KI 7300 / 7700 Series
Loss Test Set

KI 7400 / 7800 Series
Light Source

KI 7600 Series
Power Meter

OPERATING & MAINTENANCE GUIDE

KINGFISHER INTERNATIONAL

DECLARATION OF CONFORMITY

ACCORDING TO ISO/IEC GUIDE 22 AND CEN/CENELEC EN45014

Manufacturer's Name: Kingfisher International Pty. Ltd.
Manufacturer's Address: 30 Rocco Drive
Scoresby, Victoria 3179
Australia

Declares, that the product

Product Name: **KI 7000 Series**
Model Number: **KI 7300A/7700A Series, KI 7400A/7800A Series, KI 7600A Series**
Product Options: This declaration covers all options of the above product(s)

Conforms with the following European Directives:
The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly.

Conforms with the following product standards:

	Standard	**Limit**
EMC	IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998	
	CISPR 11:1997/EN 55011:1998 Group 1 Class B	
	IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995+A1:1998	4kV CD, 8kV AD
	IEC 61000-4-3:1995+A1:1998+A2:2000/	3 V/m, 80-1000MHz
	IEC 61000-4-3:1996+A1:1998+A2:2001	
	IEC 61000-4-4:1995/EN 61000-4-4:1995	0.5kV signal lines, 1kV power lines
	IEC 61000-4-5:1995/EN 61000-4-5:1995	0.5 kV line-line, 1kV line-ground
	IEC 61000-4-6:1996/EN 61000-4-6:1996	3V, 0.15-80 MHz
	IEC 61000-4-8:1993/EN 61000-4-8:1993	30 A/m
	IEC 61000-4-11:1994/EN 61000-4-11:1994	0.5 cycle/100%/each polarity
	Canada: ICES-001:1998	
	Australia/New Zealand: AS/NZS 2064.1	
Safety	IEC 61010-1:2001 / EN 61010-1:2001	
	Canada: CSA C22.2 No. 1010.1:1992	
	USA: UL 3111-1:1994	
	IEC 60825-1:1993+A1:1997 / EN6082:1994+A11:1996	
	FDA CFR 21 part 1040.10	
	FDA Accession No: 7300 Series 0220392, 7400 Series 9922312-xx, 7601 Series 0220393, 7700 Series 0220391, 7800 Series 9922470-xx	

Supplemental Information:

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

2007-Jan-11
Date

Bruce Robertson
Name

Technical Director
Title

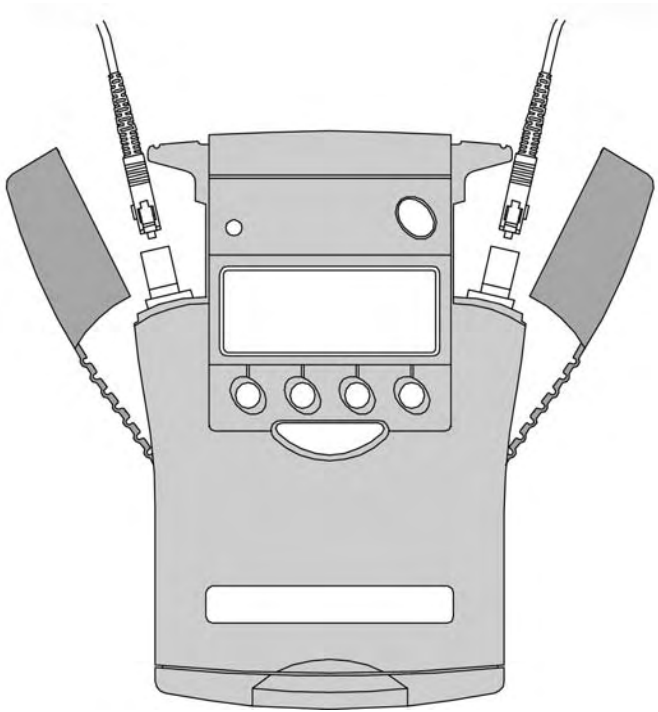
For further information, please contact your local Kingfisher International sales office, agent or distributor.

KI 7000 SERIES

Optical Power Meter

Optical Light Source

Optical Loss Test Set



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

For hints and tips from experts refer to our Application Notes on www.kingfisher.com.au

NATA WORLD RECOGNISED ACCREDITATION

4th Edition, January 2007.

CONTENTS

BEFORE READING FURTHER, REFER TO THE CONTROL PANEL PICTURE IN THE QUICK REFERENCE GUIDE SECTION OF THIS MANUAL

SERVICE & SUPPORT

Applications Support

Please visit www.kingfisher.com.au to see our comprehensive Application Notes, written to support our instrument users.

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

- Contact your local Kingfisher International distributor.
- Look at www.kingfisher.com.au to find distributor details from the Contact Us section, or to get a Service Request Form from the Support page.
- Contact our office at: Tel: (61) 3-9757-4100
  Fax: (61) 3-9757-4193
- Email sales@kingfisher.com.au

Before returning equipment to Kingfisher for Service or Calibration, please obtain and complete a Service Request Form (on our web site www.kingfisher.com.au).

Kingfisher offers a fixed price repair service, to avoid delays and minimise disruption for our customers.

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

INTRODUCTION & APPLICATIONS

General:

The KI 7000 Series Optical Power Meters, Optical Light Sources and One Way Loss Test Sets are used to test all types of fiber optic systems:

- Tx / Rx absolute power levels in dBm
- Optical loss in dB at up to 4 λ simultaneously
- Continuity testing with the test tone features
- Visible Fault Locator on the KI 7601A Power Meter
- Full CWDM, DWDM and out of band testing capability
- Options for singlemode, multimode and PCS fiber types
- Telecom construction or maintenance, CATV, LAN and R&D applications
- Quality assurance and acceptance testing
- Automated testing using external PC software

The instruments offer an exceptional level of convenience and productivity in these applications and are for use by installers, technicians and engineers. They feature superb measurement confidence, ease of use and reduced cost of ownership.

The interchangeable optical connectors are drop protected during use, are dust protected by a snap on cover, and are easily disassembled for cleaning. A wide variety of connector styles are available, include LC, MU and interchangeable connector styles.

Autotest mode on both source and meter enables automatic multi-λ (wavelength) detection for attenuation measurement.

These instruments feature very long battery life of 360 hours for the meter, and 190 hours for the source.

The instruments have shock absorbent corners, and a tough polycarbonate housing which has passed extensive drop testing.

Calibration can be performed by any suitably equipped laboratory, without opening the instrument. The recommended re-calibration cycle is 3 years.

PC reporting software allows real-time instrument control & data download, and is easily customised to suit most languages and reporting requirements. Real time display, data logging and label printing functions are included.

An alternative range of instruments is available featuring higher productivity Two Way testing and Return Loss testing. Please refer to the KI 734x / KI 774x range. The range of instruments in this manual can perform Two Way loss testing using a two-step process.

Power Meter:

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

Warm up period, range-changing delays and user dark current zeroing are 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 100 micron, with both PC and APC polish connectors.

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

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

Calibrations are available from 600 ~ 1650 nm, and power levels from +27 to -70 dBm.

Calibrations cover all popular application wavelengths, and CWDM calibrations are available from 1270 ~ 1610 nm, in 20 nm increments

The KI 7601A power meter range includes a 635 nm visible laser for extra convenience when locating faults.

Light Source:

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

Laser sources are used for testing single mode fiber systems.

LED sources at 850 / 1300 nm are used for testing multimode fiber systems. Optional LED source standards compliance is available.

The 1300 nm LED can also perform short distance single mode testing.

Loss Test Set:

The loss test sets in this range combine the source and meter functions in one convenient package. This reduces operational and equipment inventory costs for larger work groups.

GENERAL SAFETY SUMMARY

The following general safety precautions 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 manual, for safety markings and 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 or loss of life. Do not proceed beyond a **WARNING** sign until the indicated 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.

Safety Symbols

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.

The Performance Tests give procedures for checking the operation of the instrument. 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 (see page 4).

GENERAL SAFETY SUMMARY

WARNING!

You MUST return instruments with malfunctions to a Service Center for repair and calibration (see page 4).

Operating Environment

The range of Kingfisher equipments 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 equipments 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

Kingfisher instruments contain no hazardous optical or electrical items. The following information is for your reference: 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.

This instrument is manufactured under an ISO9001 approved Quality System, and conforms to CE Mark EMC specifications.

Kingfisher International maintains an ongoing program of product and process improvement, and reserves the right to improve or amend specifications without notice.

WARNING! 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 with these power levels **MUST** determine and observe relevant safety precautions, which are beyond the scope of this manual.

LIGHT SOURCE SAFETY SUMMARY

Laser & LED Safety Information

Laser	Fabery Perot or DFB Semiconductor Laser
λ	635 nm, 1270 ~1625 nm
LED	Surface emitting Semiconductor LED
λ	850 / 1300 ±100 nm
Max CW output power[1]	<1 mW
Minimum beam waist diameter	9 µm
Minimum Numerical Aperture	0.1

Laser Class according to IEC 60825-1 (1998) – International &
21 CFR 1040.10 (1995) – USA

635 nm	Class 2
850~1625 nm	Class 1

Maximum Permissible Levels for various standards & wavelengths:
IEC 60825-1 (1998) [2]

635 nm	1 mW
1310/1550 nm	8.9 mW / 10 mW

21 CFR 1040.10 (1995) [2]

635 nm	1 mW
1310/1550 nm	2 mW / 8.1 mW

Note 1: Max. 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: Max. 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

Laser & LED Safety Classification

In the USA, LED / laser sources specified by this data sheet are classified as Class 1 according to 21 CFR 1040.10 (1995).

Internationally, the same laser sources are classified as Class 1 according to IEC 60825-1 (1998).

WARNING! Please pay attention to the following laser safety warnings:

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 fibre attached to the optical output connector.

Optical magnifying instruments increase eye hazard. Always disconnect the source before using an optical magnifier.

The laser module has a built-in safety circuitry which will usually 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 & EXTERNAL POWER

These instruments are powered by two 1.5 V dry Alkaline 'C' size batteries

Instrument Function	Battery run time in hours:
Optical Power Meter	360
Optical Light Source	190 in Autotest

About 30 % capacity is obtained when using 2 x 'AA' alkaline cells using the supplied battery size adaptors, or 50 % capacity when using 2 x 1.2 V rechargeable 'C' size batteries.

The supplied AA to C size battery size adaptors enable convenient purchase of batteries in almost any location, since most shops around the world stock AA batteries.

