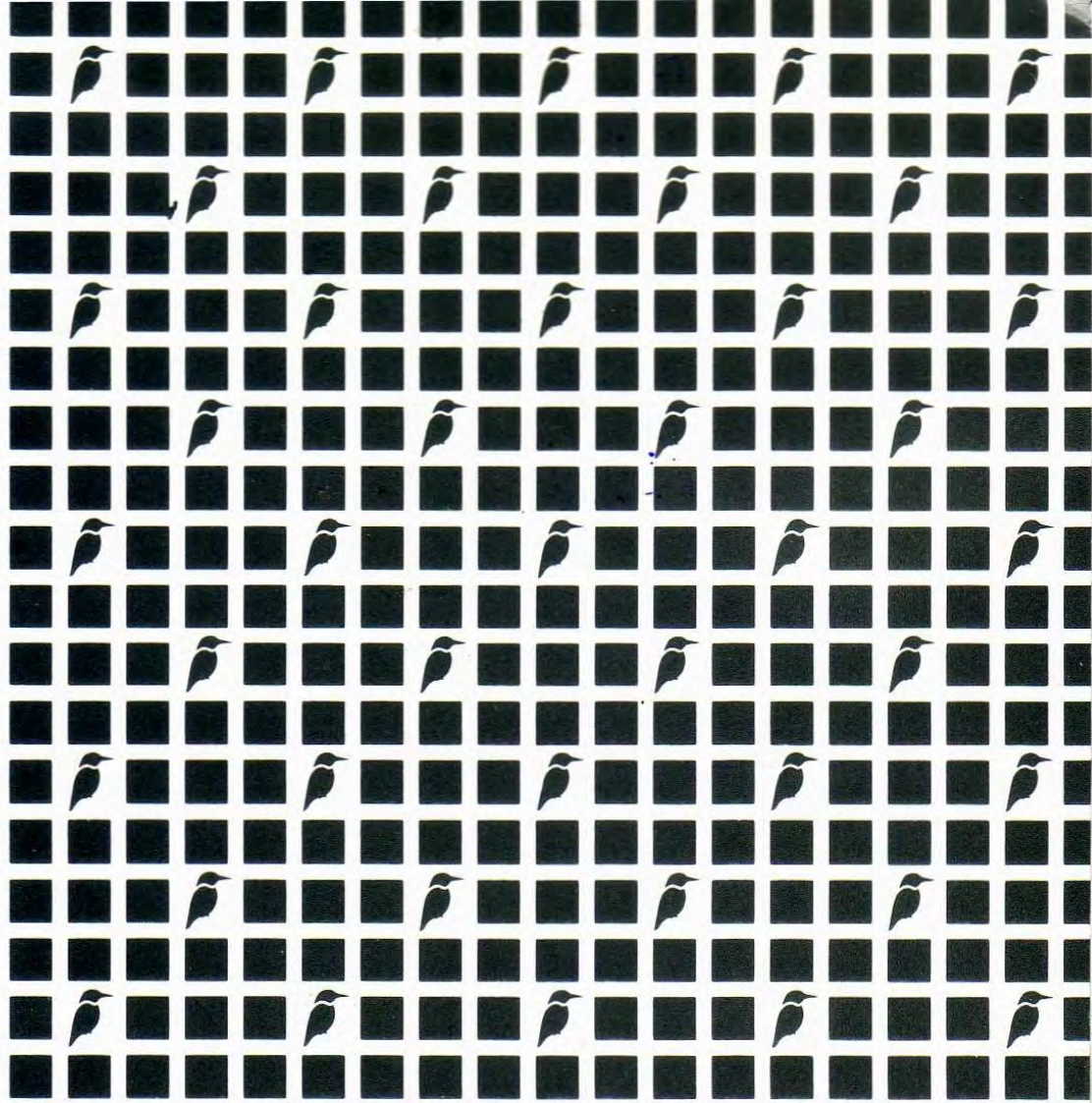


KI 4000 Series Laser Light Source



User Instruction Manual

 **KONGFISHER**



USER INSTRUCTION MANUAL

KI 4000 SERIES

LASER LIGHT SOURCE

Serial No

Congratulations on your purchase of this instrument which has been engineered to provide the best possible reliability, convenience and performance. Please spend a few minutes to read this manual and get the best use from your equipment.



