KI23400 / KI27400 Series Loss Test Meter Training Manual

Revision: 7
Date: 22 Mar 2022

Table of Content (TOC)

General Features

- Ease to use, slim & versatile

- 1-hookup bidirectional test (SM + MM) for Loss, length*, ORL*

- Real time auto pass / fail

- Larger, sunlight readable & backlit LCD

- SM, MM (EF Compliant) & quad test options

- Large memory & USB key file dump

- Interchangeable connectors

- Real-time, secure PC reporting software

- Continuity test tone with Multi-Fiber ID

- VFL VisiTester* option

- Long battery life, USB external power

- >25 calibration λ, 1% accuracy

- ISO 17025 traceable calibration

- 3 Year warranty & calibration cycle

- Made in Australia

* Only available on selected model

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Overview & Layout

Connector release
(Power Meter port)

Connector release
(MM 2-way port)

Connector release
(SM 2-way port)

Store/transfer
memory

Connector Cover

Micro USB port for
external power
& computer interface

Lanyard holder

Product label

LCD Backlight

Instrument model

Option included:
ORL, Leng (Length), Visi (VisiTester)

On/Off

USB port for
memory
stick

LCD

Battery door

Keypad

Anti-slippery pad

KINGFISHER
INTERNATIONAL
Two Way Loss Test Meter
Class 1 laser / LED product
IEC60825-1 & 21 CFR 1040.10

Model	KI23403OLV-Ge...
Serial	123456
Date	Aug 2020
Options	ORL, Leng, Visi

Kingfisher International Pty Ltd
www.kingfisherfiber.com

No user adjustable parts inside

Made in Australia

Remove adaptor: Press [release button] and pull off adaptor. Push on new adaptor.

Disable Auto-Off Timer: At Startup, Press green button [On] for 3 seconds.

Two Way Autotest: Connect fiber to two-way port on both instruments, push [Auto] once.

Set Reference:
Hold [set ref] for 3 seconds.
Store: Press [store] top right >key

Read:
In manual mode, press [memory] then -/+ to change location

Save to USB: Insert memory stick, check that USB shows.
Press [store] top right > key.

KINGFISHER
INTERNATIONAL
Hand Held 2-way Loss Test Meter

F1 F2 F3 F4

DC-PWR-IN

MEM

KINGFISHER
INTERNATIONAL

Getting Started
➡ Select test cord configuration

Identify fibre type required for test cord and configuration required. Instrument supplied with SC connector adaptor as standard.

Standard connector types:

SC/SC-hybrid connector adaptor

XL connector types:

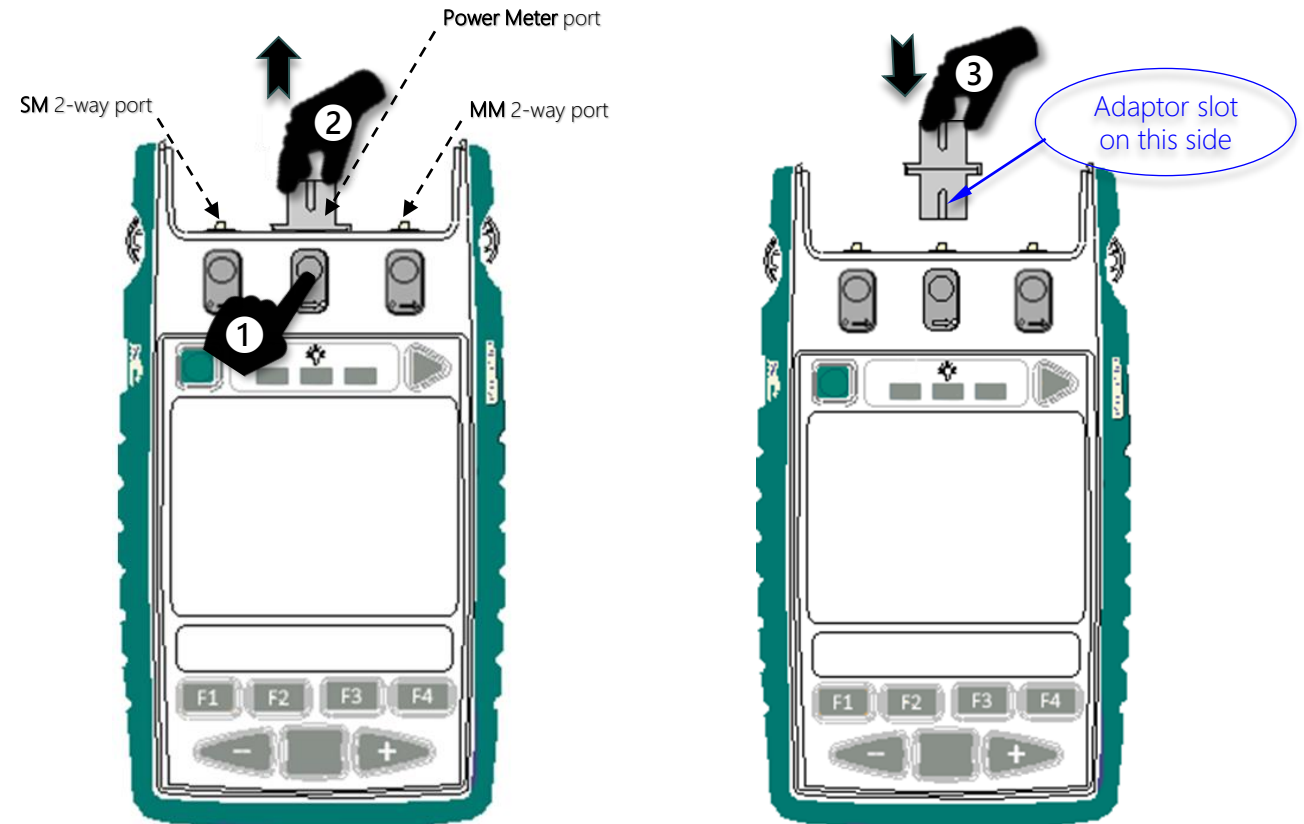**Note:** Unlike light sources, power meters accept both PC and APC connectors.

Return to TOC

Getting Started

➡ Install / uninstall connector adaptor

The instrument comes with 2 or 3 ports (i.e., 1x or 2x 2-way port/s and 1x Power Meter port) depending on the models. See picture on the right for locations of these ports.

Install and uninstall connector adaptors to these ports as per steps below:

❶ Press down release button with finger of one hand.

❷ Pull out existing adaptor with the other hand.

❸ Push in a new adaptor.

Power Meter port

SM 2-way port

MM 2-way port

Adaptor slot on this side

Return to TOC

KYNGFISHER
INTERNATIONAL

Getting Started

➥ Power

➥ External via USB

Connect instrument to a computer or an external power pack via the micro- USB connector marked "DC-PWR-IN".

Caution: When external source is connected, batteries in instrument will be charged if recharging is enabled.

To avoid recharging non-rechargeable batteries which may lead to acid leakage and instrument damage, make sure that recharging is disabled whenever these batteries are used.

See section, Disable/enable battery charging.

