Optical Return Loss testing

using KI 7340 series Loss Tester

V 040701

General feature summary

➢ **No warm up:**
  Two-Way Loss, Source, Meter & ORL tester

➢ **Autotest**

➢ Large memory

➢ 190 - 360 hr battery life

➢ KITS™ software for testing/reporting/recording.

➢ ORL with 65 dB range

➢ Interchangeable optical connectors. SFF styles available

➢ Test tone generator

Return Loss Testing Fundamentals

Up to 4 λ
• Light source
• Two-way tester
• ORL meter

power meter
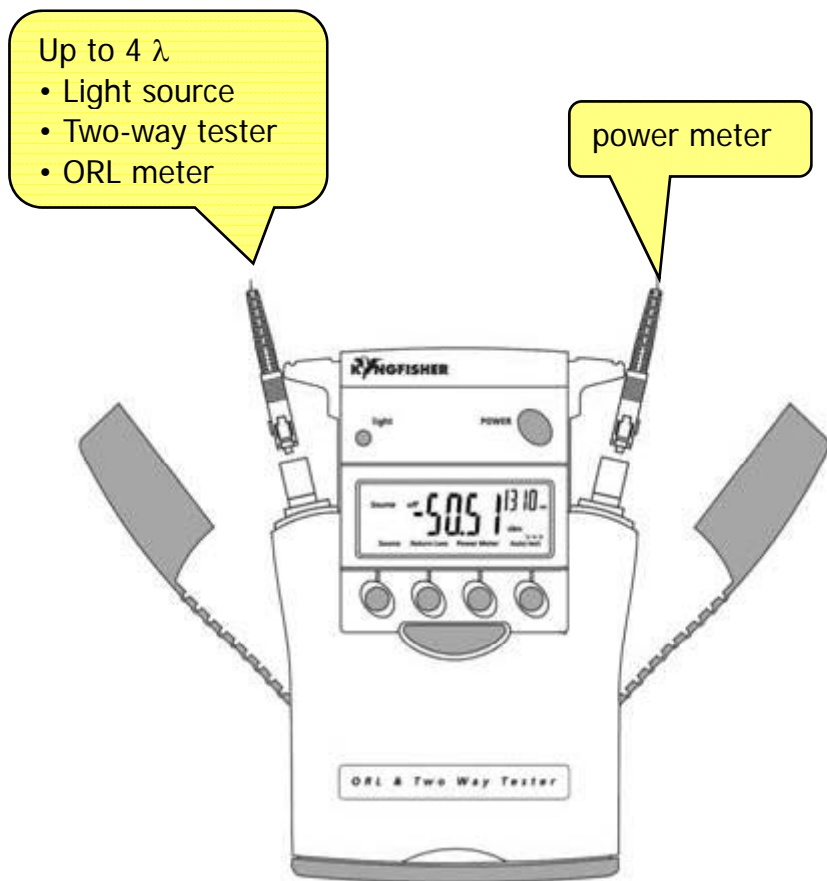
Return Loss is measured using the Optical Continuous Wave Reflectometer (OCWR) method. This gives a single combined reading of all accumulated reflections at the point of measurement.

This method is accurate, and suitable for acceptance testing.

This ORL reading will be dominated by the largest reflection in a system. So it is important to reduce stray reflections prior to testing.

Important Issues for ORL Testing

Staff performing ORL testing will need to learn about how connectors, fiber ends and other devices affect return loss.

This is not shown here. This discussion shows how to use the instruments.

For general information on return loss in fibre systems, please visit www.kingfisher.com.au, Application Note A6.