Made in Australia

CONTENTS

- 1 Introduction..... 4
- 2 Typical Applications..... 5
- 3 Specifications & Ordering Information 6
- 4 Points to Remember 11
- 3.1 Optical Connector..... 11
- 3.2 External power 12
- 4 Getting to know the KI 4000 Series 14
- 4.1 Inspection 14
- 4.2 Powering up..... 14
- 4.3 Connecting a patch cord 14
- 5 Accuracy Considerations 16
- 6 Tips on portable use..... 17
- 7 Care of your instrument 18
- 8 Maintenance..... 20
- 8.1 Important-all maintenance 20
- 8.2 Cleaning the optical connector 21
- 8.3 Opening the instrument..... 21
- 8.4 Reassembly..... 22
- 8.5 Changing the batteries 22
- 8.6 Fuses..... 23
- 8.7 Changing the operator controls..... 23
- 9 Instrument Returns..... 25
- 10 Laser Data 26

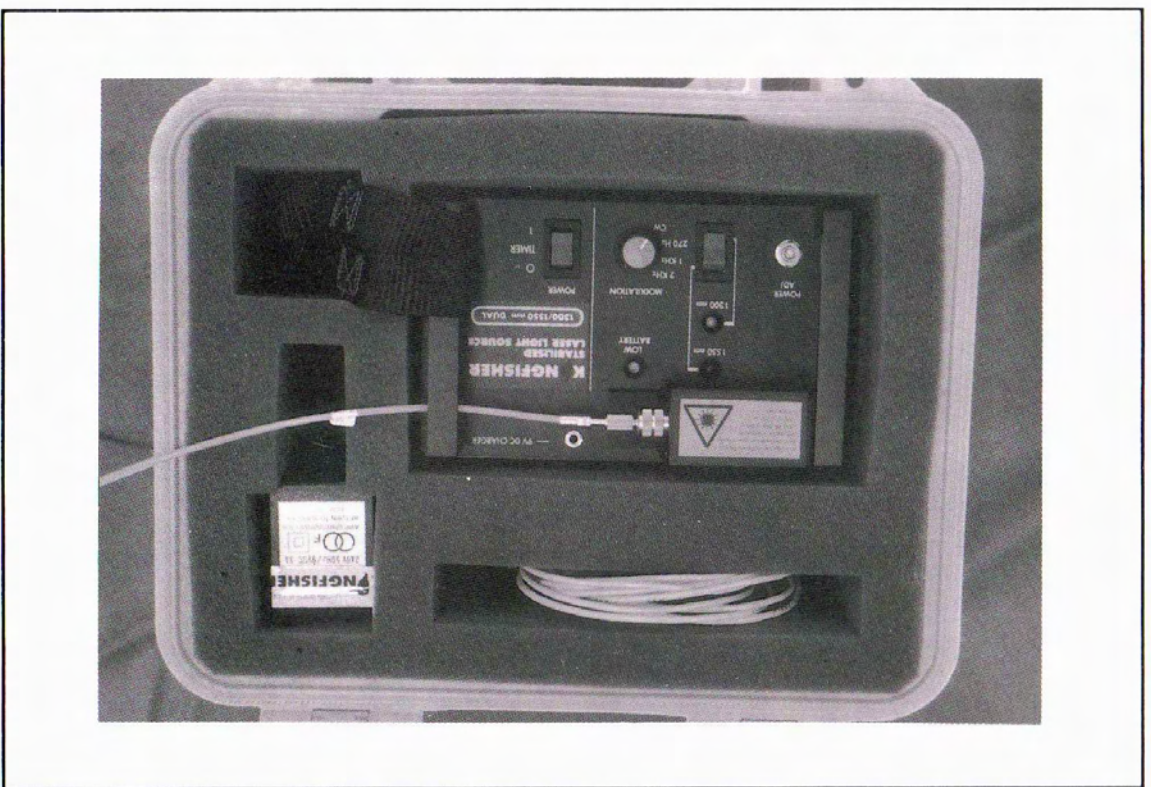


Figure 1
KI 4000 Light Source

INTRODUCTION

The KI 4000 Series Laser Light Source is designed to provide a stable optical source for use in optical attenuation measurements. The built-in modulation function also enables the sources to be used with fibre identifiers and lock-in detectors.