Micro USB

To computer
or power pack
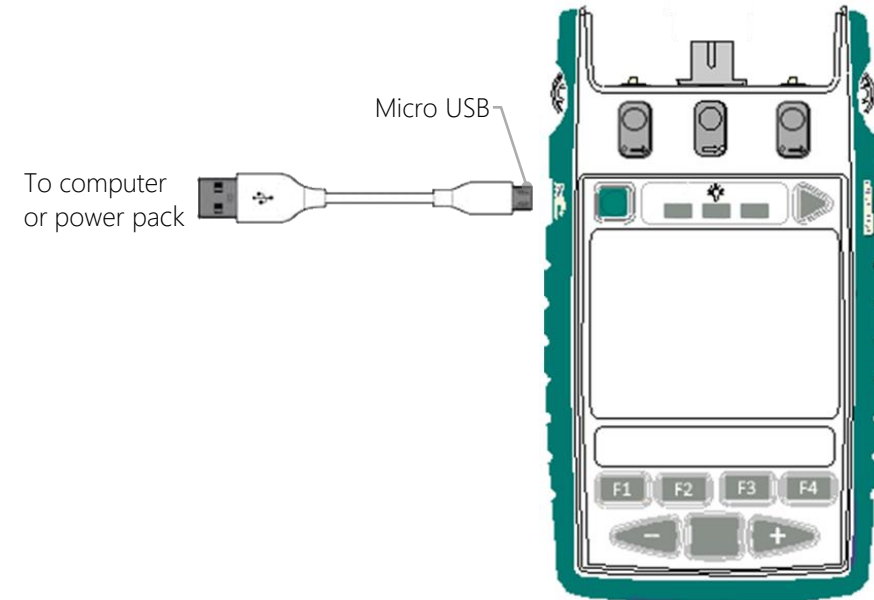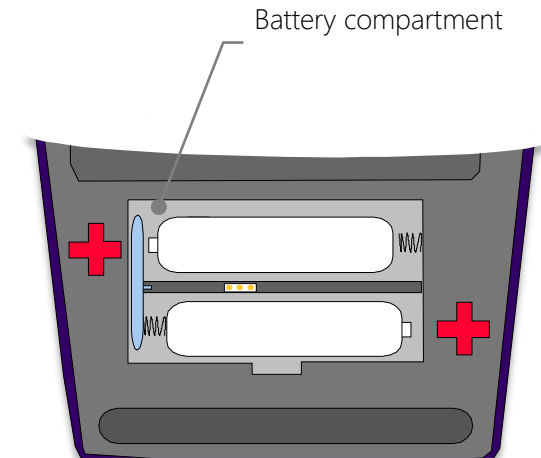
Getting Started

➡ **Power**

➡ **Batteries**

To install / uninstall batteries:

① Unclip door of battery compartment at rear of instrument.

② Insert / remove batteries. Make sure that batteries are inserted in the correct polarities.

Battery compartment

Note:

- Instrument's date / time setting holds for approx. 2 minutes during batteries change over.

- Use 2x Alkaline / Lithium AA cells or 2 x NiMH AA cells.
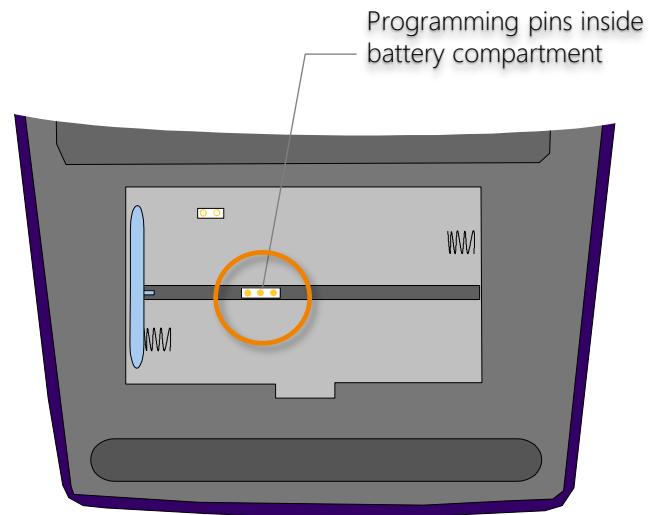
- Alkaline battery run time up to approx. 1,000 hours.

Caution: Battery charging on instrument must first be disabled when using non-rechargeable batteries. See next page for instructions to disable battery charging.
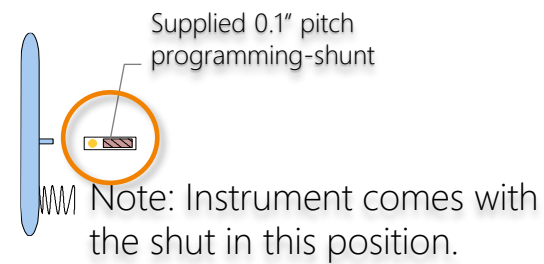
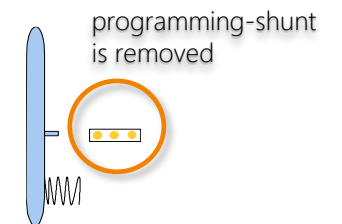KINGFISHER INTERNATIONAL

Getting Started

➡ Disable / enable battery charging

Insert the supplied programming-shunt across the pins inside battery compartment to disable or enable charging as shown below.
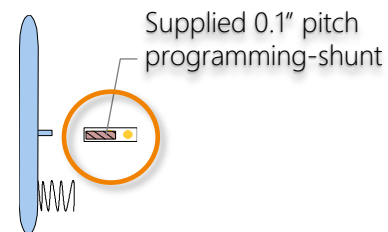
Programming pins inside battery compartment

Battery charging *disabled*:

Supplied 0.1" pitch programming-shunt

programming-shunt is removed

OR

Note: Instrument comes with the shut in this position.

Battery charging *enabled*:

Supplied 0.1" pitch programming-shunt

Return to TOC
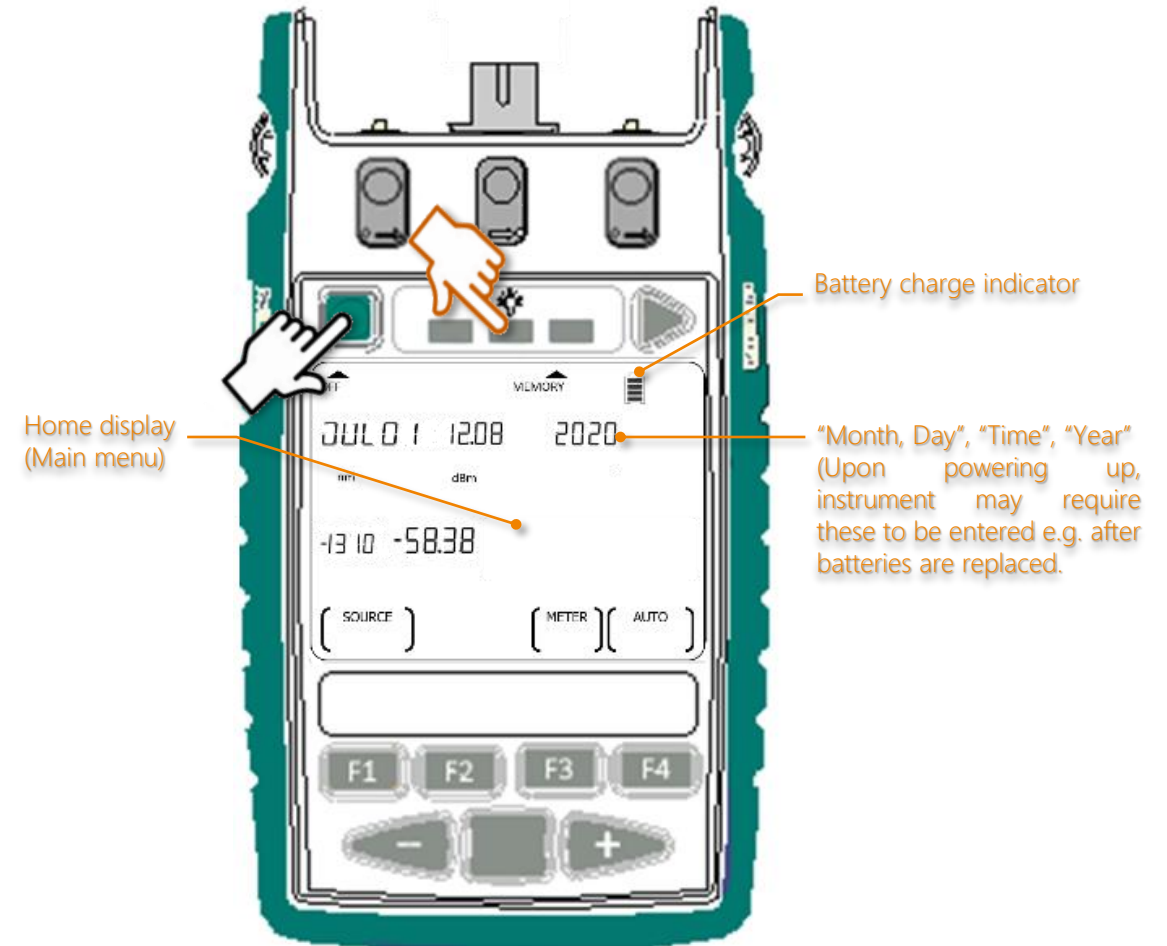
KYNGFISHER
INTERNATIONAL

Getting Started
➡ On / off instrument & LCD-backlight

To switch on:
Press the green button.

To switch off:
Press the green again.

Auto off feature:
When powered with batteries, instrument will switch off automatically 10 minutes after the last keypress.
To disable auto power off, press and hold green button for 3 seconds or until beeping stops. '**Perm**' will display on the upper LHS of the LCD.
When powered via USB, auto off feature is automatically disabled.

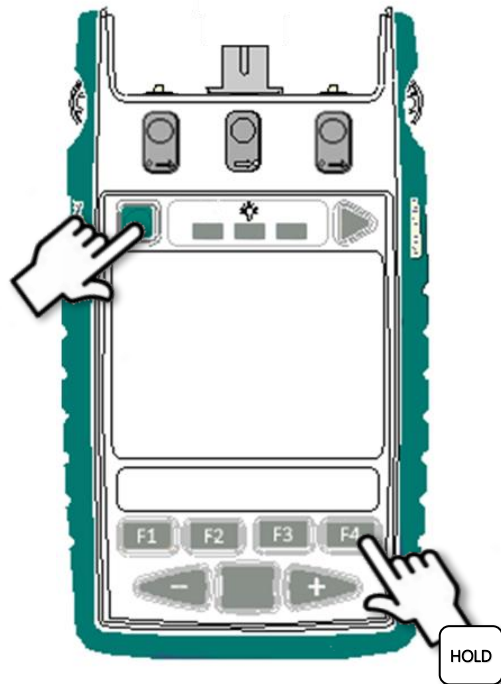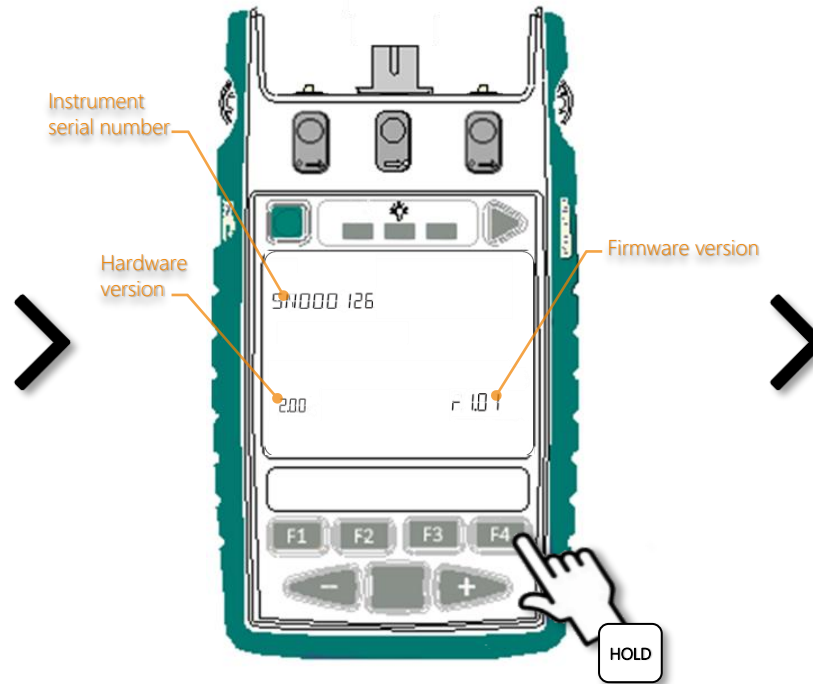**LCD backlight:** Press button below the light bulb symbol to turn backlight on or off.

Battery charge indicator

Home display
(Main menu)

"Month, Day", "Time", "Year" (Upon powering up, instrument may require these to be entered e.g. after batteries are replaced.