ORL Test - Method 1

1. **Autotest** used with two instruments automatically performs **pass / fail** ORL testing from both ends of a link, integrated into the two-way loss test, eg *no extra effort or training*! This is not discussed further here.
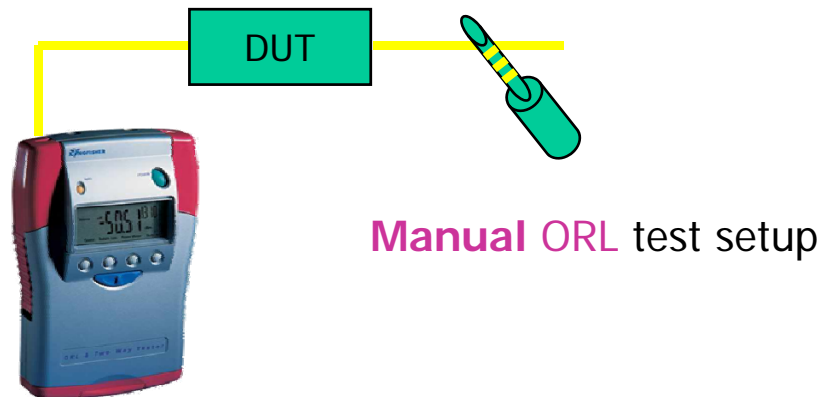
Autotest link loss & ORL test setup
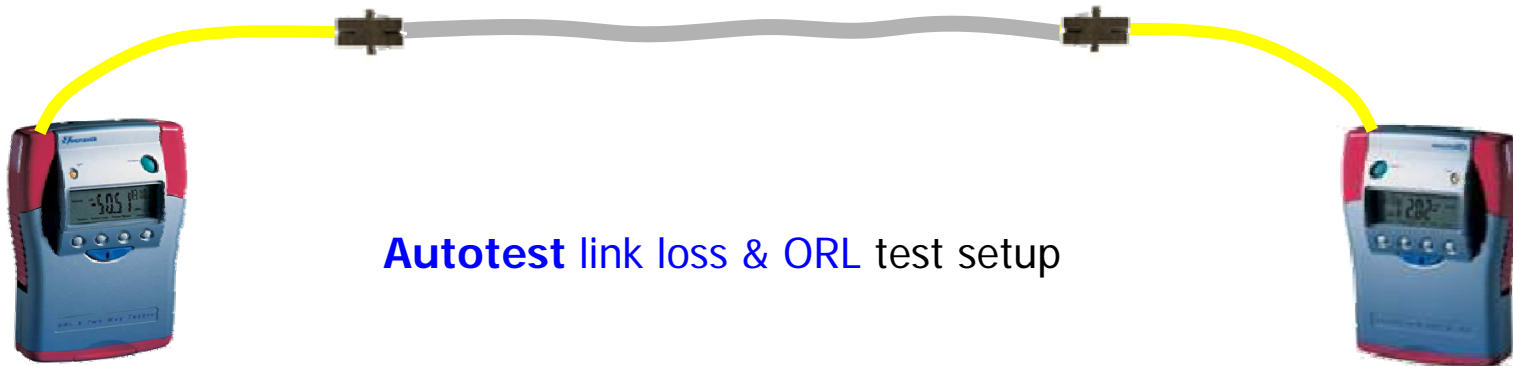
2. Manual ORL testing uses one instrument. **This is the method discussed here.** It has various additional features, and requires a skilled operator.
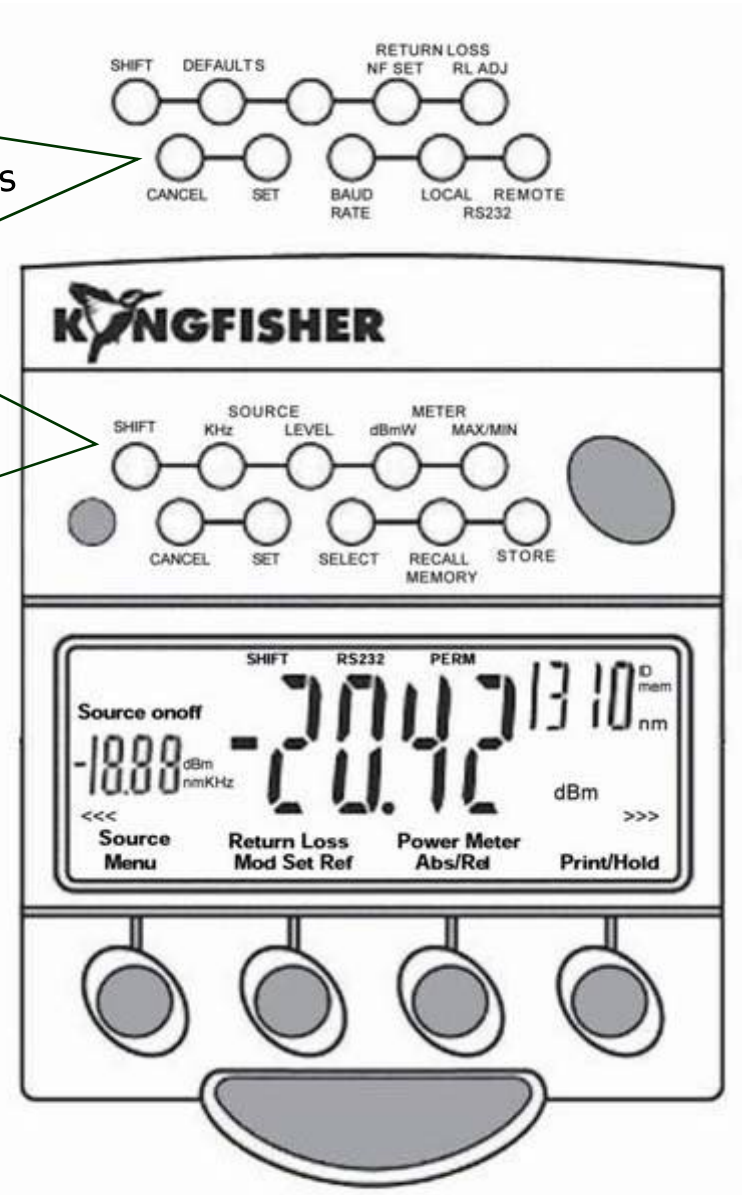