Versions are available with 1300 and 1550 nm lasers, single or dual wavelength. All versions have a single optical output port available with either a fixed connector, or interchangeable connector adaptors.

The single optical connector is fully drop protected with a patchcord installed, and the instrument can be stored for transport without disturbing the patchcord. On the interchangeable adaptor option, the connector can be disassembled in the field for cleaning.

Superb optical stability and zero warm-up period is achieved with the temperature control and internal optical feedback, which also makes the stability insensitive to temperature change.

The equipment has been designed to withstand the rigors of field use, and is extremely simple to operate. Long battery operation provides additional convenience.

Special versions are available with temperature controlled lasers, DFB lasers, superluminescent diodes, LEDs and different wavelength specifications. A version is available enabling the user to adjust the operating wavelength over approximately $\pm 8\text{nm}$ for laboratory work and other specialised testing.

The Kingfisher Optical Power Meter is the ideal compliment to these instruments, for complete attenuation and optical power measurement capability.

Also available from Kingfisher are Return Loss Meters, Visible Fault Locators and Talk Sets.

1. TYPICAL APPLICATIONS

- Precision attenuation testing of fibre optic transmission lines, in combination with a Kingfisher Power Meter.
- Continuity testing of fibre optic transmission lines in combination with a Kingfisher Power Meter or Talk Set.
- Checking connectors, splices and other components in combination with a Kingfisher Power Meter
- General purpose fibre identification source
- Long term precision loss monitoring where source stability is vital
- Measurements on dense WDM or coherent transmission lines.

2. SPECIFICATIONS AND ORDERING INFORMATION

Size/Weight

190/120/95mm, approximately 1Kg
Hard carry case:
280/330/150mm, with contents 3Kg

Operating Wavelength

1300/1550 ± 20nm
Custom specifications available

Optical Power

-5dBm, ±1dB (max)
One wavelength adjustable ±1dB
Class 1 laser product.
Complies IEC825-2,
AS2211 (1991), 21CFR1040-10

Environment

-5 to 55°C, 95% RH, Operating
-30 to 70°C, 95% RH, Storage
Thermal cut-out at 57°C

Output Connector

EITHER:
Fixed type to customer specifications

OR:
Interchangeable adaptors APC or APC interface must be specified, with any relevant screw on connector adaptor

Power

External 9V/300 ma dc battery charger

At least 8 hours operation from internal nicad batteries, maximum 16 hours recharge time. User selectable 10 minutes timeout. Low battery indicator.

Charge jack, 3.5mm, +ve centre contact.

Modulation

INTERNAL MODULATION:
100% depth, 50% duty cycle, 1% frequency accuracy. Switch selectable square wave (CW), 270Hz, 1KHz, 2KHz. Please enquire for others, 0.25MHz-10 milli Hz available.

Optical Performance

Stability	Typ	Max
Over Temperature T=25°C, ▲T±25°C	±0.05dB	±0.15dB
Long Term 6hrs ▲T=±3°C	±0.005dB	±0.02dB
Short Term 15min ▲T=±1°C	±0.001dB	-
Wavelength T=25°C, ▲T±25°C	±0.2nm	±1nm

[1] After 15 minutes warm-up at similar T condition on stable surface, using Diamond DIN 47256 optical connector and 9.5/125µm optical fibre.

[2] After 30 seconds warm-up, stability is better than 0.05dB for 15 minutes at constant T.

Adjustable Wavelength Option

The unit can be fitted with a pot allowing the user to adjust the wavelength over typically ±8nm in a laboratory situation.

Power output may be reduced to -10dBm. Wavelength would be set in combination with a wavelength meter.

Stability typically 0.05°C, wavelength coefficient 0.4nm/°C.
 Limited operating temperature 25±10°C.