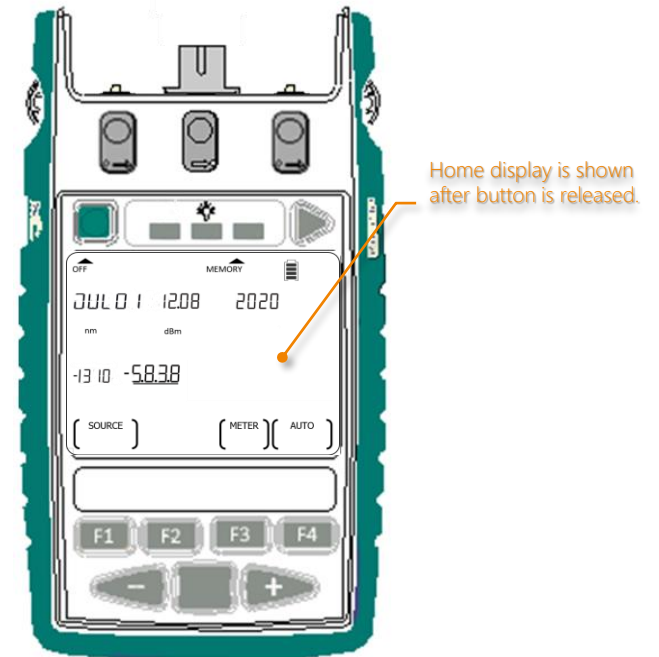Return to TOC

Getting Started
➥ To view firmware version & instrument serial number

① When instrument is *off*, hold down F4 then press green button.
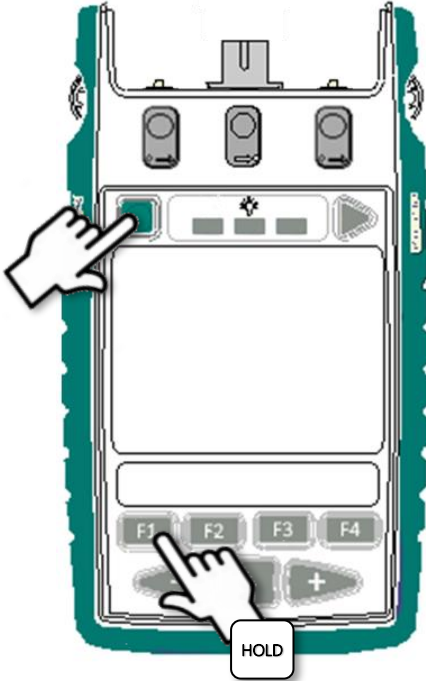
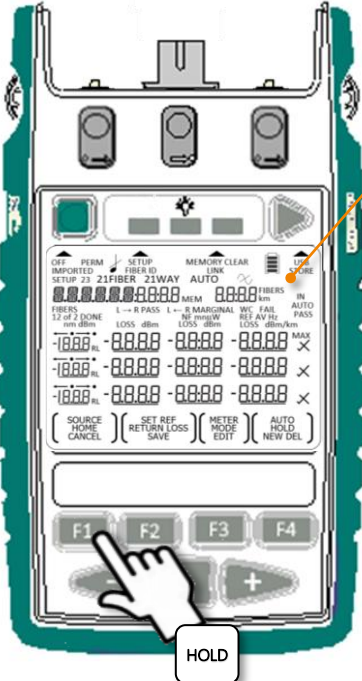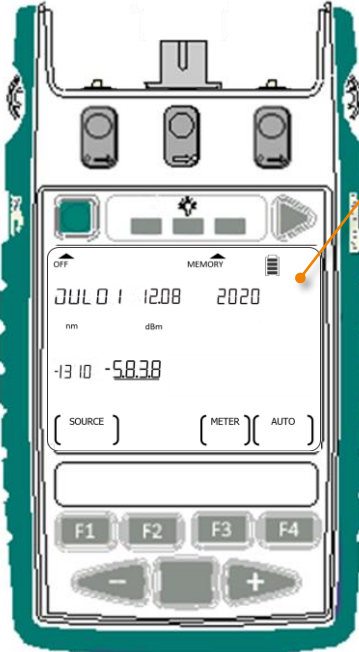② Continue to hold down F4.

③ Release F4.

Instrument serial number

Hardware version

Firmware version

SN000 126

2.00

r l.0 l

Home display is shown after button is released.

HOLD

HOLD

OFF   MEMORY

JUL 0 1   12.08   2020

nm   dBm

-13 10 -58.38

SOURCE   METER AUTO

Return to TOC

KINGFISHER INTERNATIONAL

Getting Started
➡ To show all display segments of LCD

① When instrument is *off*, hold down F1 then press green button.

② Continue to hold down F1.

③ Release F1.

Full segment display

Home display is shown after buttons are released.

HOLD

HOLD

KINGFISHER INTERNATIONAL

Instrument Operation
➡ 2-way Autotest operation

- Work with a pair of instruments(same model) only
- Performs bidirectional loss, ORL (optional), cable length (optional) measurements
- Displays test result (pass/fail) automatically

① Connect the 2-way ports of both instruments with a reference patch-lead.

IMPORTANT:
Light (especially fluorescent) entering the instruments via Power Meter ports may result in Autotest malfunctioning, so cover these ports on both instruments with opaque dust caps.

② Start Autotest:
Press F4 on *any* of the instruments.
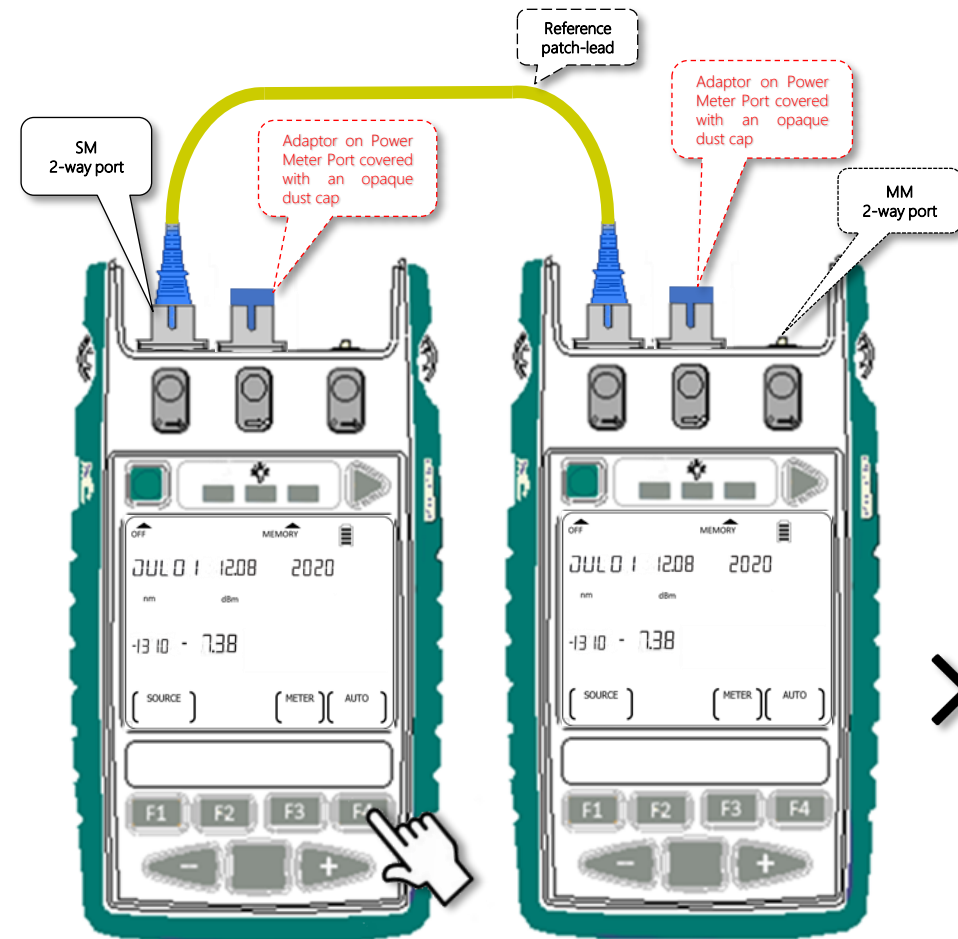
Reference patch-lead

Adaptor on Power Meter Port covered with an opaque dust cap

Adaptor on Power Meter Port covered with an opaque dust cap

SM 2-way port

MM 2-way port

Return to TOC

13

Instrument Operation
➡ 2-way Autotest operation (continue)

Reference patch-lead

When Autotest starts, LCD of both for losses of each direction and their respective averages, for all active wavelengths.

For restricted wavelength Autotest, refer to .
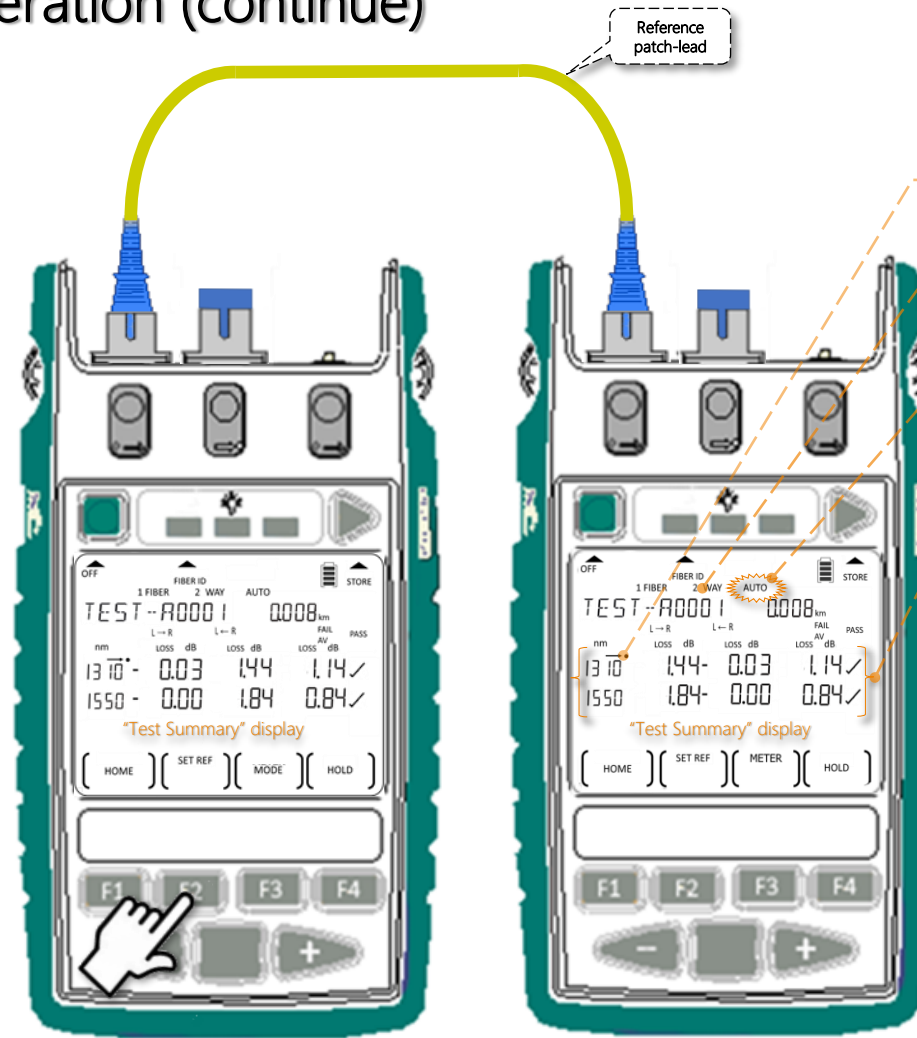
Arrow sign indicating the data row which is being updated.

