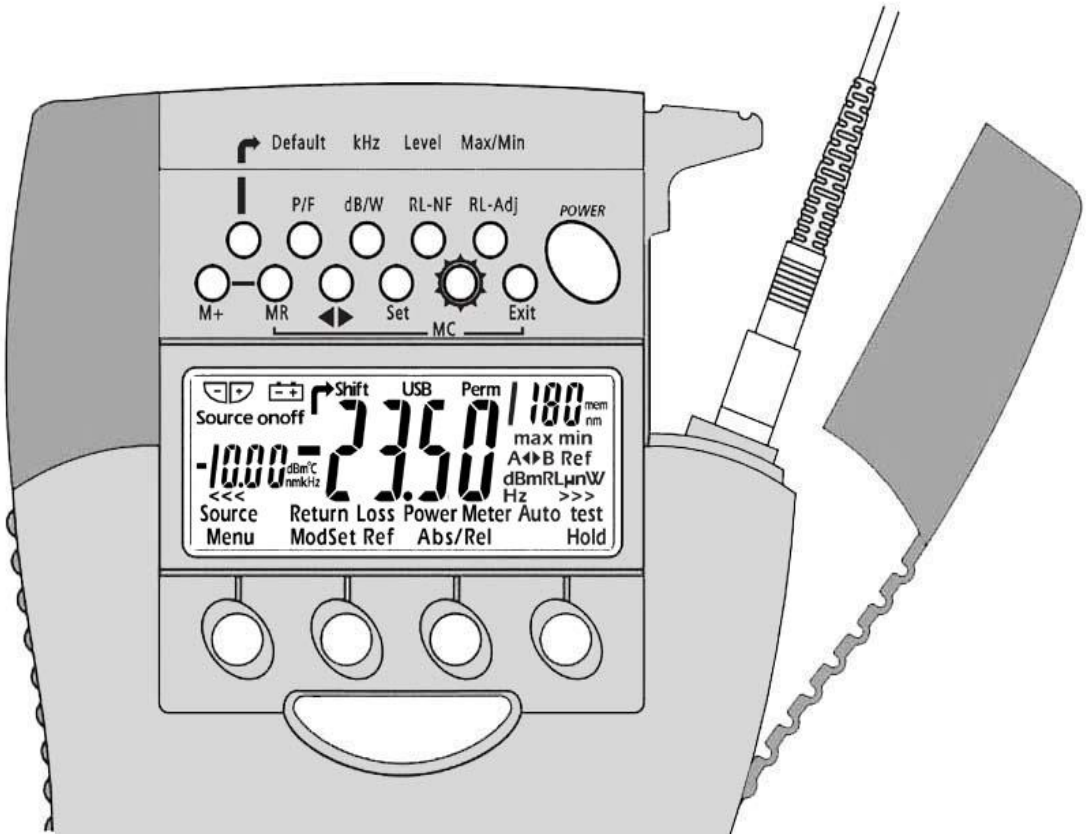
Measuring One Way Loss in Autotest

- **Reference:** connect a two way/source port to a power meter port. Select [Autotest], [Abs/Rel]. Press [Set Ref] for 3 seconds. Meter displays about 0.00 dB R.
- **Loss testing:** after referencing, connect test system to two way / source and meter ports. Loss will be automatically displayed.
- To exit Autotest**,** remove test lead for more than 8 seconds or turn off source

MEMORY OPERATION:

- Data can be stored in all modes, however, memory recall and cancel functions are not available in Autotest and only work in Light Source, Power Meter or Return Loss modes.
- **Clear all memory:** press both [MR] and [Exit] simultaneously for 3 seconds. 'clr' will display.
- To store in next location, press [M+].
- To change next store location, press [◄►] [-/+] [Set] or [Menu].
- To recall, press [MR] and [-/+] to scroll memory. Use [Abs / Rel] to see dB/dBm values. Hold down [Abs/Rel] to see reference level.
- Autotest memory recall: use [-/+] to select next wavelength.
- Two-way test only: press [◄►] repeatedly to scroll details.
- To exit memory display, press [Menu].

KI7340C/7740C SERIES TWO WAY LOSS TEST SET



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Information in this manual is given in good faith for the benefit of the user. It cannot be used as the basis for claims against Kingfisher International or its representatives, if accidental damage or inconvenience results from use or attempted repair of the equipment.

Kingfisher International products are guaranteed against defective components and workmanship for a period of 3 years from the date of delivery, unless specifically stated in the original purchase contract or agreement. This warranty excludes optical connectors or incorrect use. Opening the instrument will invalidate the warranty. Liability is limited solely to repair of the equipment.

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