When the batteries are low, the 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 switch on the instrument for permanent operation: hold the [POWER] key down for 3 seconds during turn-on until 'PERM' is shown in the display.

To change the batteries, open the cover of the battery compartment at the base of the instrument, remove the batteries, insert new ones (check polarity) and close the cover again.

For operation of the instrument by external power, use Kingfisher AC adaptor OPT103B (9V DC, 0.3 A,). The external power supply disconnects the batteries.

Suitable external power packs are easily available, and must meet the following requirements:
Rated for local mains supply voltage & safety requirements
Regulated or unregulated DC output 6 ~ 12V at 300 mA max
Connection polarity: +ve pin

Rechargeable batteries must be removed for charging by an external charger.

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 (notably nickel-cadmium) contain toxic heavy metals, so please dispose of them by returning them to a re-cycling centre. Batteries purchased from Kingfisher agents can be returned to them for appropriate disposal.

OPTICAL CONNECTOR

The 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.

To install an 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 on the latest model of these instruments, 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.

On older models without the release button, move the connector port to its mid-way point, then pull off the adaptor.

Different styles of connector adaptor can be easily fitted by the user: ST, SC, FC, MU, LC / F3000, E2000 / LSH, and LSA / DIN, SMA.

For the power meter, 2.5 mm & 1.25 mm universal adaptors are available. However we recommend that these are not so convenient for regular use, due to the possibility of measurement errors. Universal adaptors are not recommended for general use with sources, since unstable measurements are likely.

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

Power Meter:

A power meter 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.

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.

Light Source:

A light source can be used with **either** PC **or** APC connectors. This is determined when ordering the instrument, and can only be changed by a service centre.

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.

OPTICAL CONNECTOR

When not in use, keep the test port and connectors covered and away from dust.

The supplied standard adaptors do not cause metal dust contamination. Connector contamination can cause connector failure and fiber fuse at very high power levels.

Do not touch connector tips with your fingers, since body oils and dirt can impair connector performance.

CAUTION!

Do not use damaged or incompatible connectors.

Do not attempt to clean an optical interface with anything hard that could scratch glass, or permanent instrument damage may occur.

Do not attempt to clean any connector when a very high power level (eg > 0 dBm) is being emitted. This is a dangerous work practice, and above about +10 dBm, can result in permanent connector damage.

Power Meter:

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.

To clean the interface, first remove the interchangeable adaptor to access the glass interface.

Use a “stick” style connector cleaner for 1.25 mm, LC or MU connectors to clean the glass end face and remove any dirt. Alternatively, a soft brush, alcohol, air can or ‘Blu Tac‘ are appropriate.

Light Source:

Be aware of and observe relevant optical safety requirement procedures. Disable all sources when cleaning optical interfaces.

Preferred Procedures

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.

Also available are excellent ‘stick type’ fiber optic connector cleaners that enable cleaning without removing the adaptor. These clean both the adaptor and end face in one operation.

GETTING STARTED & TURNING ON

This and following sections show you how to use your instrument:

To access the optical connector, grasp the top right corner of the instrument, and pull off the cover. The connector can be swivelled to improve access.

Check that an optical connector adaptor has been fitted.

Put the batteries into the instrument (see 'Battery Power' section).

To turn the instrument on, press the [POWER] button. The display will come on displaying the firmware version. If the battery is low, this will be indicated on the display with a battery symbol.

Press [POWER] again for 2 seconds to turn the instrument off.

To stop the instrument turning off 10 minutes after the last key press: press and hold [POWER] for 3 seconds during turn-on. 'On' and then 'Perm' on the display indicates that the unit will stay on permanently.

These instruments have extra functions accessed via a hidden keypad, to simplify training and support for inexperienced users. To access this hidden keypad, lift up the display cover.

The display cover can also be cleaned easily at this point.

To disable or enable the buzzer, press and hold down the [SHIFT] button for 3 seconds.

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.

To turn on all display segments: hold down the left hand grey button under display, during instrument turn-on.

Power Meter: (not KI 74xx or KI 78xx instruments)

After instrument turn-on, the power meter performs a self-calibration sequence, and then displays absolute power in dBm at the previously set λ.

If 'HI' or 'LO' are displayed, the input is out of range.

This power meter requires no warm up, and no user adjustment of dark current to achieve its specified performance.

Light Source: (not KI 7600 instruments)

After instrument turn-on, the light source is always off. Further operator intervention is always required to turn on a source.

On the KI 770x and KI 780x series instruments, the light source requires a warm up period at the set wavelength, to achieve specified stability.

On the KI 730x and KI 740x series instruments, the light source achieves specified stability without any warm up period.

AUTOTEST OPERATION

Autotest is the easy way to perform optical loss testing when an Autotest compatible source and meter or Loss Test Set are available.

Autotest performs automated loss measurement and λ detection by data exchange between the light source and optical power meter.

It remains synchronised for about 8 seconds after disconnection, to give the user time to change optical connections without re-starting Autotest each time. This provides productivity gains.

All Kingfisher Autotest equipment is compatible. Any Autotest source will work with any Autotest meter or Loss Test Set, as long as both have compatible wavelengths.

Initiate Autotest Operation

Turn on the instrument(s), and connect a test lead. On the **light source**, press [AUTOTEST]. This is all that is required.

Alternatively, to enter Autotest λ Selection Mode, press [SHIFT] before pressing [AUTOTEST] (see later description).

Power Meter:

The meter automatically sets to the correct λ and displays the absolute power in dBm. If a multi λ light source is used, the display rotates through all source wavelengths. To display only one λ at a time, press [-/+].

The transmitted power from the light source is displayed on the left hand side of the power meter display.

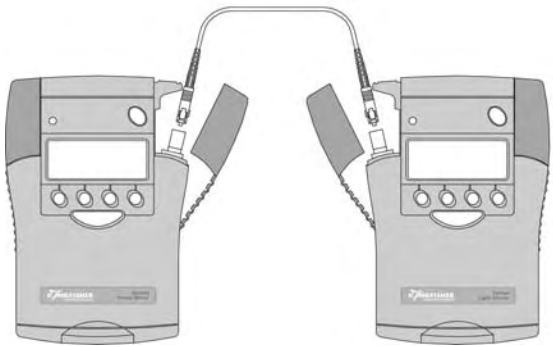
If a multi λ light source is used, the alternating wavelengths are shown in the top right hand side.

Press [ABS/REL] to make the meter display relative power and reference level. To take a **reference** under Autotest, connect the light source and meter with a test lead. Set the source to Autotest mode, and then press [SET REF] on the meter for 3 seconds. This stores the reference at all relevant wavelengths.

To exit Autotest mode:

Either, disconnect the optical test lead,
Or, on the Light Source, press [MENU].

Then select [Menu] on the meter, or wait 8 seconds for Autotest to timeout.



KI 7600 Power Meter **KI 7400 Light Source**

Loss Test Set:

Any sensible combination of Loss Test Set(s), or source and meter can be used, as long as they are Autotest compatible. Functionality will be as follows:

One way loss at multiple λ, depending on the number of source λ which match calibrated meter λ. Bi-directional testing is supported by KITS™, using successive measurements.

These instruments can also be used with KI 7000 Series Two Way loss test sets, in which case the functionality will be as above.

Loss Test Sets also support Autotest in loop-back mode, as shown in this picture:

Reference Methods: both local and remote reference methods are supported.

When setting the reference value, use a test lead(s) with a similar fiber type to the system under test. This is particularly important with multimode systems. The number of test jumpers used when taking a reference is a function of test requirements and standards compliance, not the instruments involved, so this issue is beyond the scope of this manual.

Proceed as follows:

- **Remote Reference**: On each instrument: Connect the source port to the power meter port. Select [POWER], [AUTOTEST], [Abs/Rel], hold [Set Ref] for 3 seconds. Meter displays about 0.00 dB R.

The remote reference mode is especially useful for long distance testing. Note however that excess 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.

- **Local Reference:** Connect the source port of both instruments. Select [POWER], [AUTOTEST] hold [SET REF] for 3 seconds. Meters display about 0.00dB R.

The local reference method is especially useful for short distance testing and for testing patch-lead loss, since it gives the best accuracy.

If successive fibers are re-connected within an 8 second period, then Autotest synchronisation is maintained and operation is faster. After the 8 second period, there is a small synchronising delay.

Autotest λ Selection Mode

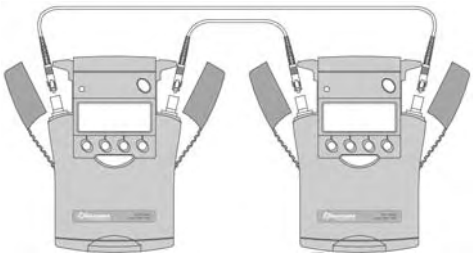
If the required regular testing uses fewer wavelengths than the instrument has available, then it may be convenient to reduce the number of active Autotest wavelengths. For example, instead of the instrument rotating through 1310 / 1490 / 1550 / 1610 nm, it can be set to test at 1310 / 1550 nm only.

Enter set-up: [POWER] / [SOURCE] / [AUTOTEST] (not displayed on screen)

Then:
Press [-/+] to change λ.
Press [AUTOTEST] to view the "in" "out" status of each λ
To toggle 'In/Out' state for each λ. Press [SHIFT] then [AUTOTEST]
Autotest now operates only with λ's selected as 'In'.
To run this mode: press [SHIFT] then [AUTOTEST].
The settings will be retained at the next turn on.

Simultaneous Autotest Measurement on two fibers

Loss Test Sets support this as shown in the picture below



Put each instrument into Autotest before connecting the patch-leads. Note the results will be stored on both instruments and then merged later, so records management needs extra care.

Use of PC Software with Autotest

To realise the full benefit of Autotest, use the KITS™ PC software in the field with a laptop to achieve real-time data acquisition, acceptance testing and reporting. Full operating sequences are given in the KITS™ on-line manual. KITS™ also supports bi-directional test results using non bi-directional instruments. KITS™ also enables merging of test results from multiple instruments.

POWER METER OPERATION

This mode of operation is typically used to measure Tx / Rx absolute power levels, to perform continuity testing using the tone detector, or to perform loss testing if an Autotest light source is not available.

On a Loss Test Set, if the power meter section is used in this mode with any laser turned on, the instrument links the source and meter section so that the source and meter wavelengths remain synchronised. So in this mode, only the source wavelengths are available to the user. This simplifies operation.

WARNING!

Observe optical safety procedures relevant to the power levels being measured, especially for the high power H3 meter.

After instrument turn-on, the meter is operational at the last used λ.

