

# KI 025 Series Optical Talk Set

*OPERATING & MAINTENANCE GUIDE*



**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:** Optical Talk Set  
**Model Number:** KI 025 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/ IEC 61000-4-3:1996+A1:1998+A2:2001	3 V/m, 80-1000MHz
	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: 2001 / EN 6082:1994+A11:1996	
	FDA CFR 21 part 1040.10 FDA Accession No.: 025 Series 9922414-01	

**Supplemental Information:**

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

2005-July-20

Date

Bruce Robertson

Name

Technical Director

Title



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

Revision: C

Issue Date: 2005- July-20

KI 025 UM-5



# Operating Manual

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## KI 025 SERIES

### Optical Talk Set

#### WITH OPTICAL CONFERENCING

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.

For hints and tips from experts, refer to our Application Notes on [www.kingfisher.com.au](http://www.kingfisher.com.au)



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5<sup>th</sup> Edition, July 2005

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*Figure 1*  
KI 025DD Optical Talk Set

## Service & Support

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### Applications Support

Please visit [www.kingfisher.com.au](http://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](mailto: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](http://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](mailto: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](http://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

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The KI 025 Series Optical Talk Set is designed to provide convenient full duplex voice communication on one optical fibre.

The superb optical performance of the 1550 nm Laser version covers all normal applications on singlemode or multimode fibre, enabling long and short haul applications to be solved with a single model. Other units are available, covering all possible wavelengths and applications up to 200 kms.

Reliable field operation is guaranteed by a unique combination of features such as very simple to operate controls, rugged drop proof construction and reliable analogue transmission.

Conferencing of 3 or 4 units may be achieved by using the dual output ports.

The dual optical port is fully drop protected, and can be cleaned easily in the field.

High quality duplex voice transmission is maintained over the full optical range, with no operator intervention. An optical reserve of typical 5 dB allows intelligible operation over very poor joints for emergency use.

The hands-free 'speakerphone' is convenient for most users, and this automatically changes to headset operation when the headset is plugged in. For noisy situations, or intermittent use, a manual transmit mode is available.

In any mode, a buzzer can be used to call the remote unit. The same buzzer can be used as a 2 KHz source for fibre identifiers.

### Limits of Operation

This optical talk-set uses a sophisticated receiver arrangement to provide operation over a very broad range of optical power, thus giving the user great flexibility without the need to make adjustments.

If you have an optical attenuator available, try testing the audio performance over a wide range of optical attenuation settings, eg. up to 50 dB or more.

As the limits of performance are reached, the background noise will become louder, and eventually the sound will fade altogether.

Note also that at very high loss levels, the set tends towards half-duplex operation, and you will find that you will have to use the headset, as the speakerphone will not operate properly.

Most users will find that the set operates well on both singlemode and multimode fibres; however the greatest optical loss range will apply to the correct fibre type.

Typical losses of a multimode-singlemode mismatch are around 10-13 dB, depending of fibre types and the mode field.

Other Kingfisher products include optical attenuators, return loss test sets, light sources and power meter instruments.

## General Safety Summary

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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.

### **Initial Inspection**

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically.

If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Sales/Service Office (see page 4).

**WARNING!** You **MUST** return instruments with malfunctions to a Service Center for repair (see page 4).

### **Operating Environment**

This equipment can be operated at temperatures between -15 °C and +55 °C and at relative humidity of less than 95 %.

### **Storage & Shipment**

This equipment can be stored or shipped at temperatures between -25 °C and +70 °C and at relative humidity of less than 95 %. Protect the unit from temperature extremes that may cause condensation within it.

## General Safety Summary

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### Safety

These 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.

Optical power levels in fiber optic systems can cause permanent eye injury and damage to eyesight. Organisations and users operating with these power levels **MUST** determine and observe relevant safety precautions, which are beyond the scope of this manual.

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 event of a fault condition, however this cannot be guaranteed. An equipment assurance program is recommended to check for safe laser operation.