Manual ORL test setup

Keypad Location

Press "*SHIFT*", hidden keypad becomes

Hidden keypad

Source   off   **1310**$_{nm}$

- 52.73$_{dBm}$

Source   Return Loss   Power Meter   Auto test
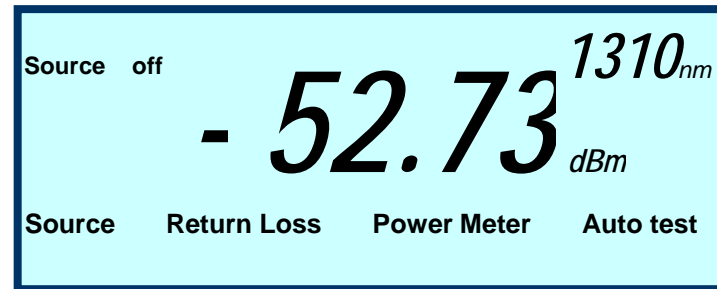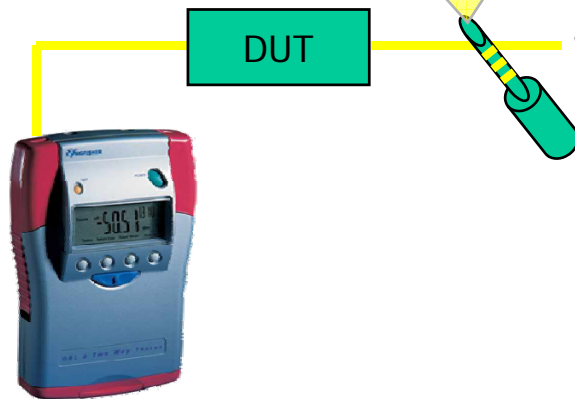
Press **"Return Loss"**
for ORL meter

The connector should be clean.

For **single mode** fiber:
using Mandrel single mode fiber low reflection termination

For **multimode** fiber:
using OPT704A multimode fiber low reflection termination

DUT

Selected wavelength

Source   on   1310 nm

-26.73 dB RL

Menu   Hold
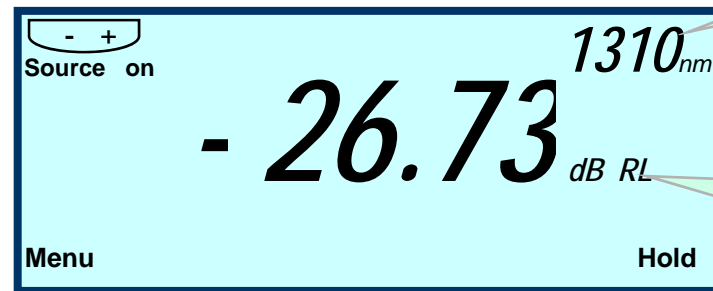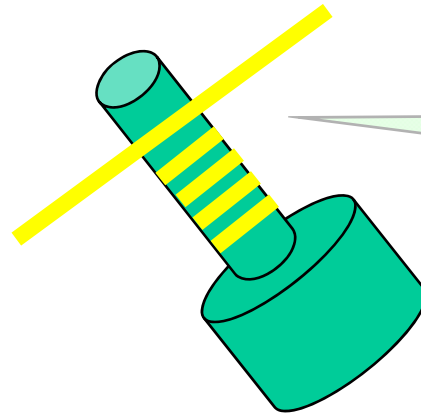
"RL" = "Return Loss" in dB