- To scroll the wavelength, press [-/+]. The λ is displayed on the top right side of the display.
- To toggle absolute / relative display mode, press [ABS/REL]. The display will show 'dB R' or 'dBm'.
- To stop / start display update, press [HOLD]. The symbol will flash when the display is on hold.
- To store a new reference, press [SET REF] for 3 seconds.
- When in relative mode, the reference value is displayed on the left hand side of the display.
- To toggle log / linear display mode, access the hidden keypad and press [dBm/W].
- To display minimum and maximum values over a period, access the hidden keypad and press [MAX/MIN]. The display shows 'Max/ Min' values in sequence. Press [MAX/MIN] for 3 seconds to re-start the recording process. This function re-sets automatically when instrument parameters are altered. This is a handy data logging function for 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 (eg 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).
- To measure the operational power level in a fiber optic system, the 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.

This mode of operation is typically used to operate the emitter, to perform continuity testing with the test tone generator, or 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 using [-/+], (eg 1310, 1390, 1550, 1610 nm, off).

For the simplest level of operation, the sequence is simply: [POWER], [SOURCE].

The active wavelength is shown on the right hand side of the display. Source power level is at the left hand side of the display. Modulation frequency (if relevant) is at the center of the display.

To modulate the source, press [MOD], and the modulation frequency is displayed. Modulation is active only while the source is enabled.

To select a different modulation frequency, press [SOURCE] / [KHz] / [+/-] scroll from 0.27 KHz, 1 kHz, 2 kHz / [SET].

Laser Output Power Adjustment

To adjust laser output power, turn the laser on, then select [LEVEL] / [-/+] to adjust the level, then [SET]. This function does not operate in Autotest mode and is not available on LED sources.

Visible Laser Operation (KI7601A instruments only)

The visible laser is a useful low skill fault finding tool. The connector ferrule is fixed PC or APC, however the connector style can be easily changed (refer to optical connector section on page **11**).

The visible laser works equally well on singlemode or multimode laser, and works best over distances of less than 1km, although the red light is generally visible at the fiber end up to about 5km.

The visible laser is classified as Class 2, eye safe as long as magnifying devices are not used. So do not use it with inspection microscopes or other magnifiers and do not stare into the light.

If the laser light is inserted into a faulty system, the fault point will glow red. The laser is modulated at 2Hz to improve visibility. The fault is generally visible through 3mm patch lead jackets, although some types do absorb light, so this should be tested before proceeding. It is also generally possible to locate faulty connectors in the same way. Due to the variety of materials, pigments and construction types of cables and fiber systems, successful use of this option is not guaranteed in all situations, however it is a generally very useful craft tool.

To switch on the visible laser, press [POWER] then [SOURCE].

To stop modulation, press [MOD]. All other modulation frequencies can also be selected, for use with tone detectors, clip on probes etc.

To turn off the laser, press [-/+].

STORING & RECALLING READINGS

Overview

There are various ways of storing and recording data:

Meter Reference Value

The power meter reference value for each λ is stored in non-volatile memory. It is displayed on the left of the display when in relative (dB) mode.

Meter Display Hold

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

Automatic MAX / MIN Recording

To display the minimum and maximum power meter value over a period, access the hidden keypad and press [MAX / MIN]. The display will show the maximum and minimum values in sequence. Press [MAX / MIN] for 3 seconds to re-set. The function re-sets when instrument parameters are altered.

Note: This function records drift, but may not accurately 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 an Excel spreadsheet in the KITS™ software. The user memory is unaffected by removal of batteries or other power sources.

One Way Autotest Data is stored as follows:

For each λ: dBm, dB R, reference dBm, source dBm, source s/n, λ.

Power Meter Data is stored as follows:

dBm, dB, reference dBm, λ.

Source Data is stored as follows:

Nominal output dBm, λ.

Operation

Operation is via the hidden keypad. To display the current memory location: press [SELECT], and then view the location at the top right. [CANCEL] to exit.

Store

To store in the next location: press [STORE]. The display shows 'busy' while a new data set is measured & stored. Alternatively in Hold mode, existing data will be stored.

To store data starting at a particular location, or over-write a record: press [SELECT], [-/+] to select a memory location, [SET], and [STORE] to store the displayed data.

STORING & RECALLING READINGS

Recall

To recall data, exit Autotest if relevant. In Autotest mode, data can only be stored.

To read from any location: press [RECALL], and [-/+]. To display the relative and reference values, press [ABS/REL]. To show a second λ, press [-/+]. Hold down [-/+] for accelerated navigation.

Erase

A full memory is indicated by a repeating buzzer.

To clear all stored data press [RECALL] & [CANCEL] simultaneously for 3 seconds. The display shows 'clr'.

Memory Capacity

For instruments with firmware version 5.00 or later, the display type is indicated during turn on. For example, "d2 5.00" is a type 2 display.

Type 1 display:

Capacity 845 two λ readings displayed in the following blocks:

Display Memory No:	Identifier	Sequence
1 – 199	mem	1 - 199
200 - 1990 (steps of 10)	mem	200 - 378
1 – 199	ID	379 - 577
200 - 1990 (steps of 10)	ID	578 - 756
1 – 199	mem / ID	757 – 845
Total Memory (type 1 display)		**845**

Type 2 display:

Memory capacity is determined by the configuration of your instrument. The following illustrates the working capacity of various configurations.

One Way, 4 λ	1962 readings (in Autotest)
Two Way, 2 λ	1269 readings
Two Way, 3 λ	874 readings
Two Way, 4 λ	667 readings

For example, the memory capacity for a Loss Test Set is 1,962 for 4 λ readings. So the combined capacity of an instrument pair is 3,924, 4 λ readings.

For very high fiber count cables, it would be more sensible to work directly into the KITS™ PC software.

PC INTERFACE

The PC interface can be used to access and control the instrument from an external computer. All functions can be accessed remotely. See next pages for available software

RS232 interface

The connection details of the instrument and connecting cables are as follows:

Some (out of spec) serial ports need a 10K resistor in the D connector across wires 1 & 2.

	Wire 1(Screen)	Wire 2	Wire 3
Instrument Jack Plug	Body (Gnd)	Ring (Tx)	Tip (Rx)
9 Pin D connector for RS232	Pin 5 (Gnd)	Pin 2 (Rx)	Pin 3 (Tx)

Baud Rate

The baud rate can be set to: 0.3, 0.6, 1.2, 2.4, 4.8, 9.6, 19.2 and 38.4 Kbaud.

The default baud rate is 9.6 Kbaud.

To set the baud rate, on the hidden keypad, press [SHIFT], [BAUD RATE], then [-/+] to set the rate, followed by [SET]. At turn on, the default is restored.

Local / Remote Modes

The hidden keypad enables the user to lock out the front panel controls, by pressing [LOCAL] or [REMOTE].

EXTERNAL SOFTWARE

KITS™ PC software enables instrument control and transfer of live or stored data to an Excel spreadsheet. This is ideal for data logging and reporting applications typical in field applications.

Functions currently supported include:

- Live power meter display
- Data logging with graph and statistical information
- Label printing
- Loss testing spreadsheet with direct click-and-point data insertion or memory downloads.
- Two Way loss reporting by merging one-directional measurements.

KITS™ is easily customised by intermediate level users of MS Excel and Notepad. This is convenient to change language, terminology or to add new reporting features.

CARE OF YOUR INSTRUMENT

- Follow the directions in this manual on optical connector care.
- Use only high quality sealed alkaline batteries.
- During prolonged storage, remove batteries to eliminate the possibility of acid leakage.
- 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 alcohol or other non solvent cleaning agents. Acetone or other active solvents may damage the case.
- The instrument housing is made of tough polycarbonate material with impact absorbing rubberised corner features, and is therefore drop resistant.

Power Meter:

- Limit an InGaAs or Ge power meter input to +15 dBm above the max reading
- Limit the H3 power meter input to < +30 dBm for 2 minutes.

ACCURACY CONSIDERATIONS

All Measurements

Keep optical connectors clean and in good condition. APC connectors will generally provide improved power stability on single mode systems.

To reduce the effect of polarisation changes, the 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 standards compliant (overfilled) LED source, and a mandrel wrap.

Power Meter:

λ uncertainty affects power meter calibration. This is significant with a Ge detector in the 1550 nm band (eg > 1560 nm in cold weather), and an InGaAs detector in the 850 nm band, where absolute errors of the order of 1 dB are possible.

Do not use a Ge detector at λ's around or above 1580 nm. Only an InGaAs detector will be accurate at these λ's.

This λ sensitivity is why Ge detectors are used in 850 / 1300 nm multimode applications, and why InGaAs detectors are used in high end single mode applications. This issue affects absolute power measurements. It may not significantly affect attenuation measurements where the meter was referenced to the same light source.

Ge power meters are inherently non-linear by about 0.04 dB. Ge meters also have temperature dependent calibration drift at 1300 nm of typically 0.03 dB per 10 ºC.

Improved measurement stability on laser based systems is typically achieved by using an APC connector at the power meter interface, which reduces line reflections. 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. Specifications are for typical drift, warm up, and with a specified level of return loss. Actual drift will be vary between instruments and test situations.

Most available laser sources (except the KI 7300 Series One Way Loss Test Set) 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.

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

DWDM Loss and Power Measurements

The DWDM bands are typically within 1525 ~ 1610 nm. For this application, an InGaAs power meter detector gives much improved absolute accuracy compared to a Ge detector, which is excessively sensitive to wavelength and temperature above 1580 nm.

Since an InGaAs detector has a flat response across this wavelength region, it is not necessary to precisely match an InGaAs power meter calibration wavelength to the measured wavelength, a single 1550 nm calibration is usually adequate.

Testing loss at 1610 or 1625 nm 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 about 1383 nm.