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

### Laser & LED Safety Information

Laser Fabry-Perot Semiconductor Laser

$\lambda$  1550 nm

Max CW output power<sup>1</sup> <1 mW

Minimum beam waist diameter 9  $\mu$ m

Minimum Numerical Aperture 0.1

Safety Class

IEC 60825-1 (1998) – International Class 1

21 CFR 1040.10 (1995) – USA Class 1

Maximum Permissible Levels for various standards & wavelengths:

IEC 60825-1 (1998) <sup>2</sup>  
1550 nm 10 mW

21 CFR 1040.10 (1995) <sup>2</sup>  
1550 nm 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.



*Figure 2*  
**KI 025DD Fibre Optic Talk Set**

## Optical Connector

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

To remove an adaptor, press the 'red' button on the upper edge of the connector housing then pull off the adaptor. It can be much easier to pull off the adaptor with a test lead in place, since this gives better grip.

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

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

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

The supplied standard adaptors have ceramic sleeves to avoid connector metal dust contamination. This contamination can cause connector failure. Ceramic connector sleeves also work better in cold conditions.

**CAUTION!** Do not use damaged or incompatible connectors.

The talk set is **either** PC **or** APC connector specific. This is determined when ordering the instrument, and can only be changed at the factory.

**CAUTION!** The use of bare fiber adaptors with the talk set is not recommended as permanent instrument damage may occur.

### How to clean the optical connectors

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

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

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

### Preferred Procedures

To clean the interface without removing the adaptor, you can use a "stick" style connector cleaner for 1.25 or 2.5 mm ferrules. This cleans both the adaptor and end face in one operation.

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

## Battery & External Power

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This instrument is fitted with an internal rechargeable battery.

For operation of the instrument by external power, use Kingfisher AC adaptor OPT103 (9V DC, 0.3 A.).