Special Laser Options

- Different tolerance specifications on 840/850/1200/1300/1310/1550 nm bands
- DFB and other specialised types
- Superluminescent diodes or LEDs can be supplied
- Pigtail output available for ultimate stability

Reliability

About 35 years MTBF based on theoretical component behaviour at 25°C.

Operator Controls

- On / Off / Timer
- Wavelength Selector & Indicator
- Optical Power Adjust Potentiometer
- Rotary Switch: CW/270Hz/1KHz/2KHz
- Low Battery Indicator
- Charger Jack
- Optional Keyswitch

Ordering Information

- KI 4130S - 1300 nm Singlemode
- KI 4155S - 1550 nm Singlemode
- KI 4235S - 1300/1550 nm Singlemode
- KI 4xxx - SPECIAL DUAL SOURCE
 (Please consult factory)

Accessories

STANDARD:

101	Operation Manual	1 pc
102	Battery Adaptor (Specify Country)	1 pc
142	Hard Carry Case	1 pc

OPTIONAL:

107D	Keyswitch
130	Clip on Coupler 1300/1500nm

Optical Connector Options

INTERCHANGEABLE INTERFACE

018	Standard
019	Angled Physical Contact Polish

INTERCHANGEABLE OPTICAL CONNECTOR ADAPTOR :

001	DIN 47256
001-APC	DIN/APC
002	FC
002-APC	FC/APC
003	SC
003-APC	SC/APC
004	ST
004-APC	ST/APC
005	E 2000
005-APC	E 2000/APC
006	HMS-10/A
007	HMS-10/B
007 B	Diamond MST-3
007 C	F&G
008	D4
010	Biconic

FIXED OPTICAL CONNECTOR :

- 501 FC
- 501 A FC/APC
- 502 ST
- 504 DIN 47256
- 505 D4
- 506 Biconic
- 507 Special
- 508 SC
- 508 A SC/APC
- 509 E 2000
- 510 E 2000/APC

PATCHCORDS AND PIGTAILS :

- 601 Please specify your requirement

SPECIAL WAVELENGTH TOLERANCES :

- 702 $\pm 10\text{nm}$ (specify wavelength)
- 703 $\pm 5\text{ nm}$ (specify wavelength)
- 704 Special centre wavelength, please specify
- 818 Adjustable wavelength

LASERS :

Please consult factory for non-standard requirements or additional accessories.

3. POINTS TO REMEMBER

3.1 Optical Connector

The optical connector is a precision component, and requires care in use. Please carefully observe the following:

- Never try mating incompatible or damaged connectors into the socket;
- Always clean the mating connector before mating;
- Always replace the dust cap after use.

Optical connectors have a limited life, and their optical performance degrades with wear. The connector has a rated life of at least 1000 insertions. For optimum life of this component, the instrument is designed so that a patchcord can be left permanently attached, even when the instrument is stored. This practice avoids connector wear and dirt affecting optical performance, and is to be recommended. If the patchcord is replaced after it has been used 1,000 times, then over 1000x1000=1 million measurements can be performed before the front panel connector is likely to show signs of deterioration.

Replacement of the optical connector must be performed at an authorised service centre.

To clean the connector, wiping gently with a soft lens tissue is normally adequate. For more thorough cleaning, alcohol can be used to dissolve dirt. Do not use acetone or more active solvents, since these can dissolve the epoxy glue which is used within the connector assembly.

On the interchangeable series of connectors, the through connector may be easily accessed by unscrewing the connector adaptor, enabling easy cleaning of the various parts.

On the fixed connector type interface, cleaning must be performed without dismantling anything. An air-blast will be required to remove dust after cleaning with tissues etc.

3.2 External Power

This instrument runs off any unregulated 9V/200 mA DC battery adaptor (3.5mm jack, +ve tip). Check that the supplied adaptor has the correct mains voltage rating.

The unit is diode protected from reverse polarity input, and will not suffer damage if reverse inputs are applied.

Do not attempt charging from higher voltages.

An internal fuse (20mm type, 0.5A) protects the unit from excessive charging current.