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

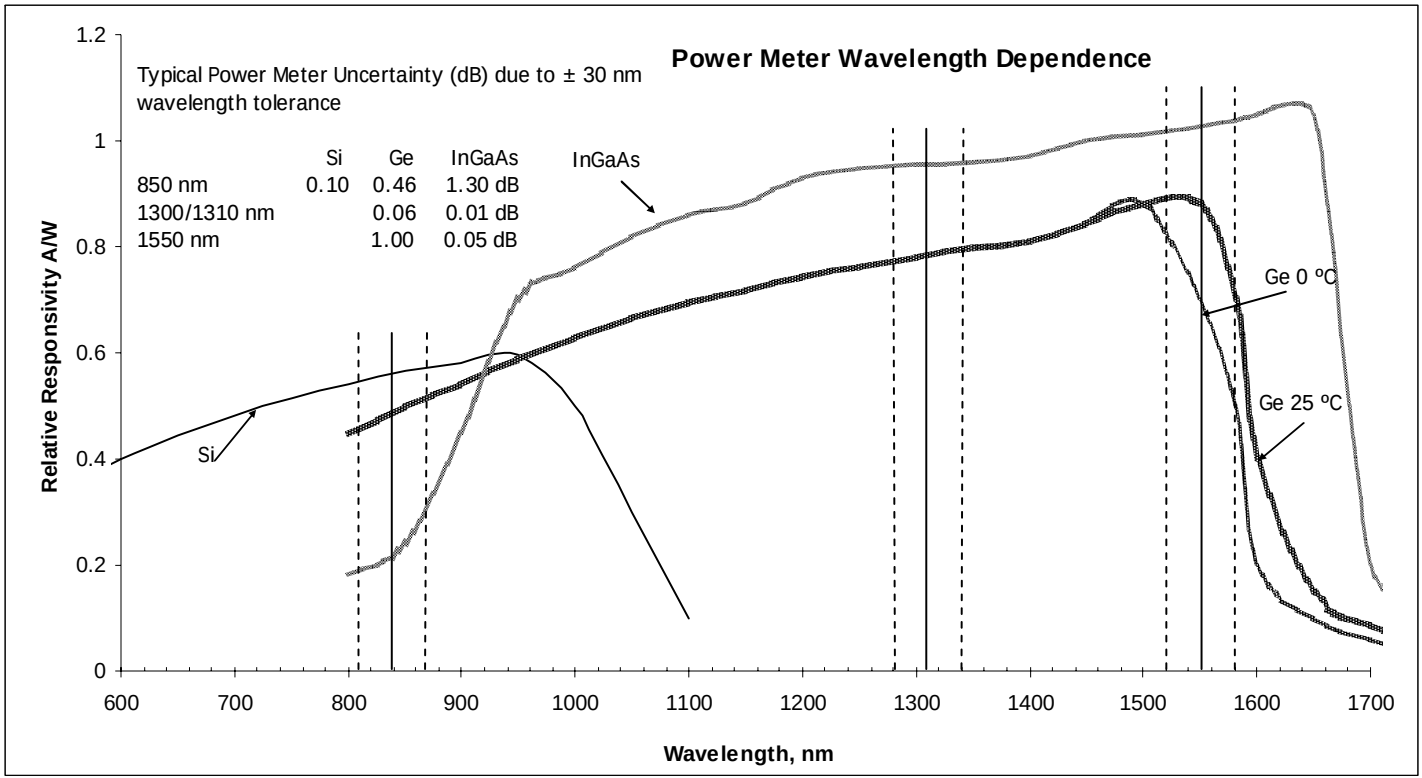
The points raised about InGaAs and Ge detectors for DWDM also apply, with the additional issue that:

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.

ACCURACY CONSIDERATIONS



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 - which includes 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 which includes noise and drift (connectors and test leads must be absolutely clean and undamaged).

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

Light Source:

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

Power Uncertainty / Repeatability: The 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 9/125 or 62.5 µm fiber, at constant temperature, and within a specified temperature window.

Centre λ: The λ representing the centre of mass of the selected peaks**.**

$$\lambda_{cw} = (1/P_o)\Sigma(P_i \lambda_i)$$

Where: P_i and λ_i are the power and λ of each spectral component and P_o 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.

SPECIFICATIONS

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/hr, (or 2 'AA' cells - using supplied adaptor) or external 9V DC with 2.5 mm '+ve' pin. Selectable auto-off and low battery indicator and back lit display
Case:	Polycarbonate, 1 meter drop tested.
Hidden Keypad:	For setting advanced functions
RS232:	3.5 mm jack connector, 0.3 ~ 38.4 K baud

Power Meter:

Calibration:	Performed without opening instrument. Recommended calibration cycle: - Every 3 years.
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%.
Damage level:	Si, Ge, InGaAs: > +15 dBm above the max reading H2 / H3: > +3 dBm above the max reading for 2 minutes
Max / Min:	Recording feature for stability testing

Light Source:

Modulation:	CW, 0.27, 1, 2 KHz ± 2%, square wave Visible Source KI7601: 2 Hz, 0.27, 1, 2 KHz
LED Power:	1300 nm LED power into SMF: > - 40 dBm
Laser Power:	adjustable over 6 dB in 0.01 dB increments

Reconnection repeatability: 0.1 dB, 95 % confidence

SPECIFICATIONS

Power Meter: - KI 7600A

Detector Type	Response λ nm	Damage Level dBm	Calibration λ nm	Power Range dBm	Autotest Sensitivity dBm	Mid range Linearity[1] dBm	Calibration Accuracy[2] %	Polarisation Sensitivity dB	Total Uncertainty[3] dB
Ge	600 ~ 1650	+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	*+10 to -65* +10 to -70	*-45* -50	0.04	1 %[2] (0.06 dB)	<0.005	0.5
InGaAs	800 ~ 1700	+15	*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 to -60* +5 to -70	*-40* -50	0.02	1 %[2] (0.06 dB)	<0.005	0.3
H3B (InGaAs)	800 ~ 1700	+30[4]	1300, 1310, 1550, 1270, 1290, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1490, 1510, 1530, 1570, 1590, 1610, 1625	+27 to -50	-30	0.02	1 %[2] (0.06 dB)	<0.005	0.35
					typical	typical		typical	max

Note 1: Mid range linearity excludes top 3 dB and bottom 10 dB of range.
Note 2: Calibration condition: non coherent light, -35 ± 5 dBm, 23 ± 1 °C, ± 1 nm, 10 ± 3 nm FWHM, PC ceramic connector, 100 µ m fiber
Note 3: Includes: contributions due to: varying optical connector types, calibration uncertainty, full temperature, dynamic range and fiber type up to 200 µm core diameter.
Note 4: H3B can sustain the damage level for 2 minutes

Power Meter: - *KI 7600*

Detector Type	Response λ nm	Calibration λ nm	Power Range dBm	Autotest Sensitivity dBm	Mid range Linearity[1] dBm	Calibration Accuracy %	Polarisation Sensitivity dB	Total Uncertainty[3] dB
Ge	600 ~ 1600	650, 850, 1300, 1310, 1550, 1590, 1610, 1625	+10 to -65 +10 to -70	-45 -50	0.04	2 %[2]	<0.005	0.5
InGaAs	800 ~ 1700	850, 1300, 1310, 1550, 1610, 1625	+5 to -60 +5 to -70	-40 -50	0.02	2 %[2]	<0.005	0.3
H3 (InGaAs)	800 ~ 1700 980 ~ 1660	850, 1300, 1310, 1550, 1610, 1625	+27 to -40 +27 to -50	-20 -30	0.02	2 %[2]	<0.005	0.35

Optional visible laser: 635 ± 20 nm, -2 ± 1 dBm from single mode fiber, modulated at 2, 270, 1K, 2K Hz, CW. The modulation can be turned off.

SPECIFICATIONS

Power Meter Section: - KI 7300A

Detector Type	Response λ nm	Damage Level dBm	Calibration λ nm	Power Range dBm	Autotest Sensitivity dBm	Mid range Linearity[1] dBm	Calibration Accuracy %	Polarisation Sensitivity dB	Total Uncertainty[3] dB
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 to -50* +15 to -60	*-30* -40	0.02	1 %[2]	<0.005	0.3

Light Source: – KI 730x & KI 74xx

	1310/ 1550 nm	Other Lasers	LED	Comments
2 λ source power 3 or 4 λ power	-7 dBm -10 dBm	-7 dBm -10 dBm	-23 dBm	± 1 dB
Short term stability	0.03 dB	0.05[5] dB	0.01 dB	15 min, max no warm-up, Δ 3 °C
Stability, over temp	0.2 dB	0.2 dB	0.35 dB	Max, over temperature
λ tolerance	20 nm	6.5 nm	30 nm	At 25 °C
λ width	3 nm	< 1 nm	35 / 100 850 / 1300	FWHM, typical
λ nm / °C	0.4	0.1	0.4	Typical
Reconnection repeatability	0.1 dB		0.05 dB	95% confidence
Modulation	270 Hz, 1, 2 KHz ± 2 %			
Laser output	Adjustable over 6 dB in 0.01 dB steps			

Note 5: For ORL < -25 dB

Light Source: – KI 770x & KI 78xx

	Laser	LED	Comments
output power	-6 dBm	-23 to 62.5•m -38 to 10•m	± 1 dB
Short term stability	0.04[5] dB	0.01 dB	15 min, ± Δ 2°C after warm-up,
Stability, over temp	0.6 dB	0.35 dB	Typical, over temperature
λ tolerance	20 nm	30 nm	At 25 °C
λ width	3 nm	35 / 100 850/1300	FWHM, typical
λ nm/°C	0.4	0.4	Typical
Reconnection repeatability	0.1 dB	0.05 dB	95% confidence
Modulation	270 Hz, 1, 2 KHz ± 2 %		
Laser output	Adjustable over 6 dB in 0.01 dB steps		

ORDERING INFORMATION

Power Meter: KI 7600A Series

Ge Power Meter	**KI 7600A - Ge**
Ge Power Meter, visible laser, PC	**KI 7601A - Ge**
InGaAs Power Meter	**KI 7600A - InGaAs**
InGaAs Power Meter, visible laser, PC	**KI 7601A - InGaAs**
InGaAs Power Meter, Visible laser, APC	**KI 7601A - InGaAs - APC**
H3 Power Meter	**KI 7600A - H3B**
H3 Power Meter, visible laser, PC	**KI 7601A - H3B**
H3 Power Meter, Visible laser, APC	**KI 7601A - H3B - APC**

Power Meter: *KI 7600 Series*

Ge Power Meter	*KI 7600 - Ge*
Ge Power Meter, visible laser, PC	*KI 7601 - Ge*
InGaAs Power Meter	*KI 7600 - InGaAs*
InGaAs Power Meter, visible laser, PC	*KI 7601 - InGaAs*
InGaAs Power Meter, Visible laser, APC	*KI 7601 - InGaAs - APC*
H3 Power Meter	*KI 7600 - H3*
H3 Power Meter, visible laser, PC	*KI 7601- H3*
H3 Power Meter, Visible laser, APC	*KI 7601 - H3 - APC*

Non-bold – No-longer available as New, but technical support still available.