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 9 - 12V at 50 mA max

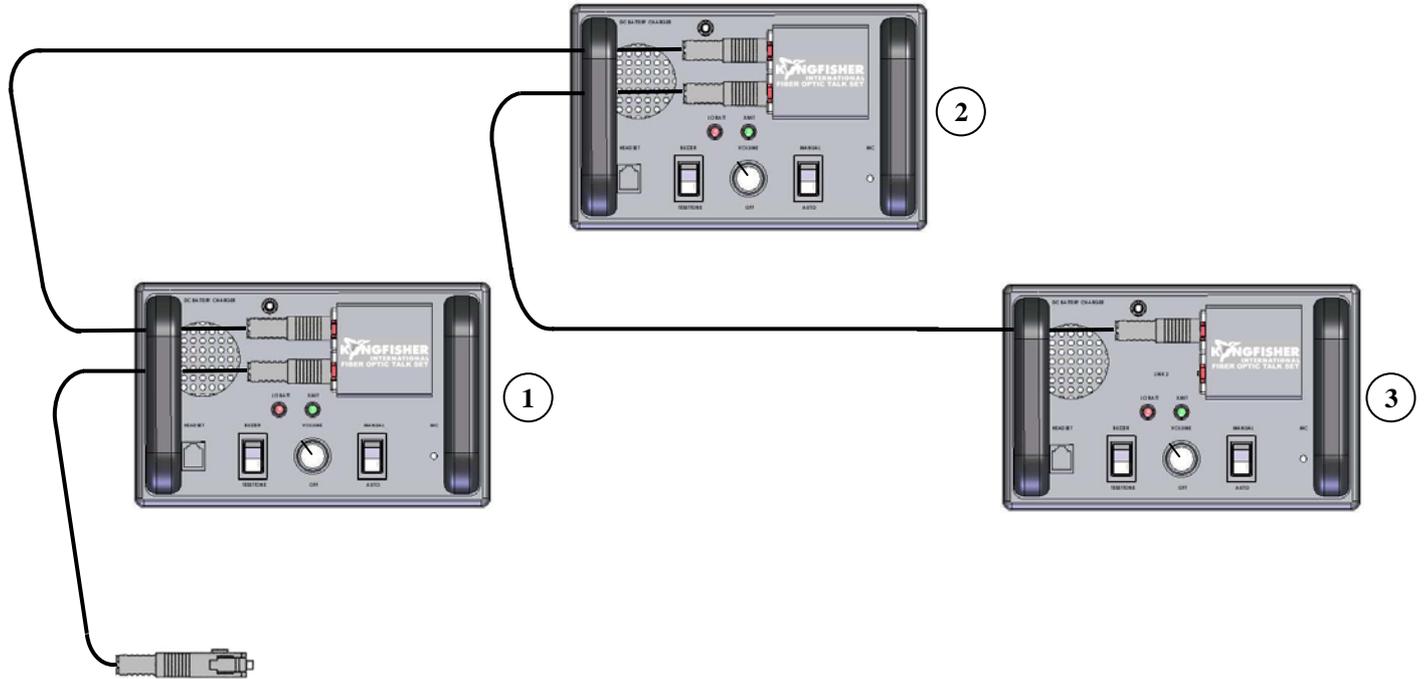
Connection polarity: +ve pin

The instrument can also be charged from 12 V vehicle systems in an emergency, however overcharging in this situation will reduce battery life significantly.

When the internal battery is low, a low-battery 'Red' LED indicator is shown on the top panel.

- a. Only start charging after the low battery indicator starts operating.
- b. Do not charge for more than 10 hours.

# Performance Verification Tests



**'Party Line' Connection**

## Getting Started & Turning On

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### Powering Up

Check the compatibility of the supplied mains power unit with your mains power supply. Check the setting of the 110/240 V 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 few minutes before the unit becomes operable.

### Connecting a Patch-cord & Turning On

To operate the system, you will need two instruments and a long patch-cord. Clean the patch-cord connector, and plug it into the talk set optical connector. For speakerphone operation, the two talk sets need to be in different rooms, or separated by at least 10 metres, to avoid acoustic interference. To turn the instrument on, turn the volume knob, and set it mid-way. Upon turn-on you should hear a tone emitted briefly which indicates normal operation.

### Headset Operation

Set the rocker switch to Auto (on both instruments), plug in the headset, and you should now be able to carry on a conversation. Note that the 'XMIT' indicator shows that you are transmitting. If this does not go on, the other person will not hear you.

Try also using the buzzer. Note that with the headset plugged in, the built-in speaker is silent, however the buzzer will cause the speaker to sound, alerting the user to put on his headset.

If the rocker switch is set in the mid position, you will be able to listen, but not transmit. In this mode, push the 'Manual' function to transmit. This feature can be useful in very noisy situations, to avoid spurious transmission.

### Speakerphone Function

To try testing the speakerphone function, unplug the headset. You should now be able to operate the unit as a half duplex speakerphone. Note that if you are talking, and the unit is transmitting, then you will hear the other person until he/she 'cuts in'.

In the speakerphone mode, you can also use the rocker-switch to select auto or manual operation.

### 'Party Line' Conversation

To use more than 2 talk sets in a communication link, you need to use the second optical output connector connected to an additional talk set.

The number of units that can operate is limited by the fact that each individual unit reduces the available operating performance by about 7 dB. For this kind of use, headset operation is preferable, since the half-duplex speakerphone is difficult to use when several people are involved.

As long as the units are turned on, their buzzers will still operate to call people to a conversation.

## Getting Started & Turning On

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It's as simple as:

Turn the unit on, and set the volume



You can now receive calls or hear the buzzer



The buzzer is independent of all other controls

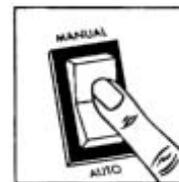
If you want to use a headset – just plug it in

Plug in the fibre



Set transmit to auto or manual

Speakerphone operation is now fully functional





*Figure 3*  
**KI 025DD Optical Talk Set, Internal View**

## Care of your Instrument

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### Environmental

This equipment is ruggedly constructed with a cast aluminium frame, which will take normal wear and tear. The internal pcb is also mounted in a shock absorbing arrangement and the panel controls are protected when the instrument fails face down.

The unit is designed to be reasonably dust & moisture resistant, with a plastic waterproof speaker etc. However, if water gets into the microphone, it may stop working until it dries out again. If the microphone is damaged, see the maintenance section for replacement.

Avoid leaving the unit in direct sunlight, where it can get very hot.