Indicating instrument operating in 2-way Autotest mode

Flashing to indicates unit is operating in Autotest mode

Test data (bidirectional losses & their respective averages) and results,

- for all active wavelengths are displayed here.

- for each wavelength are shown in a row.

- 3 wavelengths can be shown simultaneously at a time. If more than 3 active wavelengths, screen auto scrolls & cycles to show all wavelengths

"Test Summary" display

"Test Summary" display

③ **Set reference:** On any instrument, press down F2 until beeping stops.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation

➡ **2-way Autotest operation (continue)**

When "SET REF" & "bUSY" stop blinking, values for cable length (optional), losses & average losses displayed on both instruments are zeroed momentarily.
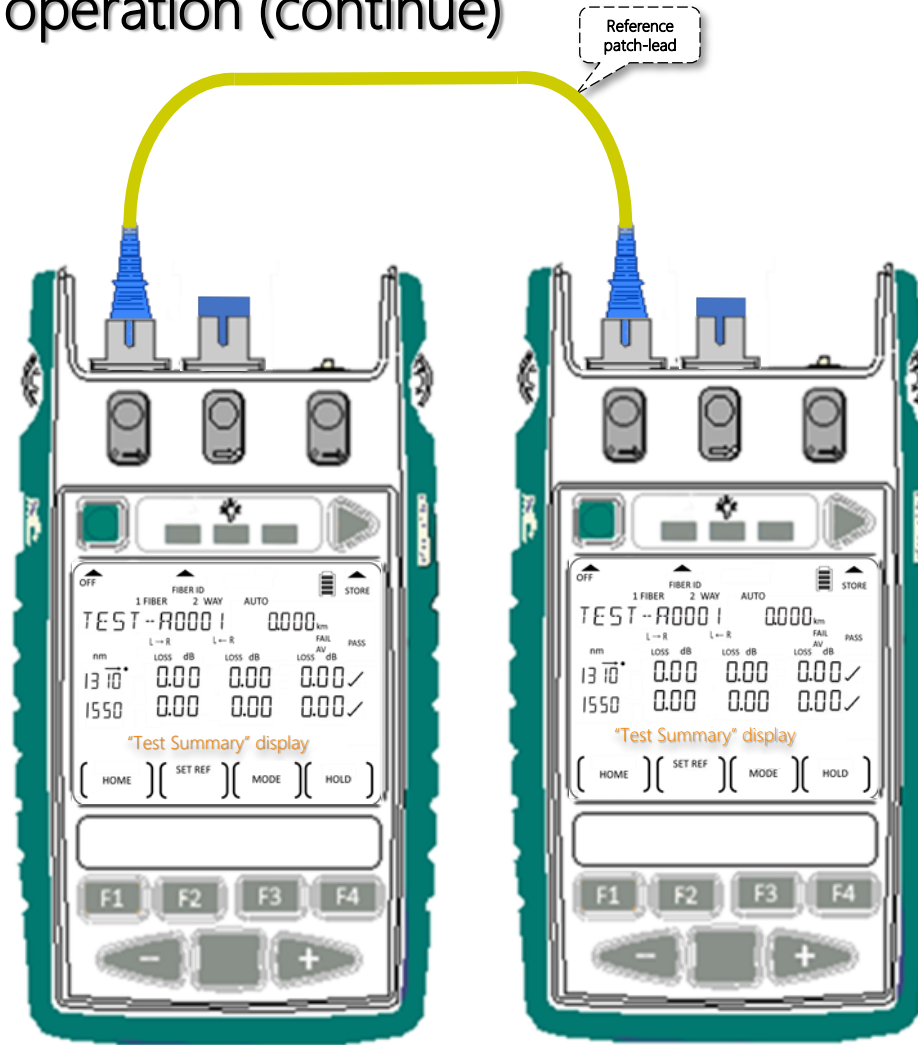
④ Reconnect instruments' ports with DUT (Device Under Test) fiber.

Note:
The master unit (where Autotest was initiated) will be in Autotest standby mode if the fiber is disconnected from the 2-way ports for long enough. Autotest will resume automatically when a fiber is reconnected.
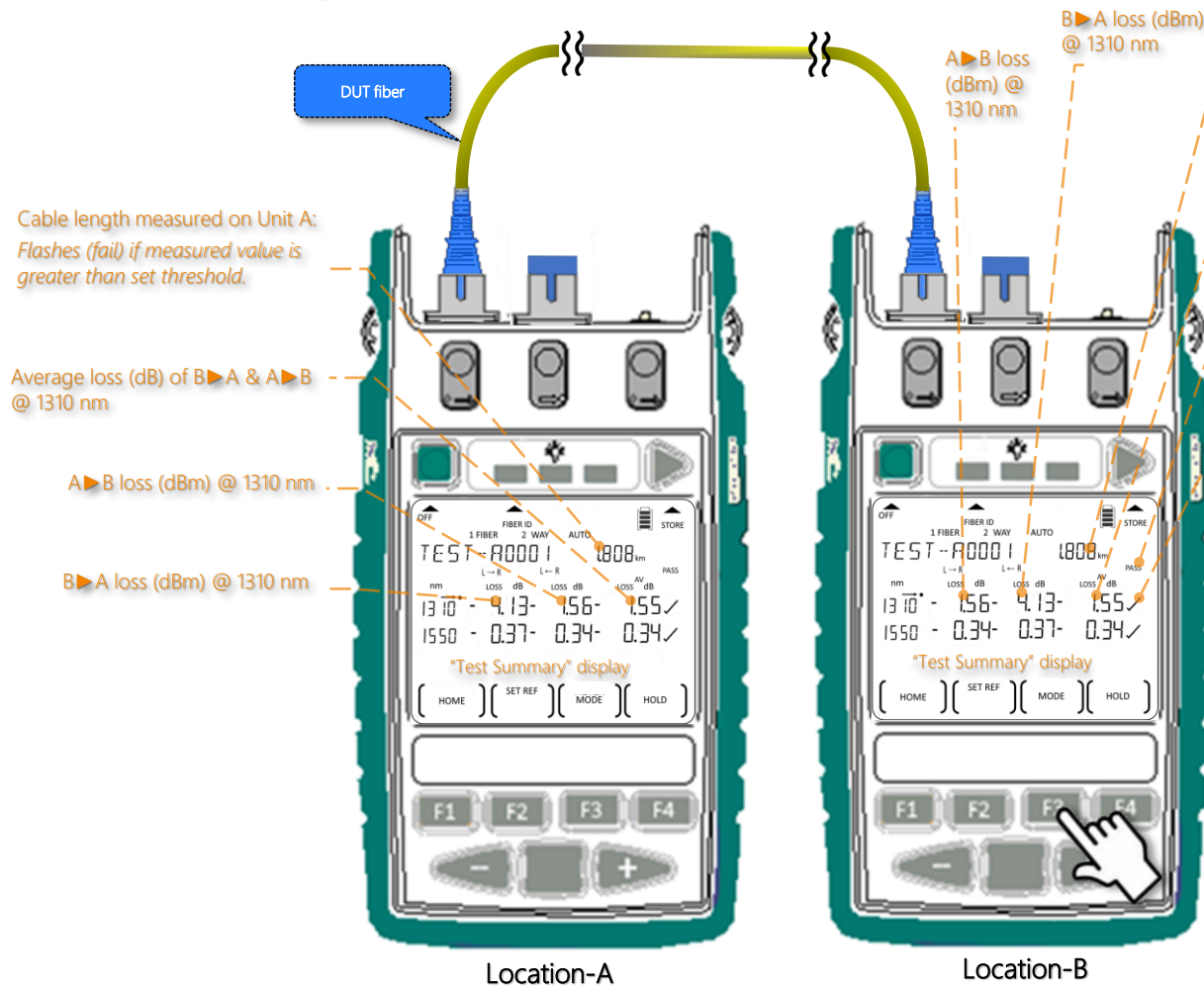
Allow approx. 10 seconds for the instruments' displays to be updated with test data for a newly connected fiber.