Light Source: KI 7400 Series

1310 / 1550 nm laser, PC	**KI 7402**
1310 / 1550 nm laser, APC	**KI 7402 - APC**
1490 / 1610 nm laser, PC	**KI 74012**
1490 / 1610 nm laser, APC	**KI 74012 - APC**
1550 / 1610 nm laser, PC	**KI 7406**
1550 / 1610 nm laser, APC	**KI 7406 - APC**
1310 / 1390 / 1550 / 1610 nm laser, PC	**KI 7426**
1310 / 1390 / 1550 / 1610 nm laser, APC	**KI 7426 - APC**
1310 / 1490 / 1550 nm laser, PC	**KI 7427**
1310 / 1490 / 1550 nm laser, APC	**KI 7427 - APC**
1310 / 1490 / 1550 / 1610 nm laser, PC	**KI 7428**
1310 / 1490 / 1550 / 1610 nm laser, APC	**KI 7428 - APC**
1310 / 1550 / 1625 nm laser, PC	**KI 74010**
1310 / 1550 / 1625 nm laser, APC	**KI 74010 - APC**

Light Source: KI 7800 Series

850 / 1300 nm LED, PC	*KI 7803*
850 nm, LED, & 1310 nm laser, PC	**KI 7804**
850 nm LED & 1310 / 1550 nm laser, PC	**KI 7823**
850 nm LED, PC & 1310 / 1550 nm laser, APC	**KI 7823 – PC/APC**
850 / 1300 nm LED, & 1310 / 1550 nm laser, PC	**KI 7824**
850 / 1300nm LED, PC & 1310 / 1550 nm laser, APC	**KI 7824 – PC/APC**

ORDERING INFORMATION

KI 7300A Series One Way Loss Test Set:

No Warm-up Loss Test Set

1310 / 1550 nm laser PC, InGaAs Meter	**KI 7303A - InGaAs**
1310 / 1550 nm laser APC, InGaAs Meter	**KI 7303A - InGaAs - APC**
1310 / 1550 nm laser PC, H3 Meter	**KI 7303A - H3B**
1310 / 1550 nm laser APC, H3 Meter	**KI 7303A - H3B - APC**
1310 / 1550 nm laser PC, H5 Meter	**KI 7303A - H5**
1310 / 1550 nm laser APC, H5 Meter	**KI 7303A - H5 - APC**
1490 / 1610 nm laser PC, InGaAs Meter	**KI 73012A - InGaAs**
1490 / 1610 nm laser APC, InGaAs Meter	**KI 73012A - InGaAs - APC**
1550 / 1610 nm laser PC, InGaAs Meter	**KI 7306A - InGaAs**
1550 / 1610 nm laser APC, InGaAs Meter	**KI 7306A - InGaAs - APC**
1310 / 1490 / 1550 nm laser PC, InGaAs Meter	**KI 7307A - InGaAs**
1310 / 1490 / 1550 nm laser APC, InGaAs Meter	**KI 7307A - InGaAs - APC**
1310 / 1550 / 1625 nm laser PC, InGaAs Meter	**KI 73010A - H3B**
1310/ 1550 / 1625 nm laser APC, InGaAs Meter	**KI 73010A - H3B - APC**
1310 / 1390 / 1550 / 1610 nm laser PC, InGaAs Meter	**KI 7308A - InGaAs**
1310 / 1390 / 1550 / 1610 nm laser APC, InGaAs Meter	**KI 7308A - InGaAs - APC**
1310 / 1490 / 1550 / 1610 nm laser PC, InGaAs Meter	**KI 7309A - InGaAs**
1310 / 1490 / 1550 / 1610 nm laser APC, InGaAs Meter	**KI 7309A - InGaAs - APC**

KI 7700 Series One Way Loss Test Set:

Basic Loss Test Set

850 nm LED PC, Si Meter	**KI 7701 - Si**
850 / 1300 nm LED PC, Ge Meter	**KI 7704 - Ge**
1310 / 1550 nm laser PC, Ge Meter	*KI 7722 - Ge*
1310 / 1550 nm laser APC, Ge Meter	*KI 7722 - Ge - APC*
1310 / 1550 nm laser PC, InGaAs Meter	**KI 7722 - InGaAs**
1310 / 1550 nm laser APC, InGaAs Meter	**KI 7722 - InGaAs - APC**
1310 / 1550 nm laser PC, H3 Meter	**KI 7722 - H3B**
1310 / 1550 nm laser APC, H3 Meter	**KI 7722 - H3B - APC**
1310 / 1550 nm laser PC, H5 Meter	**KI 7725 - H5**
1310 / 1550 nm laser APC, H5 Meter	**KI 7725 - H5 - APC**

KI 7300 No Warm-up Loss Test Set

1310 / 1550 nm laser PC, InGaAs Meter	*KI 7303 - InGaAs*
1310 / 1550 nm laser APC, InGaAs Meter	*KI 7303 - InGaAs - APC*
1550 / 1610 nm laser PC, InGaAs Meter	*KI 7306 - InGaAs*
1550 / 1610 nm laser APC, InGaAs Meter	*KI 7306 - InGaAs - APC*
1310 / 1550 nm laser PC, H3 Meter	*KI 7303 - H3*
1310 / 1550 nm laser APC, H3 Meter	*KI 7303 - H3 - APC*
1550 / 1610 nm laser PC, H3 Meter	*KI 7306 - H3*
1550 / 1610 nm laser APC, H3 Meter	*KI 7306 - H3 - APC*
1310 / 1550 / 1625 nm laser PC, H3 Meter	*KI 73010 - H3*
1310/ 1550 / 1625 nm laser APC, H3 Meter	*KI 73010 - H3 - APC*

Non-Bold – No-longer available as New, but technical support still available

ORDERING INFORMATION

Standard Accessories

ST, SC, FC optical connector adaptors, KITS™ software and cable, manual, batteries, 'AA'-to-'C' size battery converter, NATA traceable calibration certificates, carry strap, leather pouch & protective holster.

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. Order any number of additional adaptors.

Optional Interchangeable Connector Adaptors

E2000/LSH, blue	**OPT060**	SMA 905/906	**OPT082**
E2000/LSH, green	**OPT060G**	Universal 1.25mm	
LSA/DIN 47256	**OPT071**	Universal 2.5mm	**OPT081**
LC / F3000	**OPT072**	Metal Free	**OPT090**
MU	**OPT080**		

To order metal free connector, specify: connector style + OPT090

Optional Accessories

Power Pack, 90~240V IEC	**OPT103B**
Carry case, 2 instruments	**OPT153**
USB-RS232 converter	**OPT188**

LED Source Standards Compliance Option

TIA/IEC standard compliance for LED sources: CPR and λ 50 μm fiber. Including 50 μm mandrel wrap. Output power tolerance ± 3 dB.	**OPT091**
TIA/IEC standard compliance for LED sources: CPR and λ 62.5 μm fiber. Including 62.5 μm mandrel wrap. Output power tolerance ± 3 dB.	**OPT093**

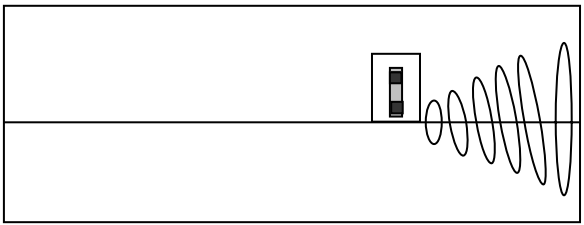
Please visit our web site at www.kingfisher.com.au for other fiber optic test instruments.

See section 'Getting Started & Turning On' to:
Re-boot the microprocessor
Turn on all display segments

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' & 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 λ to be calibrated.
- Ensure that all installed batteries are good.
- When calibration is complete, remove the calibration shunt, and place an anti-tamper label over the aperture in the battery compartment.
- Do no forget to update your calibration records, and schedule the next due date.

System Rollback (from version 5.0)

If in the event of wrong calibration constants being entered and stored, or the instrument becoming otherwise corrupted, all factory settings can be restored by the following method.

To restore all factory settings, first enter 'CAL' mode then press and hold [RECALL MEMORY] for 3 seconds.

Power Meter:

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

Required are: a laser light source with accurate calibrated λ and good power stability; a power meter with appropriate calibrated λ; singlemode 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.

Record the existing calibration offsets as follows:

- Put the instrument into calibration mode.
- Press [POWER METER] then [-/+] to set the λ and then [MAX/MIN] twice to display the offset. Note the offset down for each λ.
- Re-enter or adjust known offsets at this point, or calibrate the meter at the selected λ as follows: -
- Measure and record the source power using the reference meter.
- Transfer the same power level to the meter to be calibrated, set [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 (version 5.00 will continuously update the measured optical power).
- Set [MAX/MIN] to read and note the new stored calibrated offsets, then press [SET] to store and exit, or [CANCEL] to exit without storing new values.
- Go back and 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.

Light Source:

The emitter power level can be re-calibrated, and the current checked:

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

Required are: a power meter with appropriate calibrated λ, singlemode 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.

- Connect a calibrated power meter with a known good patch lead (the patch lead loss forms part of the calibration condition).
- Press and hold [SOURCE] then press [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 λ to match.
- Adjust the [-/+] button to change the source output level to match the displayed level on the source display, or re-enter a known cal factor. (The laser current can not go above a level that has been set for the individual laser during manufacture.)
- Note the new calibration values and laser current for future reference then press [SET] to store and exit, or [CANCEL] 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.
- This unit contains static sensitive devices. Anti-static handling procedures should be observed at all times when handling internal circuits.
- There are no internal user adjustments. All calibration is performed without opening the instrument. The optical sensor / connector assembly is not user serviceable.

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.
- Hinged display cover removal can be done at this point.
- The ribbon connector can be disengaged to completely separate the instruments 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.

All tests can be performed without access to the interior of the instrument. The test equipment given corresponds to tests carried out with FC/PC connectors on the DUT (device under test).

Equipment Required

Equipment required for the performance test is 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. Since the test limits and set-up information are printed on the Test Record for easy reference, the record can also be used as an abbreviated test procedure (if you are already familiar with the test procedures). The Test Record can also be used as a permanent record and may be reproduced without written permission from Kingfisher International.

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.

Table 1: Required Equipment (Kingfisher)

Instrument / Accessory	Recommended Model	Required Characteristics	Alternative Model
Optical Light Source	KI 730xA		KI 7400, KI 7800
Optical Power Meter	KI 7600A		KI 7700
Optical Attenuator	KI 7010A		KI 7010
Connector Interfaces	ST, FC or SC		
Singlemode Fiber			
FC Connector Adaptor			
For optional test only			
Optical Spectrum Analyzer	71450B		71452B, (8164xA,B)
Connector Adaptors			
Singlemode Fiber			

Power Meter:

Performance Test

The performance test given in this section includes the Power Meter Accuracy Test. Perform each step in the order given, using the corresponding test equipment.