Take note of the section 'Optical Connector' in relation to the optical connector, and 'Battery and External Power' for power requirements.

Please note that the instrument is not waterproof, so exposure to liquids should be avoided if possible. The (optional) carry case is hose-proof and dustproof, and provides complete protection.

### Tips on Portable Use

When using the instrument in a mobile situation, a few turns of the patch-cord around one of the handles provides strain relief for the optical connector.

The instrument is fully operational without removal from the carry case, which provides excellent protection in normal use.

## Specifications

<b>Size:</b>	190 / 120 / 95 mm (7.4" x 4.7" x 3.7") 1 kg (2.2lb)
<b>Carry Case:</b>	280 / 330 / 150 mm (11" x 13" x 5.9") 1.9 kg (4.2lb)
<b>Shipping Weight:</b>	3 kg (6.6lb)
<b>Power:</b>	Internal Rechargeable Batteries. Min. 10 hrs operation (20 typical), 16 hrs re-charge from external charger, 9 V / 200 mA DC, Low battery indicator.
<b>Operating:</b>	-5 to 55 °C non condensing
<b>Storage:</b>	-40 to 75 °C
<b>Reliability:</b>	36 Years MTBF at 25 °C
<b>Output Level:</b>	> -6 dBm approx
<b>Optical Tone:</b>	2 KHz ± 1%, 50% modulation depth, sine wave

### Minimum Optical Range:

		Singlemode	Multimode
KI 025DD	1550nm Laser	-50 dB	-38 dB

<b>Headset:</b>	Headset can be used when wearing a safety helmet. Headset operation is selected by plugging in the headset connector.
<b>Speakerphone:</b>	Speakerphone operation is selected by unplugging the headset connector. The unit acts as a normal half-duplex speakerphone in this mode.
<b>Operator controls:</b>	The operator can select automatic (hands-free) vox operation, listen only, or manual modes.
<b>Operator controls:</b>	The operator can select automatic (hands-free) vox operation, listen only, or manual modes.
<b>Buzzer:</b>	2 KHz tone from speaker when operated, even when the headset is plugged in. Operable to typically 5 dB greater optical loss than audio function. Can also be useful as a fibre identifier and for attenuation measurements.

## Specifications

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**Audio Quality:** At normal headset sound level, S/N is 20 dB until optical loss is 10 dB less than specified maximum, where performance deteriorates.

Receiver bandwidth: 500 Hz ~ 3.5 KHz

Headset microphone bandwidth: 1.8 ~ 3.5 KHz

Built-in microphone bandwidth: 500 Hz ~ 2 KHz

**Multiplex Operation:** More than two units can be operated together. Optical loss performance reduces by 7 dB per additional unit.

## Ordering Information

### Ordering Information:

Instrument	p/n
Optical Talk Set, PC connector	KI 025DD
Optical Talk Set, APC connector	KI 025DD-APC

The above p/n is for one instrument. So minimum practical order qty is 2.

### Standard Accessories:

ST, FC, SC metal-free optical connector adaptors, manual, soft carry case, headset, carry strap, emergency power pack.

### Interchangeable Connector Options:

This instrument is supplied with metal-free interchangeable optical connector adaptors. The ferrule type is fixed and customer specified as either PC or APC. Green is associated with APC. You can order any number of connector adaptors. Order quantity two of each type.

### Optional Interchangeable Connector Adaptors:

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

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

### Optional Accessories::

Emergency Power Pack	OPT100
Battery Charger(Australia only)	OPT102
Battery Charger, IEC, 90~240V	OPT103
Carry Strap	OPT104
Operation Manual	OPT109
Fiber clip-on coupler, 20-30 dB typ coupling loss <sup>1</sup>	OPT130
Carry Case	OPT142
ST-125 $\mu$ m Bare Fibre Adaptor	OPT210
FC-125 $\mu$ m Bare Fibre Adaptor	OPT215
Headset	MEC007

(Please specify your requirements)

**Note 1:** The Clip-On coupling is 17 dB under ideal conditions, however 20-30 dB is often achieved under practical conditions.