➥ 2-way Autotest operation (continue)

DUT fiber

B►A loss (dBm) @ 1310 nm

A►B loss (dBm) @ 1310 nm

Cable length measured on Unit A:
Flashes (fail) if measured value is greater than set threshold.

Average loss (dB) of B►A & A►B @ 1310 nm

A►B loss (dBm) @ 1310 nm

B►A loss (dBm) @ 1310 nm

"Test Summary" display

Location-A

Location-B

Cable length measured on Unit B:
Flashes (fail) if measured value is greater than set threshold.

Average loss (dB) of A►B & B►A @ 1310 nm

Overall test result ("**PASS**" / "**FAIL**"):

"**PASS**": if test result for loss of all wavelengths are "✓" or marginal (blinking "X") and,, cable length (optional) test passes and, ORL (optional) test passes.

"**FAIL**": if any loss or, ORL (optional) test result is "X" or, length (optional) test fails (blinking).

Note: For accurate pass/fail result on instrument model without Length and ORL options, set all thresholds for ORL and length to "0" (disabling them).

Symbol signifying loss & ORL(optional) pass/fail against the set thresholds (refer to Pass/fail Threshold Setting, slides 75~77) for each wavelength:

If AV (Average) method is selected:

- "✓" : Pass/fail check is disabled (threshold value is set at "0"). or
- "✓" (pass): *Average loss* value (magnitude) is smaller than or equals to PASS threshold and, ORL (optional) passes.
- Flashing "X" (marginal): *Average loss* value (magnitude) is greater then PASS but, smaller than or equals to MARGINAL thresholds and, ORL (optional) passes.
- "X" (fail): *Average loss* value (magnitude) is greater than MARGINAL thresholds or, ORL (optional) fails.

If WC (Worst Case) method is selected:

- "✓": Pass/fail check is disabled (threshold value is set as "0").
- "✓" (pass): *Worst case* loss value (magnitude) is smaller than or equals to PASS threshold and, ORL (optional) passes.
- Flashing "X" (marginal): *Worst case* loss value (magnitude) is greater then PASS but, smaller than or equals to MARGINAL thresholds and, ORL (optional) passes.
- "X" (fail): *Worst case* loss value (magnitude) is greater than MARGINAL threshold or, ORL (optional) fails.

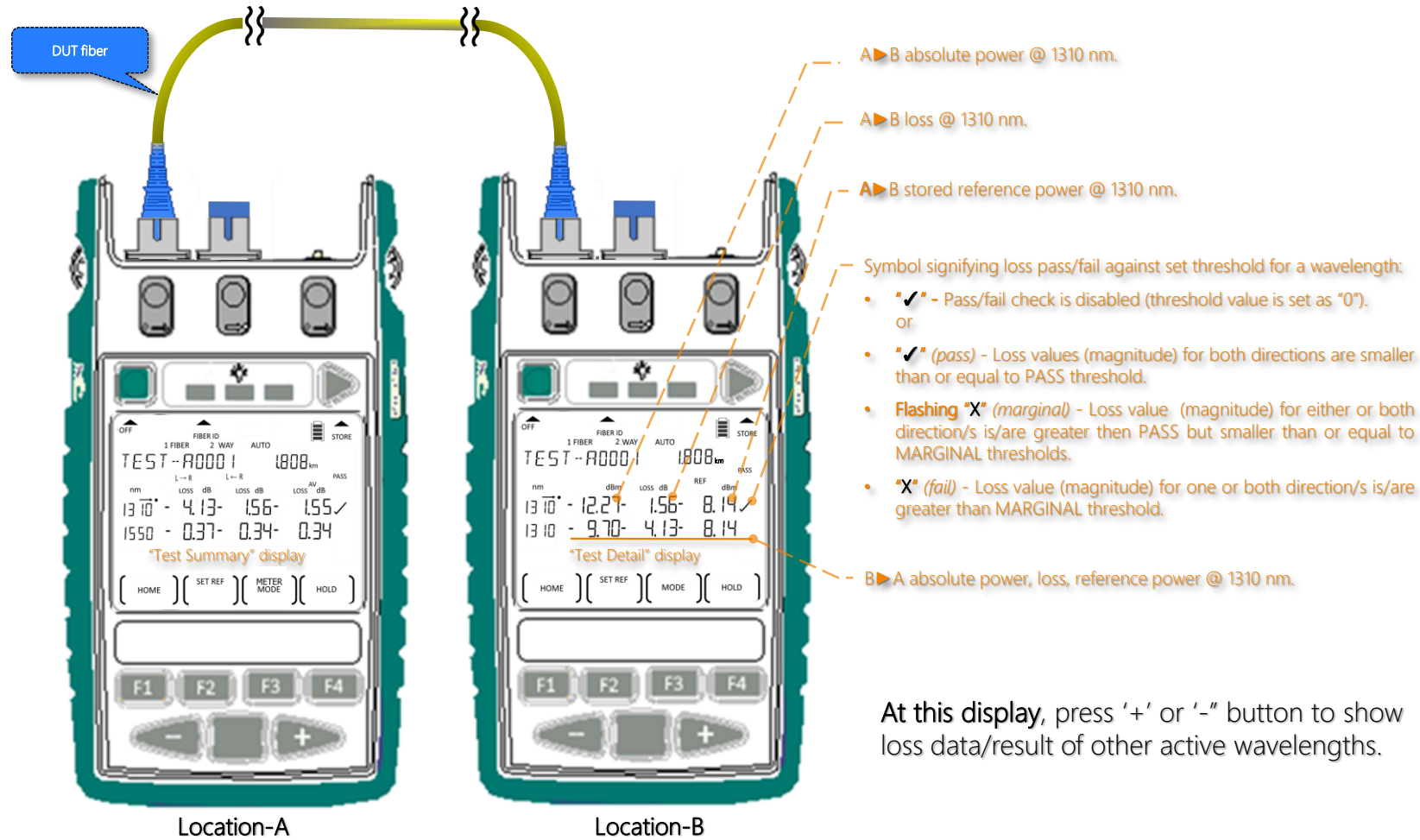*Note: For consistent pass/fail results, ensure the same thresholds are set on both instruments.*

⑤ Display "Test Detail": press F3 on one of the instruments.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation
➥ 2-way Autotest operation (continue)

DUT fiber

A▶B absolute power @ 1310 nm.