-        +

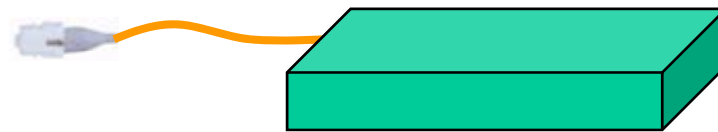Press "- +" to select wavelength

Lo = out of testing range

Low reflection termination

Single mode

Mandrel diameter $\cong$ 5 mm

Wrap > 5 times

Multi mode

OPT704A multimode fiber low reflection termination

Advanced Operation

To improve testing accuracy:

➢ When performing measurements at levels close to unwanted residual back reflections: **ORL Zero function**.

➢ To compensate for unwanted forward attenuation in a test set-up: **UCAL mode**

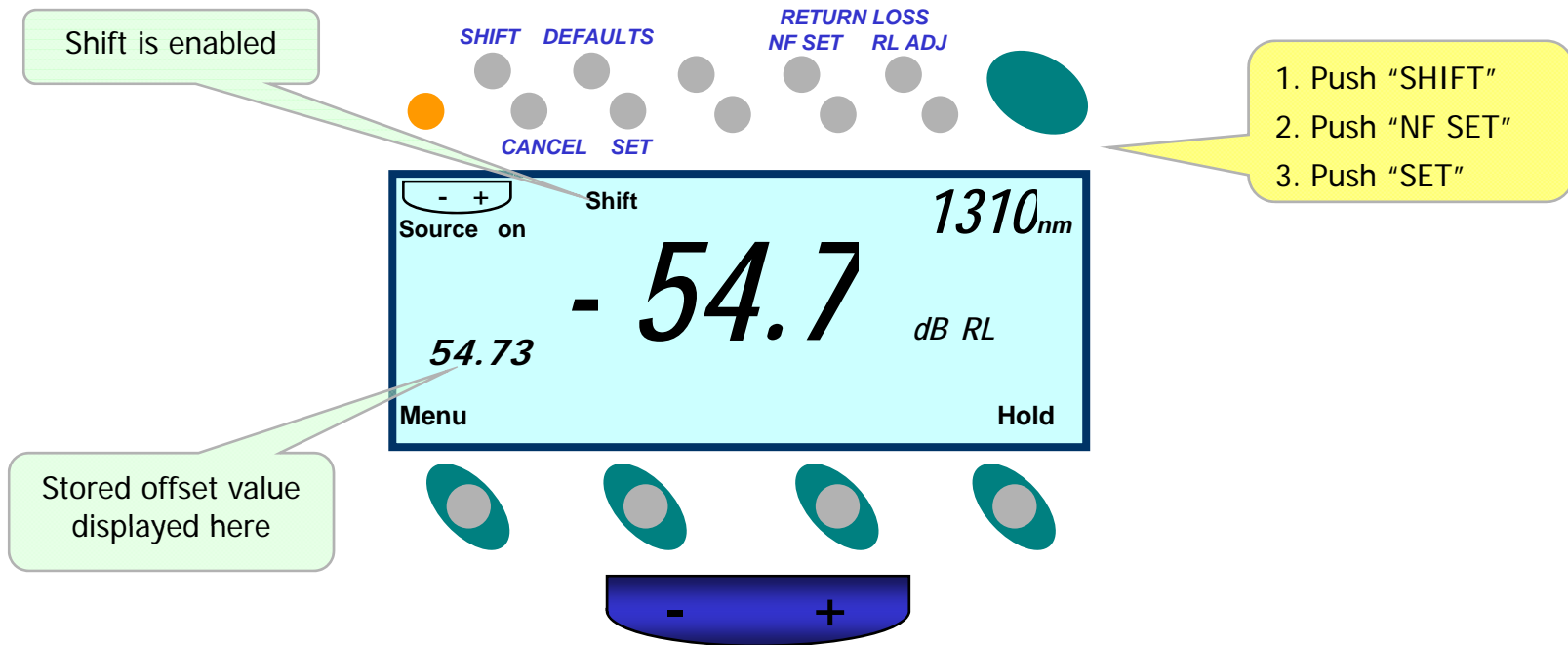# ORL Zero function

Step 1: Set up minimal ORL condition

To attenuate unwanted reflections:
- Mandrel for single mode
- OPT704A for multimode
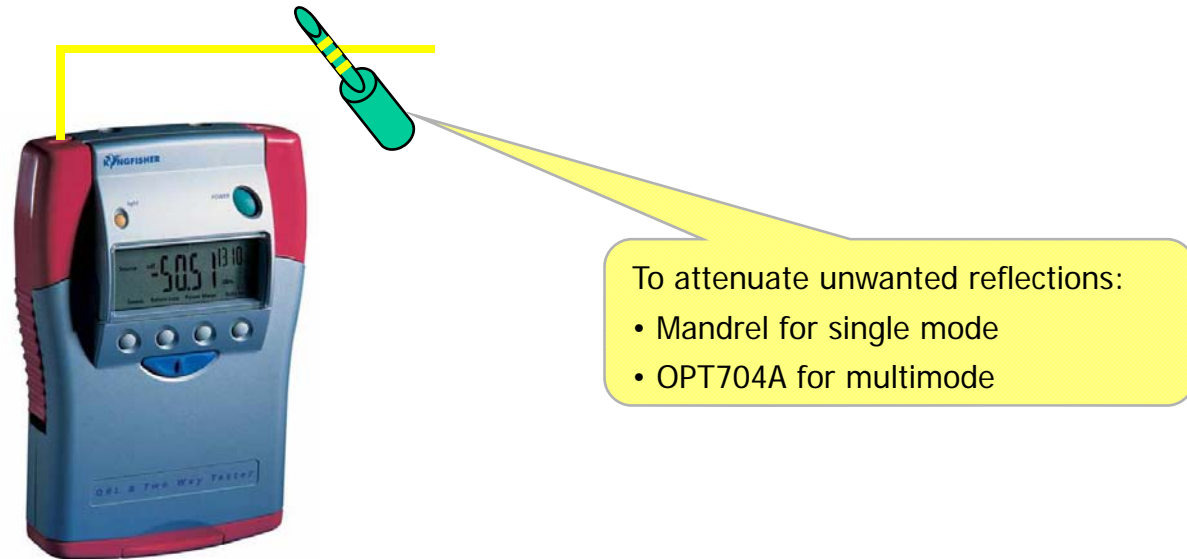
The ORL zero function compensates for residual reflections, and enables measurements up to 10 dB lower than the residual reflection level.

Repeat the set-up function whenever the residual ORL changes.

ORL Zero function

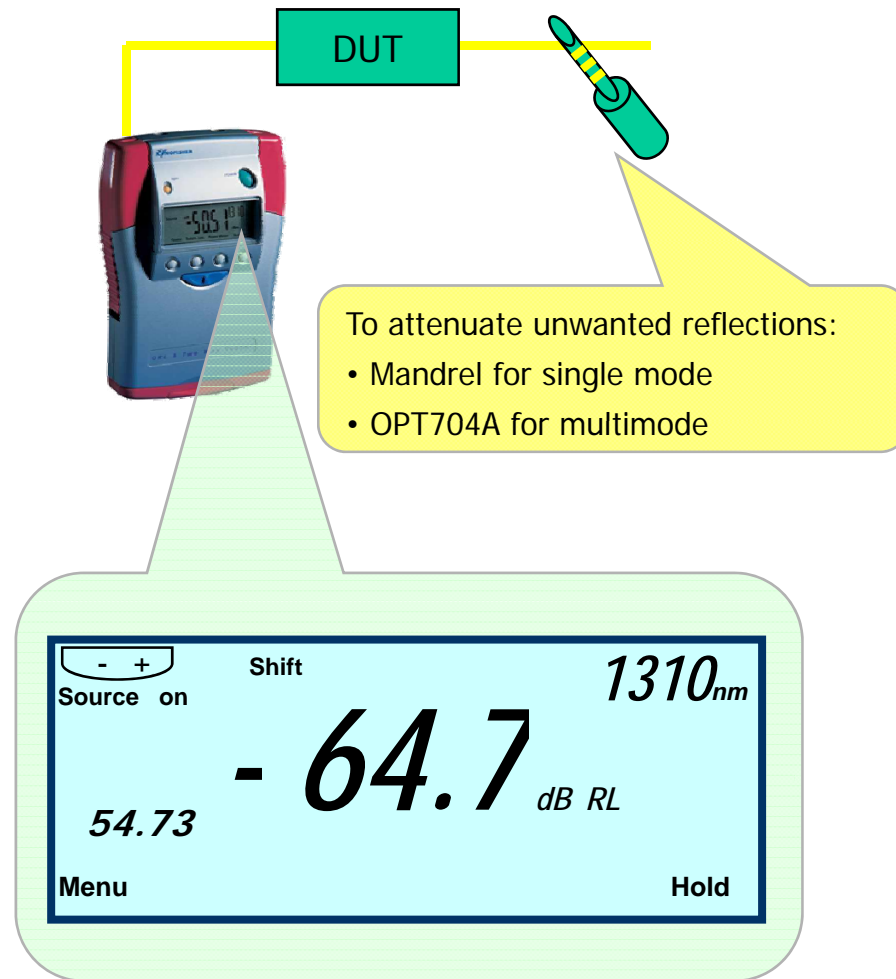## Step 2: Record ORL noise floor (NF)