## Maintenance

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### **IMPORTANT:**

#### **READ THIS BEFORE OPENING AN INSTRUMENT**

This equipment contains delicate and expensive fibre optic and optoelectronic components. DO NOT OPEN unless:

1. You are authorised to do so;
2. You have familiarity with handling fine fibres etc;
3. You have laboratory facilities.

The only user serviceable parts inside are:

Changing Rechargeable batteries;

Changing the microphone;

Changing one of the operator controls;

Adjusting the buzzer operation frequency;

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

### **CAUTION!**

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

### **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.

You may be able to clean a dirty optical connector without opening the unit.

## Maintenance

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### Opening the Instrument

1. Read previous section before starting;
2. Place the instrument face down on a bench, and remove the 6 screws holding the baseplate to the instrument body. Do not turn the instrument over, or let the baseplate fall away;
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 3.

Note the position of the fibre optic connector, and internal fibre. Most of the fibre optic components and the opto-electronic devices sit under the pcb.

To further separate the unit, unplug the ribbon connector, and undo the optical connector. To completely separate the top and bottom halves, cut the cable ties that hold the unit together. It is important to replace these ties during re-assembly, because they stop accidental fibre breakage during subsequent instrument dismantling.

You will now have two separate items on the bench, eg. The p.c.b. and optical components in one part and the main body, operator controls etc. in the other part. In this way it is easy to repair the items on the main body, with minimal risk of damage to the fibre components.

### 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 protruding before assembling the two halves, or the fibre will get cut during assembly.

### Headset Operation

The headset connector is wired as follows (polarity unimportant):

'Outside' connector pin pair: microphone

'Inside' connector pin pair: speaker (polarity not important)

The all black headsets use a magnetic type microphone, which can be wired either polarity. If the instrument gets problems with acoustic feedback in a new headset, re-do the headset connector with one pair of connections reversed.

## Maintenance

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### Changing the Batteries or Microphone

You will need 4 x AA size rechargeable batteries with solder tags and 50 mA charge current, or get a (side-by-side) battery pack with solder terminals. These can be obtained from Kingfisher. If you have bought separate batteries, solder them in a 'flat-four' arrangement, and put insulation around the battery pack. Note: do not attempt to solder on batteries without solder tags, or internal damage will result.

Open the instrument as instructed on page 19 and get the two instrument halves completely separated. You will see that the battery clamp is held in 3 places. The battery clamp also houses the microphone in a rubber grommet.

Unscrew the two screws (which also secure a handle) and the one bolt that is secured through to the connector housing. Ensure first that the connector housing cover is open so that you are able to remove the securing nut. You should then be able to remove the battery clamp, and access the batteries or microphone.

Change the batteries or microphone as required, and re-assemble.

Be careful with both items to get the polarity of the wiring correct. The microphone is a standard electret type, with -65 dB sensitivity, 10 mm diameter.

Replacements are available from Kingfisher.

### Fuses

There are two internal fuses, 20 mm fast-acting types, with functions as follow:

F1, 200 mA is the battery charger protection fuse;

F2, 1 AMP is the battery protection fuse.

If F1 has been blown, check your charging arrangements.

If F2 has been blown, either the fuse was faulty, or the instrument must be returned for service (eg. internal short circuit).

To change the fuses, follow the instructions to open the instrument, and they are easily accessible on the pcb.

### The Buzzer Frequency

The buzzer circuit consists of a single oscillator, and tone detector, the frequency of which is adjustable via a single potentiometer.

To adjust, open the unit (as in Section 'Opening the Instrument'), turn it on and use a frequency meter 0V connected to eg. the pcb.

The maximum frequency deviation allowable between sets is  $\pm 4\%$ . This circuit should not need adjustment in normal use. It is factory set to 2 KHz.