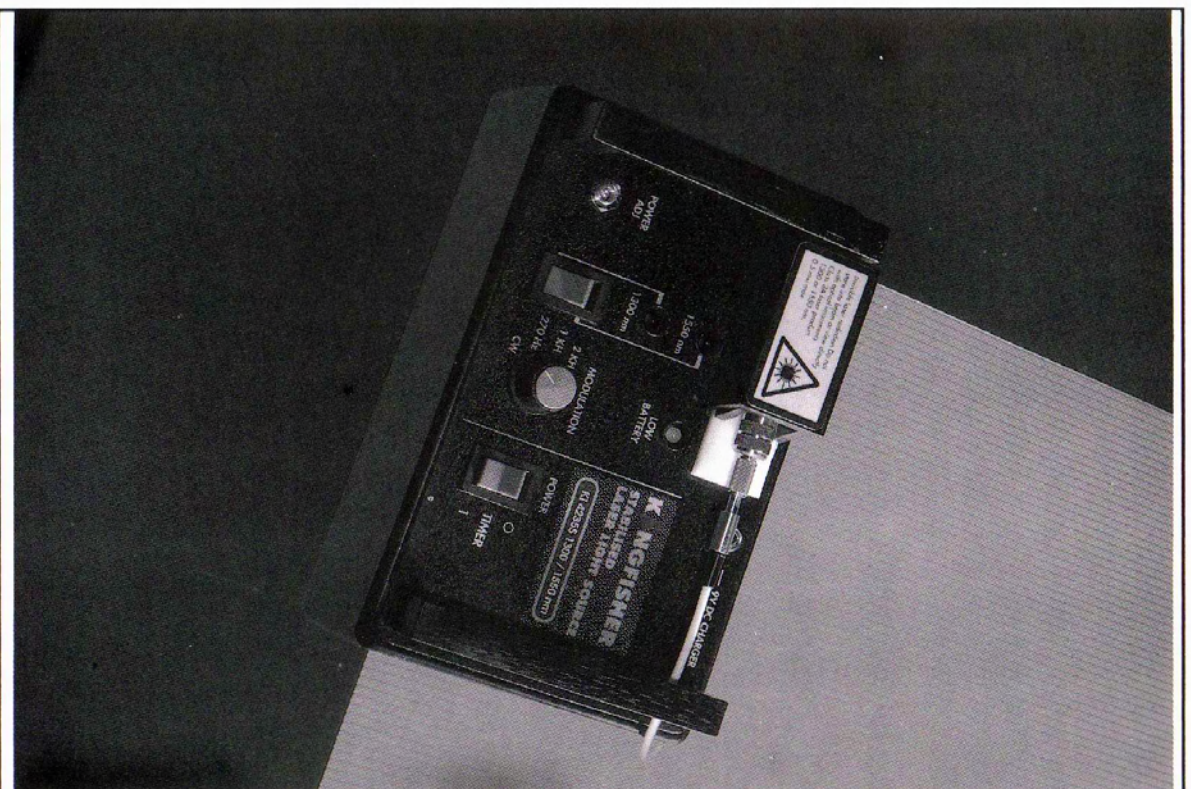


Figure 2

4. GETTING TO KNOW THE KI 4000 SERIES

4.1 Inspection

On arrival, please carefully inspect for any obvious physical damage. Immediately file a claim with the relevant carrier if any damage is found; and keep all packaging materials for inspection by the insurers.

See the back of this manual for material return procedures.

4.2 Powering Up

Check the compatibility of the supplied mains power unit with your mains power supply. Check the setting of the 110/240V selector, if applicable. Connect the power unit to the mains, and plug the output jack plug into the instrument power socket. If the battery is completely flat, you will have to wait a moment before the unit becomes operable.

Turn the 'Power' switch to 'Timer', and the green LED should come on. The LED will flash, indicating that the unit is on an 8 minute timer. To defeat the timer, push the power switch to 'ON', and the LED will go on permanently, indicating that the unit will stay on permanently.

A low battery is indicated by a red LED.

For units fitted with an optional keyswitch, the keyswitch should be turned 'ON' before operation can be started.

4.3 Connecting a Patchcord

Please read section 3.2 'Optical Connector' before using the instrument. Connect the other end of your patchcord to a power meter, or an opto-electric converter and oscilloscope.