Note: 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.

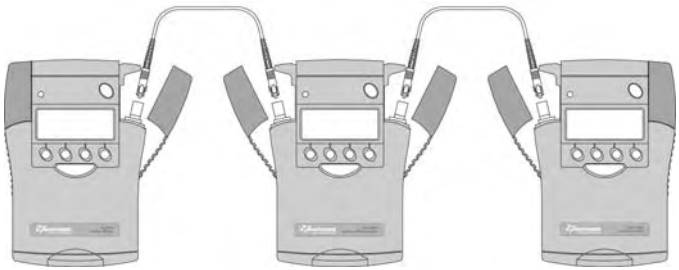
Make sure that the ambient conditions are in the following ranges:

Temperature	21 ± 3 ºC
Relative humidity	45 to 75 %

To switch on the equipment for permanent operation: hold the [POWER] key down for 3 seconds during turn-on until 'PERM' is shown in the display.

Power Meter Accuracy Test

1. Make sure that you satisfy the environmental conditions.
2. Make sure all your connectors are clean.
3. Connect the equipment as shown in figure below.



KI 7600A **KI 7010A** **KI 730xA**

Test set-up for the Power Meter Accuracy Test

- Make sure that all Patch cords are fixed to the table and that they will not move during measurements.
- Switch on all instruments.
- Set all instruments to 1310 nm.

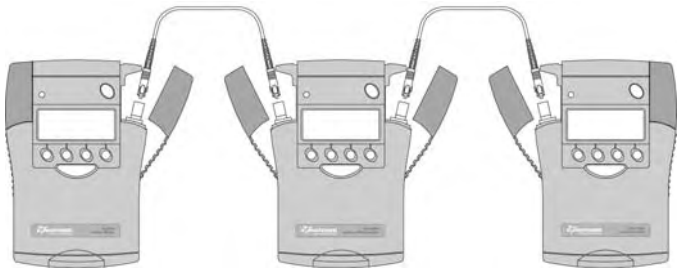
- Change the attenuation of the attenuator until the reference optical power meter displays -10.00 dBm. Note the attenuator setting in setting 1 of the test report.

If the laser source is not powerful enough to give -10.00 dBm, set the attenuator to 2.5 dB and correct the appropriate values in the test report.

- Change the attenuation of the attenuator until the optical power meter displays -20.00 dBm. Note the attenuator setting in setting 2 of the test report.
- Change the attenuation of the attenuator until the optical power meter displays -30.00 dBm. Note the attenuator setting in setting 3 of the test report.
- Change the attenuation of the attenuator until the optical power meter displays -40.00 dBm. Note the attenuator setting in setting 4 of the test report.
- Change the attenuation of the attenuator until the optical power meter displays -50.00 dBm. Note the attenuator setting in setting 5 of the test report.

4. Measure the DUT:

- Connect the attenuator output cable to the DUT as shown in figure below.
- Select the correct wavelength on the DUT Power Meter.



KI 7600A **KI 7010A** **KI 730xA**

Test set-up for the DUT Measurement

- Set the attenuator to its value for setting 1. Note the displayed power level of the DUT in the test record.
- Set the attenuator to its value for setting 2. Note the displayed power level of the DUT in the test record.
- Set the attenuator to its value for setting 3. Note the displayed power level of the DUT in the test record.
- Set the attenuator to its value for setting 4. Note the displayed power level of the DUT in the test record.
- Set the attenuator to its value for setting 5. Note the displayed power level of the DUT in the test record. [Not for H series instruments]

5. Repeat from list item 3 to list item 4 for additional λ's if required.

PERFORMANCE TEST

Model: **KI 7600A Optical Power Meter**

Date:

Serial No.:

Ambient Temperature: ºC

Options:

Relative Humidity: %

Firmware Rev.:

Line Frequency: Hz

Test Facility:

Customer:

Performed by:

Report No.:

Special Notes:

PERFORMANCE TEST

	Description	Model No.	Trace No.	Cal. Due Date
1.	Optical Light Source	KI 730xA	_____	_____
2.	Optical Power Meter	KI 7600A	_____	_____
3.	Optical Attenuator	KI 7010A	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

Accessories	#	Product
Singlemode Fiber	1	
Connector Interfaces	1	OPT060G

PERFORMANCE TEST

Model: **KI 7600A Optical Power Meter** Report No.:_____ Date:_____

	Total Uncertainty / Accuracy Test				
	Test Wavelength = nm				
Setting Number	Reference	Attenuator Setting	Minimum Spec. (-0.3 dB of Ref.)	**KI 7600A**, DUT Measurement results	Maximum Spec. (+0.3 dB of Ref.)
	(~-10.00 dBm)		(~-10.30 dBm)		(~-9.70 dBm)
1.		_____ dB		_____ dBm	
	(~-20.00 dBm)		(~-20.30 dBm)		(~-19.70 dBm)
2.		_____ dB		_____ dBm	
	(~-30.00 dBm)		(~-30.30 dBm)		(~-29.70 dBm)
3.		_____ dB		_____ dBm	
	(~-40.00 dBm)		(~-40.30 dBm)		(~-39.70 dBm)
4.		_____ dB		_____ dBm	
	(~-50.00 dBm)		(~-50.30 dBm)		(~-49.70 dBm)
5.		_____ dB		_____ dBm	
	Measurement Uncertainty			_____ dB	

Note 1: This is for the KI 7600A-InGaAs. For the KI 7600A-Ge or H series instruments, increase by ±0.2 dB.

Light Source:

Performance Test

The performance test given in this section includes the Output Power (CW) Test. Additionally it includes - as optional tests – the Short-Term Stability Test and the Centre λ and Bandwidth (FWHM) Test. Perform each step in the order given, using the corresponding test equipment.

Note: 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.

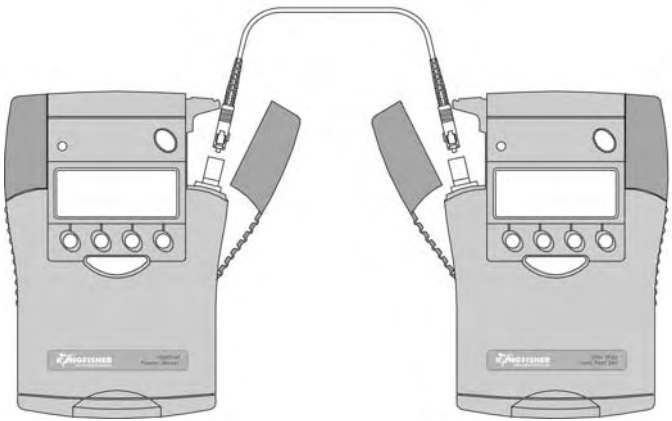
Make sure that the ambient conditions are in the following ranges:

Temperature	21 ± 3 ºC
Relative humidity	45 to 75 %

To switch on the equipment for permanent operation: hold the [POWER] key down for 3 seconds during turn-on until 'PERM' is shown in the display.

Output Power (CW) Test

1. Make sure that you satisfy the environmental conditions.
2. Make sure all your connectors are clean.
3. Connect the equipment as shown in figure below.



Test set-up for the Output Power Test

Make sure that all Patch cords are fixed to the table and won't move during measurements.

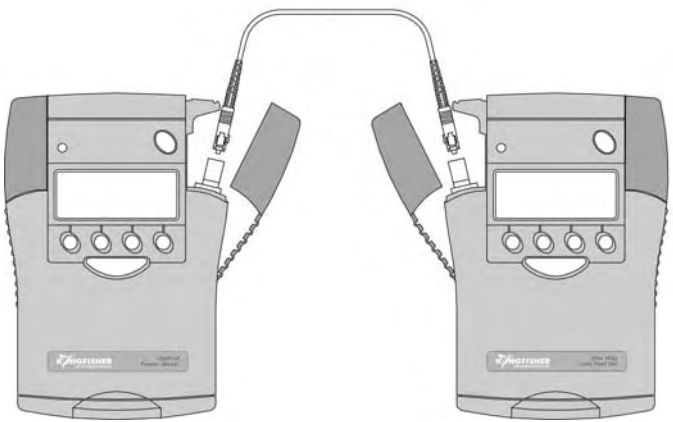
4. Switch on the instruments.
5. Set the Optical Power Meter to 1310 nm

- Set the DUT λ to 1310 nm. Setting the λ automatically enables the source.

6. Note the value shown on the KI 7600A in the test report.

7. Repeat this measurement (list item 5) with the DUT and the KI7600A set to 1550nm.

Short - Term Stability Test (optional)



Test set-up for the Short Term Stability Test

Make sure that all Patch cords are fixed to the table and won't move during measurements.

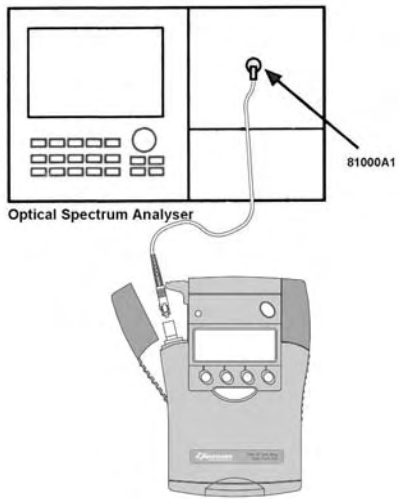
Make sure that you satisfy the environmental conditions.
Make sure all your connectors are clean.

- Connect the equipment as shown on this page.
- Set the optical power meter to 1310 nm.
- Set the DUT λ to 1310 nm. Setting the λ automatically enables the light source.
- Let the unit warm-up for 15 minutes then note the power.
- Record the power every 30 seconds for 3 minutes.
- Calculate max – min values for stability (< 0.1 dB)

00 sec	dB
30 sec	dB
60 sec	dB
90 sec	dB
120 sec	dB
150 sec	dB
180 sec	dB

Centre λ & Spectral Bandwidth (FWHM) Test (optional)

1. Make sure that you satisfy the environmental conditions.
2. Make sure all your connectors are clean.
3. Connect the equipment as shown in figure below.



Test set-up for the centre λ and spectral bandwidth

Make sure that all Patch cords are fixed to the table and won't move during measurements.

4. Switch on the instruments and allow to fully warm up.
   - Set the DUT λ to 1310nm. Setting the λ automatically enables the Source.
   - On the OSA, press the [Instr Preset] key
   - Press [Auto/Meas] and wait until 'End of Automeasure' is displayed
   - Choose [User] and select the type of source to be measured (FP for Fabry Perot laser).
5. 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.
6. 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.