ORL noise floor (NF) = -54.7 dB

ORL Zero function

Step 3: Measure ORL

DUT

To attenuate unwanted reflections:
• Mandrel for single mode
• OPT704A for multimode

Using **ORL Zero** function can expand measurement range further 10 dB.

In above example
ORL noise floor = -54.7 dB

Measurable ORL:
-(54.73 + 10) dB = -64.7 dB

- +
Source on
Shift
1310nm

- 64.7 dB RL

54.73

Menu
Hold

User Calibration Mode (UCAL)

Step 1

Test Jig

Set up the reference optical condition, eg a known optical reflection
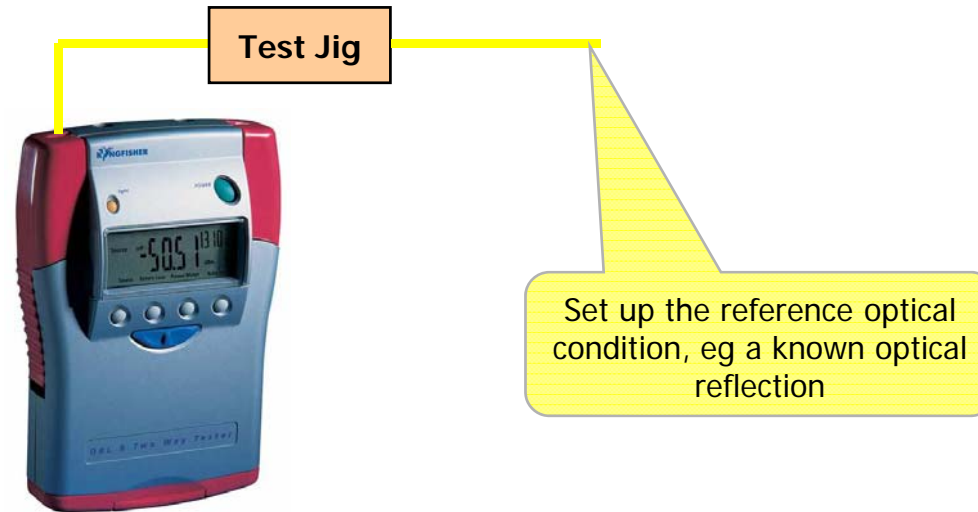
This method is to compensate for attenuation in the test jigs.

A known optical reference condition should be used to calibrate the instrument and Test Jig.

A known optical reference condition could be:
• A new, clean, PC connector end, which will provide -14.65 dB back reflection
• A gold flashed end providing 0 dB back reflection

User Calibration Mode (UCAL)