Turn the light source on, and observe the fast stabilisation time;

- To change wavelengths (on the dual model) just flick the wavelength switch. Note the fast stabilisation when this is done;
- To apply modulation, adjust the modulation select knob. The modulation is a 50% duty cycle, 100% depth square wave, and is suitable for use with lock-in amplifiers, and fibre identifiers etc.

For power measurement, select 'CW'.

- To adjust the power level of one laser, use the front panel potentiometer. On the dual source, this can be used to adjust the relative power levels, so that when the source is switched between wavelengths, the meter reference reading remains the same.

This is very convenient for dual wavelength attenuation testing, since the meter setting is then completely unaffected by the measurement wavelength.

Try adjusting your measurement set up to achieve this, and you will immediately spot the usefulness of this feature.

- Leave the measurement set-up on over an extended period, and observe the excellent stability.

Your source can be used for measurements on multimode fibre, however be aware that some inaccuracy can result, since optical power launched from a singlemode to a multimode fibre 'underfills' the multimode fibre, and the light travels in a small spot very much smaller than the fibre core size. To overcome this, a mode scrambler is used to create an 'equilibrium mode distribution' within the Multimode fibre core.

A mode scrambler could consist of:

1. About 1 km of suitable Multimode fibre
OR
2. Five turns of patchcord on a 0.5 inch mandrel.

5. ACCURACY CONSIDERATIONS

Your instrument has been designed to produce excellent optical stability.

This light source provides immediate power stabilisation and extreme power stability under the most adverse conditions. Also, the dual wavelength version can be set with exact relative power levels between the two wavelengths, facilitating dual wavelength testing.

On a typical 20 dB loss singlemode fibre span, wavelength drift of an uncooled laser is likely to produce an attenuation drift of less than 0.1 dB/10°C., e.g. not very significant.

Units with temperature controlled lasers provide excellent wavelength stability, since the laser temperature is fixed over the full rated ambient temperature range.

In systems with wavelength multiplexers or filters, wavelength stability can be very important.

Note that in typical applications achievable measurement precision is likely to be dominated more by the stability and repeatability of the connecting patchcord, rather than internal drift within the instrument. For improved Patchcord performance, connectors which have been actively optically aligned are preferred, such as those manufactured by Diamond. These are available in DIN, SC, FC, ST and E 2000 styles.

6. TIPS ON PORTABLE USE

- This instrument is fully functional without removing it from the carry case, which provides excellent protection in normal use. For field use, it is good practice to only remove the instrument from its carry case when really necessary
- The optical connector is arranged so that a patchcord may be left permanently attached. Also, the connector is fully drop protected when the connector is attached. For field use, it is good practice to leave the patchcord attached, since this eliminates the possibility of getting dirt in this critical connector
- When the patchcord must be removed, be sure to close the connector cover to keep out dust
- When the hard carry case is closed, this provides waterproof and dustproof protection to the instrument. Therefore during field use, keep the lid shut when the instrument is not in use
- Try and avoid strong sunlight falling on the instrument. This can cause it to get very hot, which is bad for any electronic equipment
- Try and ensure that the connecting patchcord leaves the carry case via the front. If it leaves near the hinge, it may get broken if the lid falls on it

7. CARE OF YOUR INSTRUMENT

- Please observe the comments in section 2.2 about maintaining the performance of the optical connector
- This equipment is ruggedly constructed with a cast aluminum frame, which will take normal wear and tear. The internal PCB is also mounted in a shock absorbing arrangement, and all controls and connectors are drop protected
- The unit is designed to be reasonably dust & moisture resistant. However, if moisture does get into instrument, it is advisable to dry it out before using again. It is unlikely to suffer damage as long as no corrosion is likely. If corrosive or dirty liquid has got inside, it would be advisable to return the unit for proper cleaning
- During transport and storage, placing the instrument in the proper hard carry case provides protection against dropping, vibration, crushing, dust and moisture, and is to be recommended
- Avoid leaving the unit in direct strong sunlight, where it may get hot
- Avoid leaving the battery on extended charge. Whilst not actually causing damage, this does shorten the useful life of the batteries