7. From the displayed measurements check and note the values for "mean λ" (Centre λ) and "FWHM" (Spectral Bandwidth) in the test report.

8. Repeat the test with the DUT set to additional λ's.

PERFORMANCE TEST

Model: **KI 730xA One Way Loss Test Set**

Date:

Serial No.:

Ambient Temperature: ºC

Options:

Relative Humidity: %

Firmware Rev.:

Line Frequency: Hz

Test Facility:

Customer:

Performed by:

Report No.:

Special Notes:

PERFORMANCE TEST

	Description	Model No.	Trace No.	Cal. Due Date
1.	Optical Power Meter	KI 7600A	_____	_____
2.	One Way Loss Test Set	KI 730xA	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

Accessories	#	Product
Singlemode Fiber	1	
Connector Interfaces	1	OPT060G

Model: **KI 730xA One Way Loss Test Set** Report No.: Date:

Output Power (CW) Test

λ	Minimum Spec.	Measurement Results
1310 nm	-9.00 dBm	_____ dBm
1390 nm	-9.00 dBm	_____ dBm
1490 nm	-9.00 dBm	_____ dBm
1550 nm	-9.00 dBm	_____ dBm
1610 nm	-9.00 dBm	_____ dBm
Measurement Uncertainty		_____ dB

Short-Term Stability Test

λ	Measurement Results	Maximum Spec.
1310 nm	_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1390 nm	_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1490 nm	_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1550 nm	_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
1610 nm	_____ dBpp	(0.10 dBpp) 0.04 dBpp typical
Measurement Uncertainty	_____ dB	

Central λ & Special Bandwidth (FWHM) Test (optional)

λ		Minimum Spec.	**KI 730xA**, DUT Measurement Results		Maximum Spec.
Centre λ					
1310 nm		1290.00 nm	_____	nm	1330.00 nm
1390 nm		1370.00 nm	_____	nm	1410.00 nm
1490 nm		1470.00 nm	_____	nm	1510.00 nm
1550 nm		1530.00 nm	_____	nm	1570.00 nm
1610 nm		1590.00 nm	_____	nm	1630.00 nm
Spectral Bandwidth					
1310 nm			_____	nm	(6nm) 3 nm typical
1390 nm			_____	nm	(6nm) 3 nm typical
1490 nm			_____	nm	(6nm) 3 nm typical
1550 nm			_____	nm	(6nm) 3 nm typical
1610 nm			_____	nm	(6nm) 3 nm typical
Measurement Uncertainty			_____	dB	

- To remove interchangeable **connector**, press button on back of case and pull off adaptor
- To **turn on** the instrument, press [POWER].
- To defeat **auto power-off,** hold [POWER] for 3 seconds at turn on until 'ON' and 'Perm' are displayed
- To access **hidden keypad,** pull up display cover
- Select [POWER], [Source], then:
- To **set reference,** press [ABS/REL] and hold [SET REF] for 3 seconds (3 buzzer sounds)
- To **stop / start display** update, press [HOLD]
- If a **test tone** is detected, meter will display 'Hz'

AUTOTEST OPERATION

- No user action is required for meter to **enter Autotest mode**
- Autotest: **Press [Autotest] on source** and wait a few seconds
- To display one wavelength only, on the power meter press the left side of [-/+] and again for the other wavelength. Press right side of [-/+] (twice) to exit
- Autotest remains for 8 seconds after signal loss, to allow **quick connection** change
- To **exit** autotest, remove test lead for >8 seconds, or on the Light Source, press [MENU].

MANUAL OPERATION

- To **turn on** & select wavelength, press: [POWER], [Power Meter], [-/+]
- To display **linear mode**, press [dBm/W]
- To display Max/Min values, press [MAX/MIN] repeatedly. Hold [MAX/MIN] to reset (3 buzzer sounds)

MEMORY

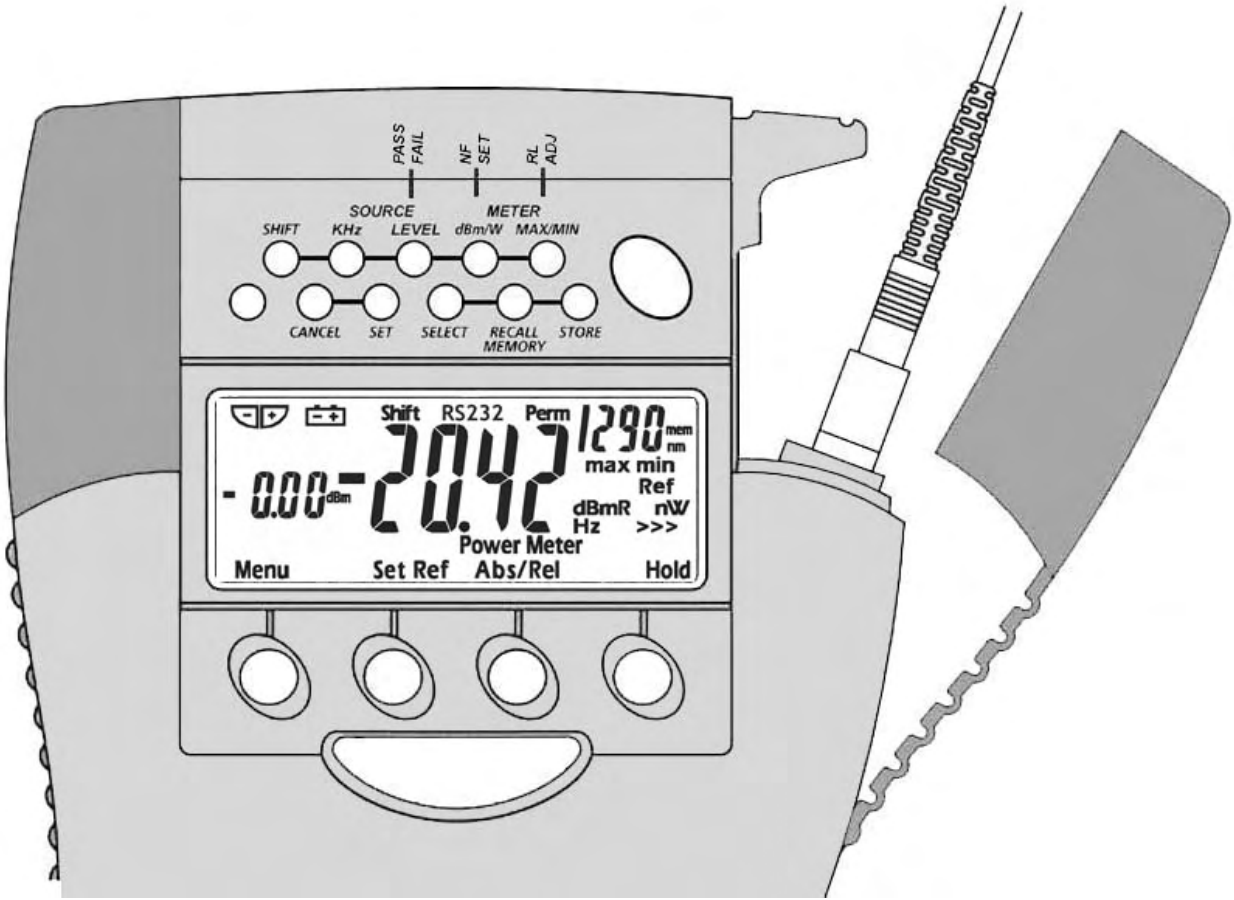
- Enter Power Meter or Autotest modes first
- While in Autotest mode, it is only possible to STORE
- To **clear all memory**, press [RECALL] and [CANCEL] simultaneously for 3 seconds. 'clr' will display
- To **store** in next location, press [STORE]
- To **change next store** location, press [SELECT], [-/+], [SET]
- To **recall**, press [RECALL], [-/+] to scroll through data
- To **exit memory** display, press [CANCEL]

ADDITIONAL AUTOTEST MEMORY OPERATION

- To read or cancel memory, first exit Autotest mode, and enter Power Meter mode
- Autotest memory: use [-/+] to scroll wavelengths

VISIBLE LASER OPTION

- Select [POWER], [SOURCE]
- To stop modulation, press [MOD]
- To turn off laser, press [-/+]


PASS
FAIL
NF
SET
RL
ADJ
SOURCE
METER
SHIFT
KHz
LEVEL
dBm/W
MAX/MIN
CANCEL
SET
SELECT
RECALL
MEMORY
STORE
Shift
RS232
Perm
1290
mem
nm
max
min
Ref
- 0.00 -
dBm
20.42
dBmR
nW
Hz
>>>
Power Meter
Menu
Set Ref
Abs/Rel
Hold

- To remove interchangeable **connector**, press button on back of case and pull adaptor.
- To **turn on** the instrument, press [POWER].
- 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 **hidden keypad**, pull up display cover.

MANUAL OPERATION

- Select [POWER], [Source], then:
- To change **wavelength,** press [-/+]
- To activate **modulation**, press [Mod]
- To change modulation **frequency**, while source is active press [KHz], [-/+], [SET].
- To change **laser power** level, while source is active press [LEVEL], [-/+], [SET].