A▶B loss @ 1310 nm.

A▶B stored reference power @ 1310 nm.

Symbol signifying loss pass/fail against set threshold for a wavelength:

- "✓" – Pass/fail check is disabled (threshold value is set as "0").
  or
- "✓" *(pass)* – Loss values (magnitude) for both directions are smaller than or equal to PASS threshold.
- Flashing "X" *(marginal)* – Loss value (magnitude) for either or both direction/s is/are greater then PASS but smaller than or equal to MARGINAL thresholds.
- "X" *(fail)* – Loss value (magnitude) for one or both direction/s is/are greater than MARGINAL threshold.

B▶A absolute power, loss, reference power @ 1310 nm.

"Test Summary" display

"Test Detail" display

Location-A

Location-B

At this display, press '+' or '–" button to show loss data/result of other active wavelengths.

Return to TOC

17

Instrument Operation
➥ 2-way Autotest operation (continue)

DUT fiber

Nominal power of Sources

"Test Summary" display

"Test Detail" display

Location-A

Location-B

⑥ Display Source's nominal power:
Hold down Toggle Centre.
LCD will return to previous display after button is released.
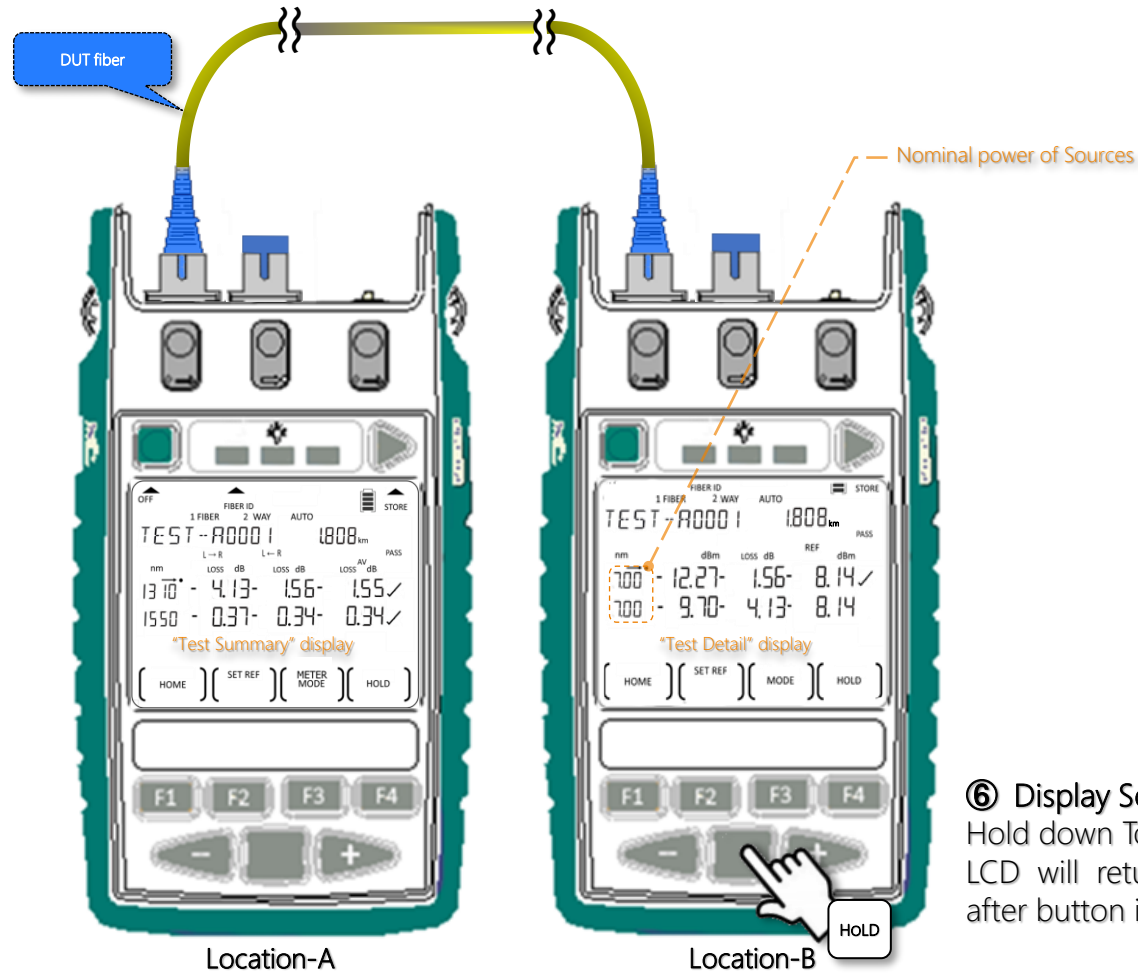
Continue next pages,
- to display ORL (optional) measurements & test result
- To stop 2-way Autotest

KINGFISHER INTERNATIONAL

Instrument Operation

➡ **2-way Autotest operation (continue)**

DUT fiber

***NOTE:**
For accurate ORL measurement on instruments with two 2-way ports, insert PC or APC Terminators as appropriate onto the unused ports to prevent stray light from entering the instrument.

DUT fiber

Location-A

Location-B
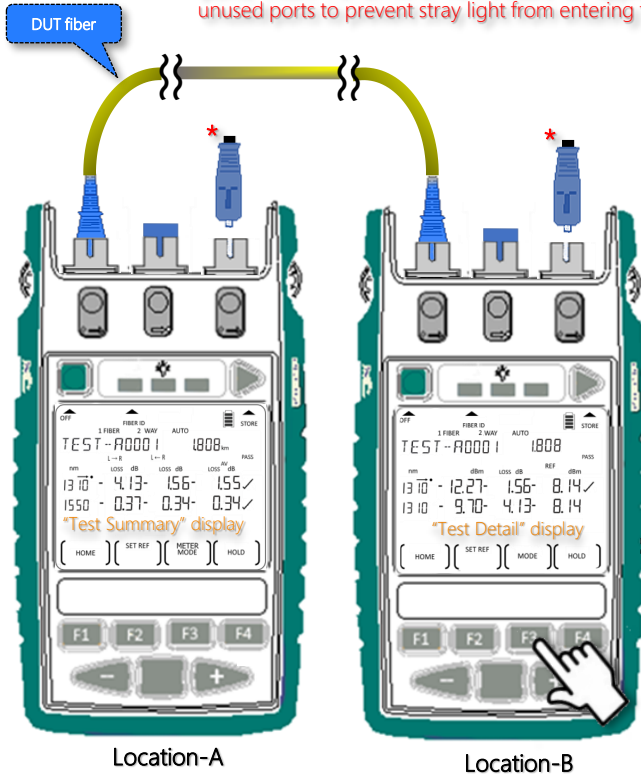
⑦ Enter ORL Test display:
Press F3.