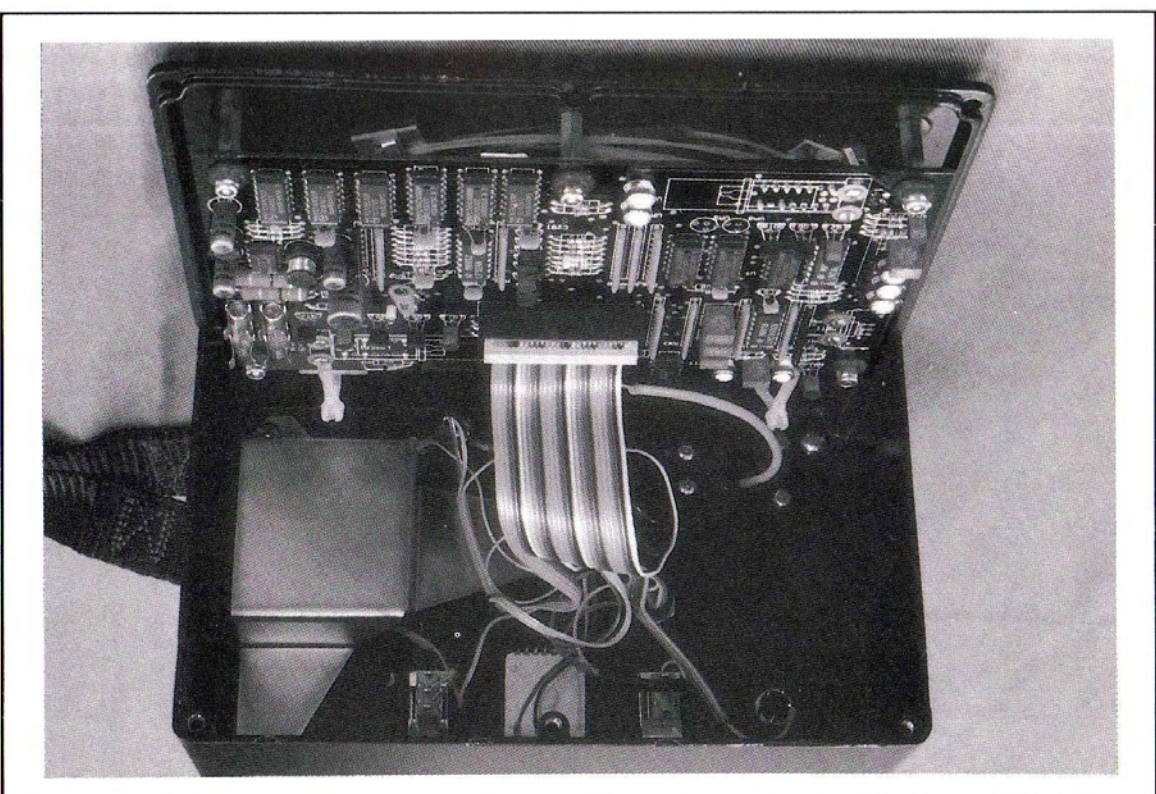


Figure 3
Internal View of Light Source

8. MAINTENANCE

8.1 Important: Read this before Opening an Instrument.

Opening the instrument will invalidate the warranty.

This equipment contains delicate and expensive fibre optic and opto-electronic components. **DO NOT OPEN** unless:

- You are authorised to do so
- You have familiarity with handling fine fibres etc.
- You have laboratory facilities

The only user-serviceable parts inside are:

- Changing the nicad batteries
- Changing the charger or battery fuse
- Changing one of the front panel controls/connectors

These are no other user-adjustable items internally. Other electronic malfunction would imply returning the unit to an authorised service centre.

CAUTION!

Never allow a hot soldering iron to touch the fine fibres - this will cause instant damage. If using a soldering iron, make certain that any fibres are protected from any contact with the heat.

CAUTION!

This unit contains components with extreme sensitivity to static electricity. Full static handling procedures should be adopted.

CAUTION!

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

8.2 Cleaning the Optical Connector

Procedures for cleaning the optical connector thoroughly will depend on the type.