## Maintenance

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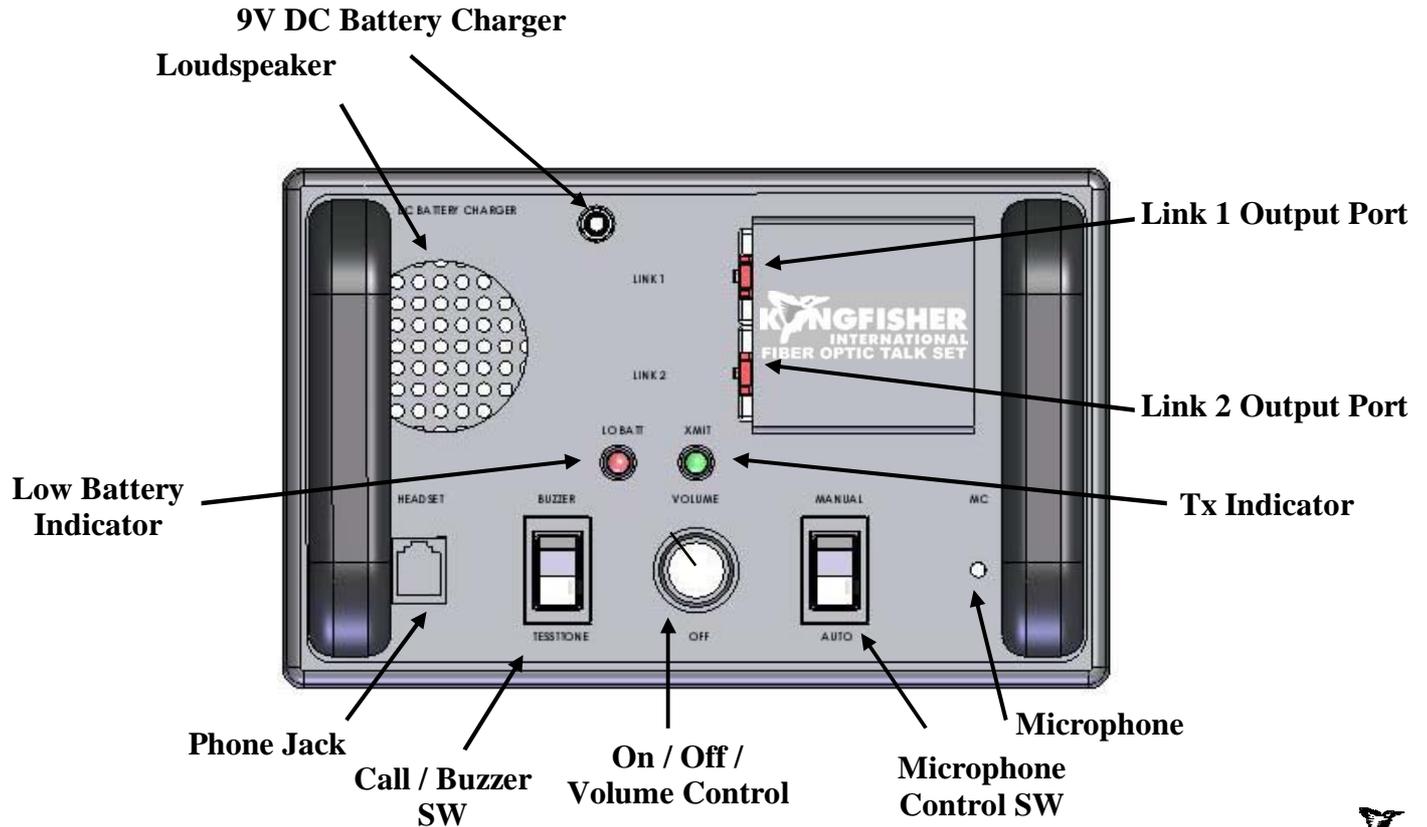
### Changing the Operator Controls

Open the unit as described in the section above, and completely separate the two instrument halves. Once this is done, changing individual item should be self-evident.

Items are as follows: -

1. Battery charger socket: CON013
2. Speaker, Mylar 50mm: MEC005
3. Headset: MEC007
4. Microphone: MEC008
5. LED's 2 mA:
  - a. Green: MEC019
  - b. Red: MEC020
6. LED Holder Panel Mount: SMC046
7. Handle, Plastic: SMC061
8. Phone Jack Clamp: SSUB21
9. Volume Knob: SW005
10. Rocker switch: SW008

## Quick Reference Guide



## Disclaimer & Warranty

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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.

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](mailto: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

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## Notes

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# Notes

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