AUTOTEST OPERATION

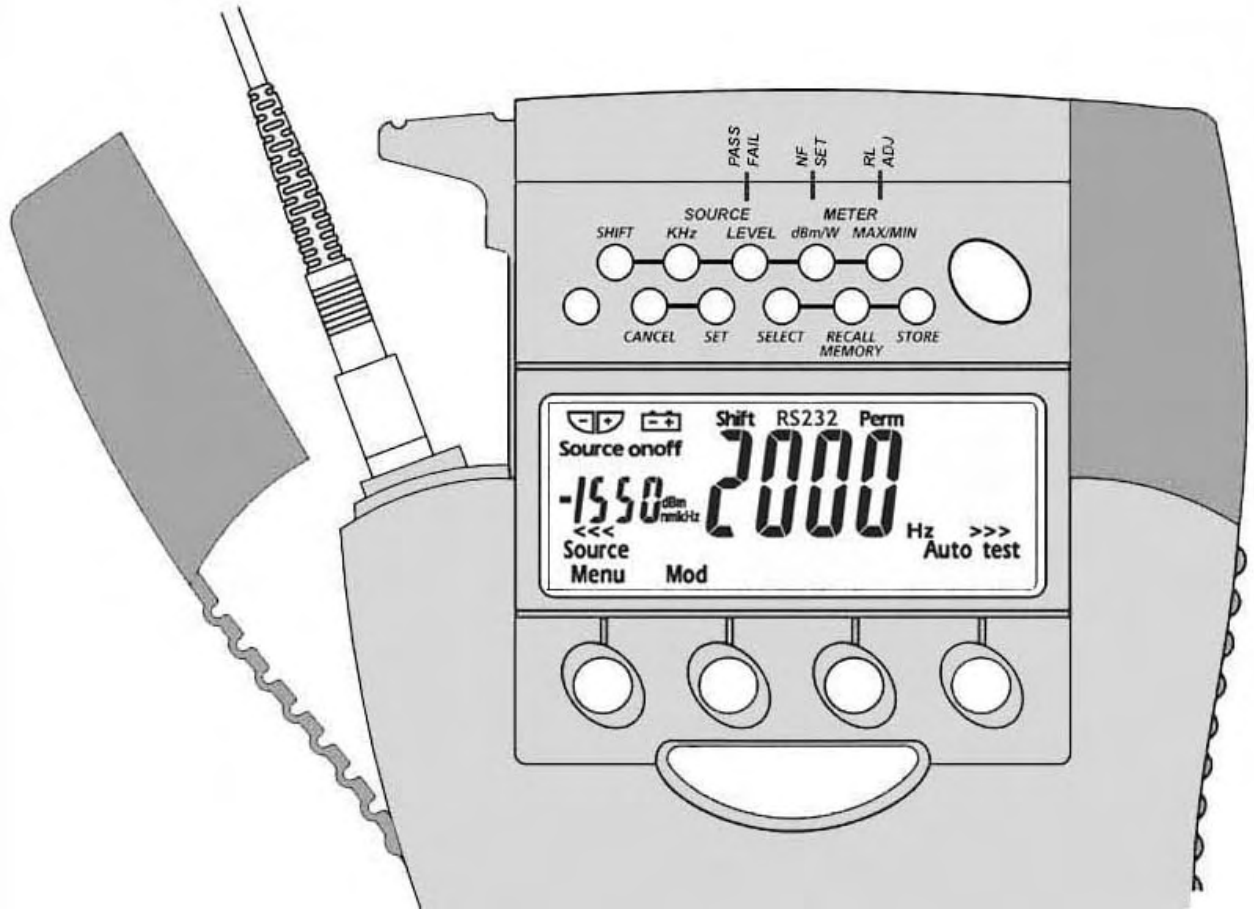
- For Autotest operation, an Autotest compatible power meter or loss test set is required.
- To start Autotest: **On the light source, press [Autotest]** and wait a few seconds. No user action is required from the power meter side.
- Autotest remains for 8 seconds in the Power Meter display after signal loss, to allow **quick connection** change.
- To **exit** autotest, remove test lead for > 8 seconds, or press [MENU]..

MEMORY

- Enter Source mode first
- To **clear all memory,** press both [RECALL] and [CANCEL] simultaneously for 3 seconds. 'clr' will be displayed.
- To **store** in next default location, press [STORE].
- To specify next store location, press [SELECT], [-/+], [SET].
- To **recall memory**, press, [RECALL] [-/+].
- To **exit memory** display, press [CANCEL].

ADDITIONAL AUTOTEST MEMORY OPERATION

- To read memory, first press [MENU] to exit **Autotest,** and enter [SOURCE] mode.
- Autotest memory: use [-/+] to scroll wavelengths.


PASS
FAIL
NF
SET
RL
ADJ
SOURCE
METER
SHIFT
KHz
LEVEL
dBm/W
MAX/MIN
CANCEL
SET
SELECT
RECALL
MEMORY
STORE
Shift
RS232
Perm
Source onoff
-1550
2000
Hz
>>>
Auto test
<<<
Source
Menu
Mod

- To remove **interchangeable connector**, press button on back of case and pull off adaptor. This may be easier with a test lead attached.
- To **turn on** the instrument, press [POWER].
- 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.

One Way Autotest (two way supported via KITS™)

- **Reference**: Connect a two way/source port to a power meter port. Select [POWER] all instruments. On source press [AUTOTEST], Meter shows 'Auto' while synchronising. On meter: [ABS/REL]. For 3 seconds, press [SET REF]. Meter will display about 0.00 dBR.
- **Loss testing**: After referencing, connect test system to two way / source port on source and meter port on meter. Select [POWER] all instruments. On source press [AUTOTEST]. Meter shows 'Auto', then press [ABS/REL] to show loss. Use [-/+] to show one • only.
- Press [Hold] to **hold / resume** display update. In this mode, [STORE] stores the retained reading.
- Autotest remains synchronised for **8 seconds** after signal loss, to allow quick connection change.
- To **exit Autotest**, remove test lead or turn off source for > 8 seconds, or on the Light Source, press [MENU].

Memory

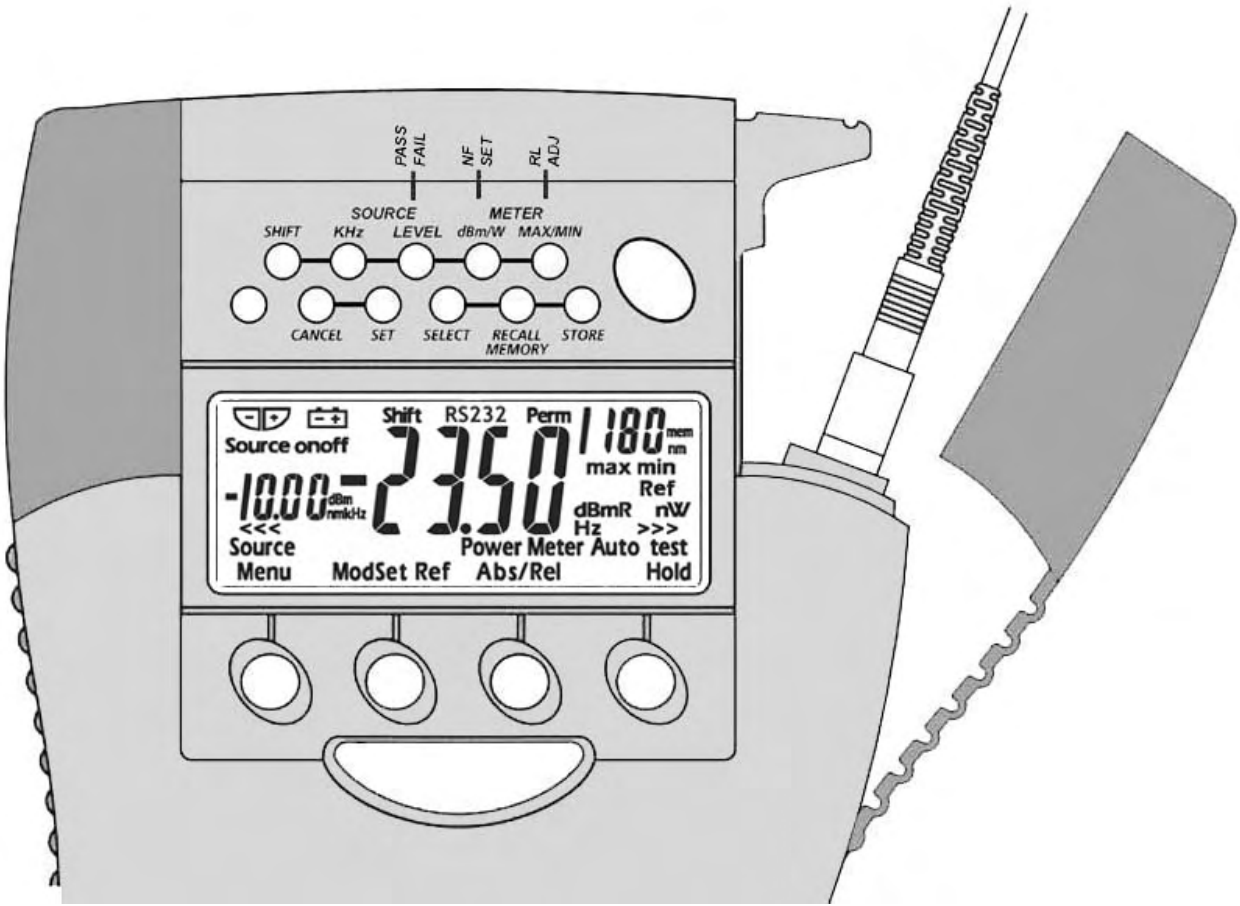
- **Store** works in all modes, however **Recall** or **Clear** only work in Source, Meter or Return Loss modes.
- **Clear all memory:** press both [RECALL] and [CANCEL] simultaneously for 3 seconds. 'clr' will display.
- To **store** in next location, press [STORE].
- To **change next** store location, press [SELECT], [-/+], [SET] or [MENU].
- To **recall**, press [RECALL], [-/+] to scroll memory. Use [Abs/Rel] to see dB/dBm values. Hold down [Abs/Rel] to see reference level. **Autotest** memory recall: also use [-/+] to select next λ (wavelength).
- To **exit** memory display, press [MENU].

Simple Light Source

- To turn on select [POWER], [SOURCE], then:
- To **change λ,** 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].

Simple Power Meter

- To **turn on & select λ,** press: [POWER], [POWER METER], [-/+] to select λ. If source is on, power meter λ tracks source λ.
- To **set reference,** press [ABS/REL] and hold [Set Ref] for 3 seconds (3 buzzer sounds) Meter displays about 0.00 dBR.
- To **stop / start display** update, press [HOLD].
- If a **test tone** is detected, meter will display 'Hz'.
- To display **linear mode,** press [dBm/W].
- To **display MAX/MIN** values, press [MAX/MIN] repeatedly. Hold [MAX/MIN] to reset (3 buzzer sounds).


PASS
FAIL
NF
SET
RL
ADJ
SOURCE
METER
SHIFT
KHz
LEVEL
dBm/W
MAX/MIN
CANCEL
SET
SELECT
RECALL
MEMORY
STORE
Shift
RS232
Perm
Source onoff
max min
Ref
dBmR
nW
Hz
Source
Menu
Power Meter Auto test
ModSet Ref
Abs/Rel
Hold

DISCLAIMER & WARRANTY

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.

KINGFISHER INTERNATIONAL PTY LTD

30 Rocco Drive, Scoresby, Victoria 3179 Australia

Phone: (61) 3-9757-4100

Fax: (61) 3-9757-4193

E-mail: sales@kingfisher.com.au

Website: http://www.kingfisher.com.au

Technical data is subject to change without notice as part of our program of continuous improvements. Therefore please verify critical parameters before ordering. Australian and international patents granted.

NOTES