Step 2

Using **Shift**

SHIFT   DEFAULTS

RETURN LOSS
NF SET   RL ADJ

CANCEL   SET

- +   Shift
Source   on

1310 nm

- 14.65 dB RL

0.85

Menu

Hold

- +

1. Push "SHIFT"

2. Push "RL ADJ"

3. Push "-   +" to adjust display value

4. Push "SET"

Stored UCAL offset factor
displayed here

# User Calibration Mode (UCAL)

Step 3

Test jig — DUT

To attenuate unwanted reflections:
- Mandrel for single mode
- OPT704A for multimode
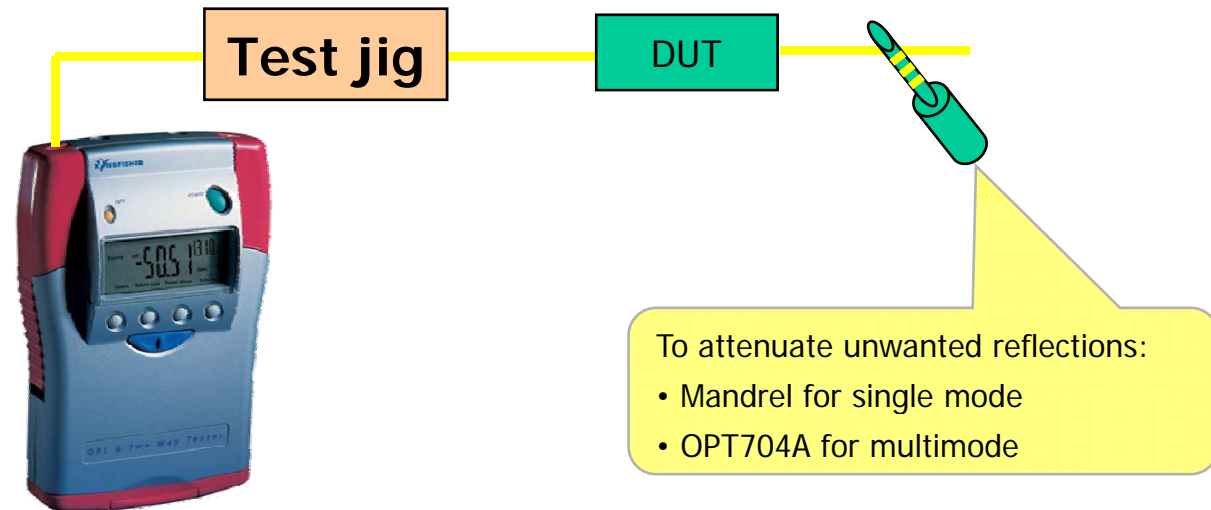
The ORL reading is the DUT reflection.

Restore Default settings

Using **Shift**

SHIFT   DEFAULTS

RETURN LOSS
NF SET   RL ADJ

1. Push "SHIFT"

2. Push "DEFAULTS"

- +   **Shift**

Source   on

1310nm

- 62.73 dB RL

Menu

Hold

- +

Blank display here
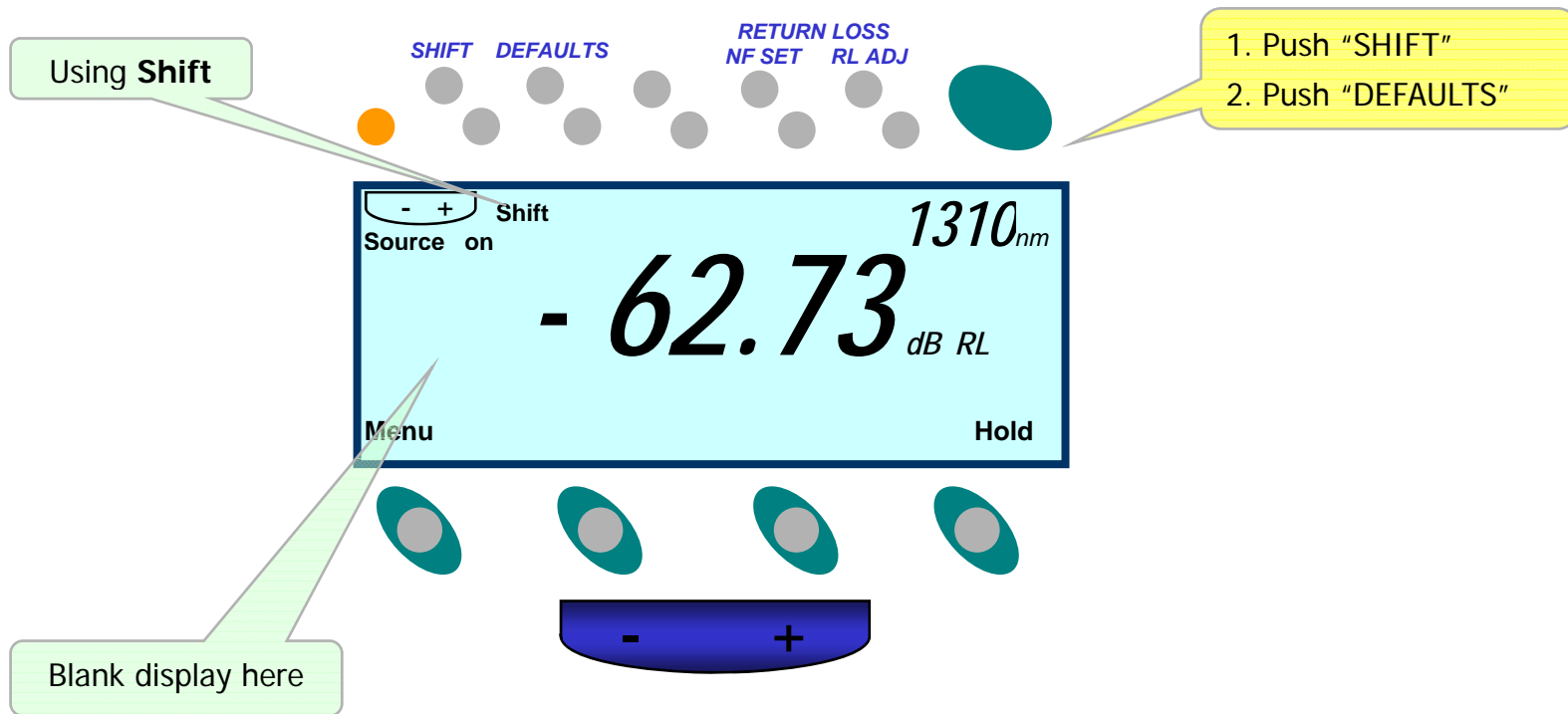
Resets both the ORL zero function and UCAL to default settings.