The interchangeable connector series can be cleaned without dismantling anything. Use a lens tissue soaked in alcohol for thorough cleaning.

The fixed connector option requires dismantling to remove really bad contamination, however before doing this, try cleaning the connector carefully. A medical cotton bud type ear cleaner, damped in alcohol, is effective for doing this, followed by an air blast to remove dust.

If this cleaning procedure does not work, then dismantle the connector housing as follows:

Remove the two screws on the slide: Then remove the two screws holding the cover down and remove the cover. The connector can then be unplugged.

To clean the connector tip, use a lens tissue soaked in alcohol; clean the through adaptor, then re-assemble.

When replacing the cover, be careful not to over-tighten the screws.

8.3 Opening the Instrument

1. Read section 8.1 before starting
2. Place the instrument face down on a bench, and remove the 6 screws holding the baseplate to the instrument body
3. Hold the baseplate onto the unit, and place the instrument on its side with the connector nearest the bench

4. Gently open the baseplate by pulling on the top edge. The unit should open easily, and will look like Fig 2
5. Note the position of the internal fibre going to the output connector

Note also that all other opto-electric and fibre components are protected underneath the PCB

6. To further separate the unit for maintenance, unplug the ribbon connector, and dismantle the optical connector, retracting the optical output completely from the outer casing

7. The two wire-wrap ties may then be cut to completely separate the instrument to two halves.

In this way, it is easy to do repairs on the main body with minimal risk of damage to the fibre and electronic components.

8.4 Re-assembly

This is the reverse of the previous section.

Be particularly careful to:

1. Replace the cable ties
2. Ensure that no fibre is poking out before assembling the two halves, or the fibre will get cut during assembly

8.5 Changing the Batteries

You will need qty. two 'C' size nicad batteries with solder tag, at least 1800 mah capacity and 100 ma charge current rating. There can be obtained from Kingfisher.

NOTE: Do not attempt to solder onto batteries without solder tags, or internal damage will result



1. Open the instrument as instructed in section 10.3 and get the two instrument halves completely separated. You will see that the battery clamp is held in three places

2. Unscrew the two screws (which also secure a handle) and the LED nut. You should then be able to remove the battery housing, and access the batteries

3. Take care to re-wire the new batteries with the correct polarity, and re-assemble

8.6 Fuses

Before changing fuses, pull out the ribbon cable connector. There are two internal fuses, 20mm fast-acting types, with functions as follows:

1. F1 protects the instrument from gross abuse of the battery charging input. If it blows, check your charger, F1=500mA
2. F2 protects the batteries from internal short circuits. If it blows, there is a serious fault and the instrument must be returned for service, F2=1.5 Amp

8.7 Changing the Operator Controls

All controls are easily replaced by a competent technician, except for the optical connector.

Items are as follows:

1. Battery charger socket-any standard 3.5mm mono jack socket (enclosed type preferred)
2. LEDs-2mA(low current) 5mm type-any manufacturer
3. Handles-replacements available from UK, RS(Radiospares) P/N 509-917

4. Two position rocker switch, C&K P/N : 7101-J16-2-B-E gray button /black bezel

5. Three position rocker switch: C&K P/N: 7107-J16-2-B-E gray button /black bezel

6. Panel potentiometer, 5 SFERNKE P/N PS8dy-50K linear

7. Knob: Any

8. Rotary switch: ITT-P/N RTA 12-48BC with adjustable stop 71904 x (Available RS or STC services)

Procedure:

Separate the instrument into two halves as in section 10.3. The procedure for then changing any one item should be self-evident to a technician.

9. INSTRUMENT RETURNS

Before returning an instrument for repair, please check with Kingfisher or its authorised representative to obtain a Return Materials Authorisation(RMA) number.

Please state nature of problem, to help ensure our prompt service.

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 etc. against Kingfisher or its representatives if accidental damage or inconvenience result from use or attempted repair of the equipment.

Kingfisher products are guaranteed against defective components and workmanship for a period of one year from the date of delivery, unless otherwise specifically stated in the original purchase or contract agreement.

This warranty specifically excludes damage to the optical connector, or incorrect use. Opening the unit will invalidate the warranty.