MEMORY & KITS™
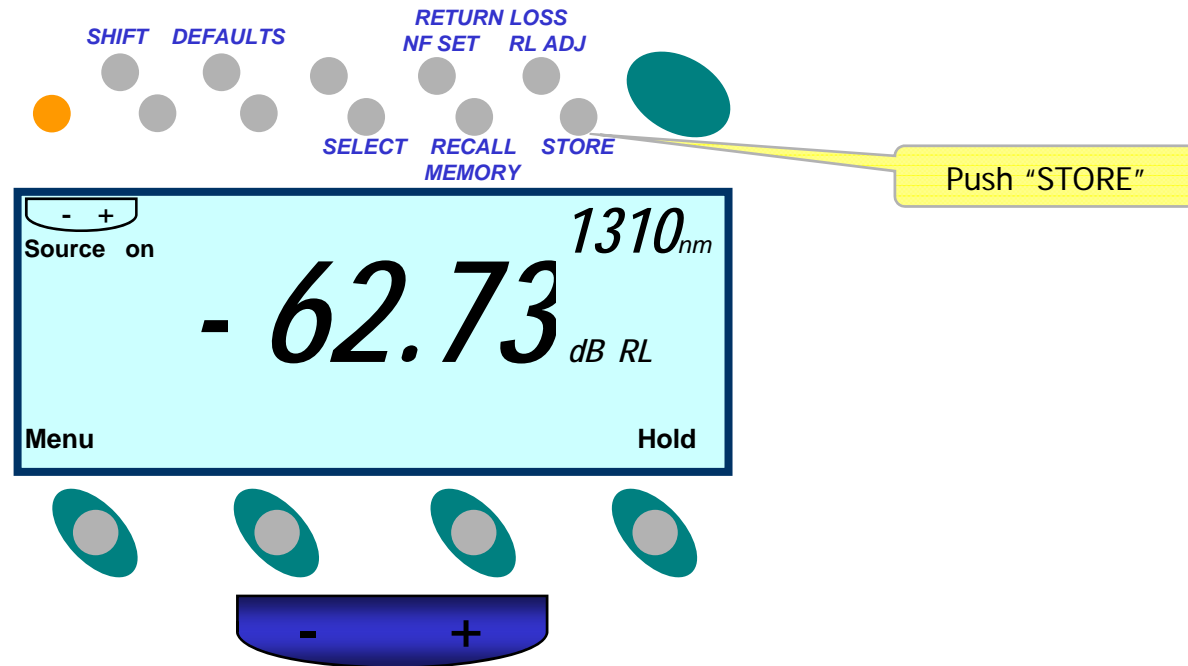
ORL results can be stored in the same way as power meter results. KITS™ displays the ORL results separately for each instrument.

KITS™ Testing/Recoding/Reporting Software

Used for manufacturing environment