DUT fiber

B▶A ORL value @ 1310 nm
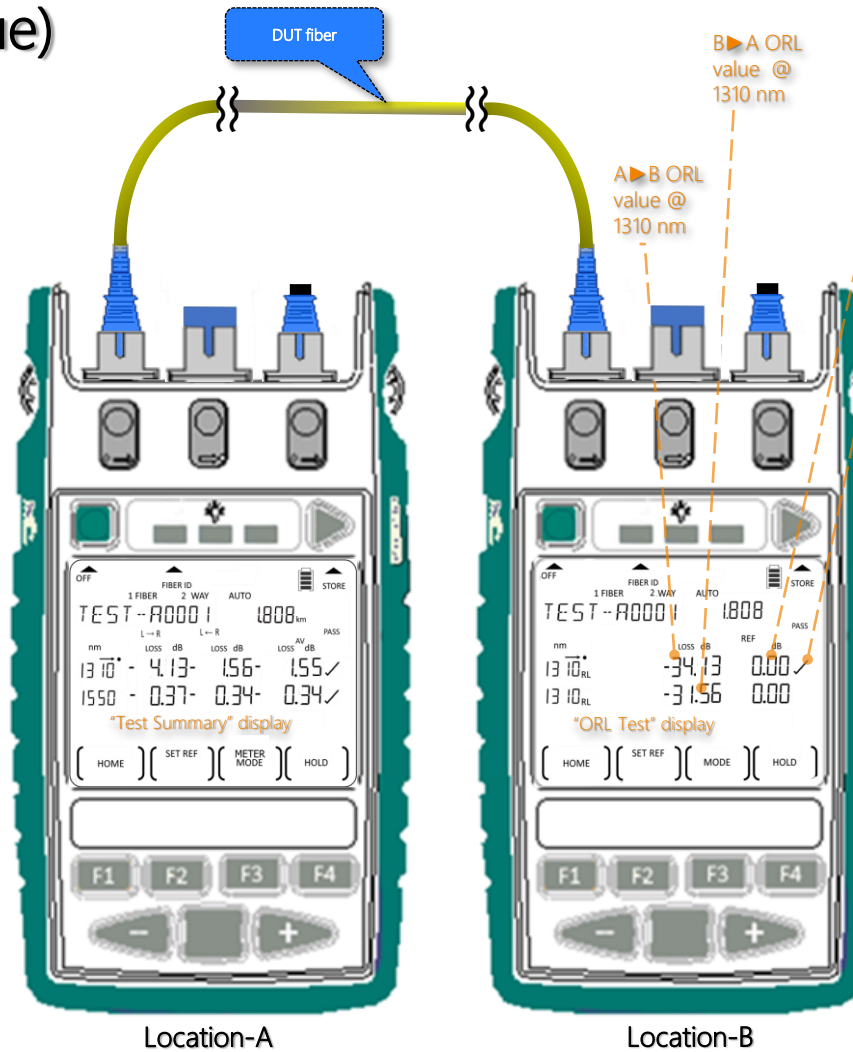
A▶B ORL value @ 1310 nm

UCAL offset value for 1310 nm (see ORL UCAL Setting section)

Symbol signifying ORL pass/fail against set thresholds for a wavelength:

- "✓" – Pass/fail check is disabled (threshold is set at "0.00".
  or
- "✓" *(pass)* – ORL values (magnitude) for both directions are larger or equal to the set thresholds.
- "X" *(fail)* – ORL value/s (magnitude) for one or both direction/s is/are smaller than the set thresholds.

On this display,
- press '+' or '–' button to show ORL data/result of other active wavelengths.
- Press F3 continuously to toggle between ORL Test, Test Summary, Test Detail displays.

Location-A

Location-B

Continue next page

Return to TOC

Instrument Operation
➡ **2-way Autotest operation (continue)**

DUT fiber

"Test Summary" display

"ORL Test" display

Flashing indicates display stops updating.

Press F4 again resume display update.

Location-A

Location-B

⑨

⑧ **Stop/resume display update:** Press **F4** repeatedly.

⑨ **Stop Autotest:** Press down **F1** until a beep is heard on any of the instruments.
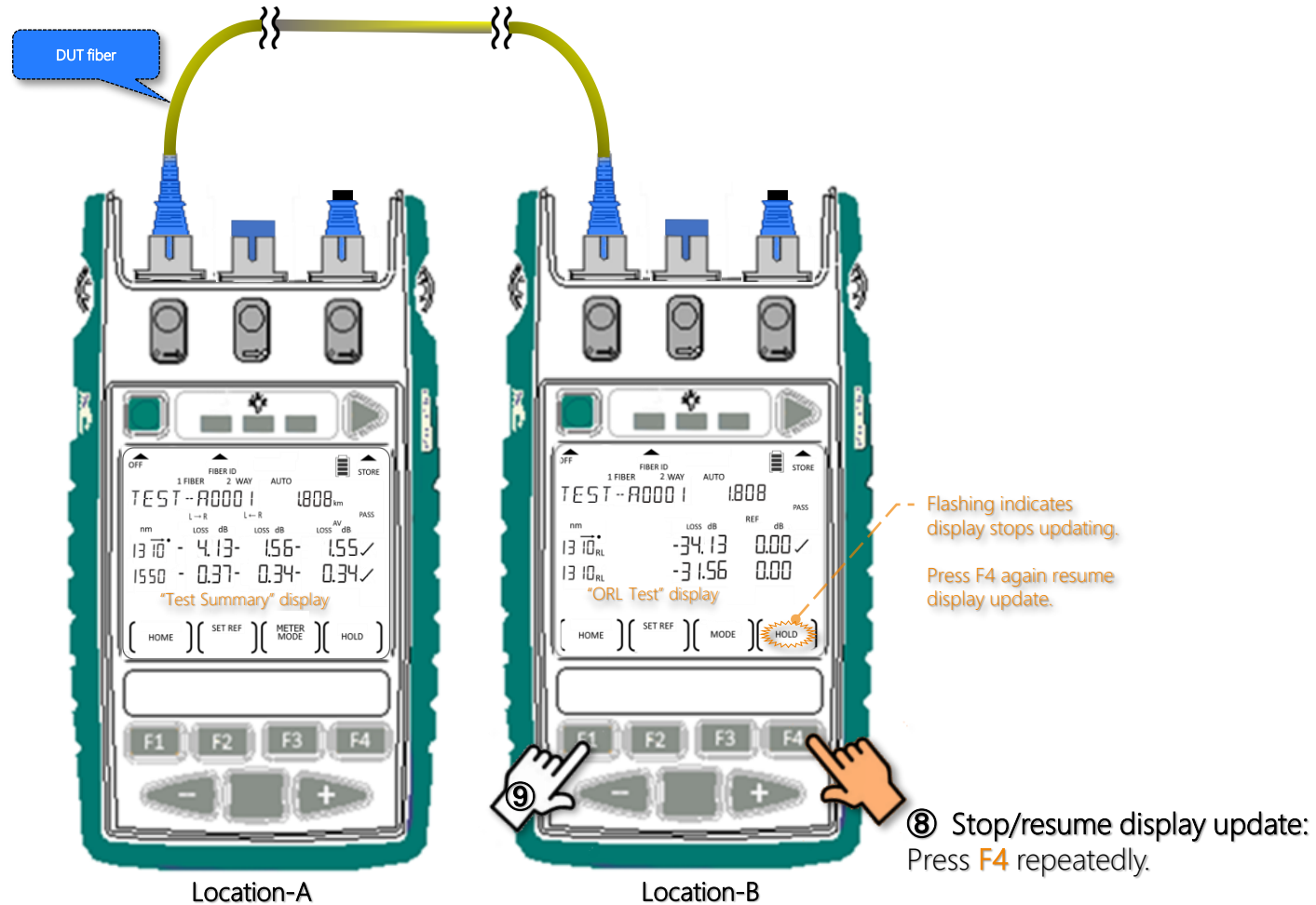
Instrument Operation

➡ 1-way Autotest operation

Performs 1-direction loss. Work with a single instrument or a pair of instruments.

Single Instrument

① Connect ports on the same instrument with a reference patch-lead as shown below.

Reference patch-lead

Meter port

SM 2-way port

MM 2-way port

Home display

Continue next page

② Start Autotest: press F4.
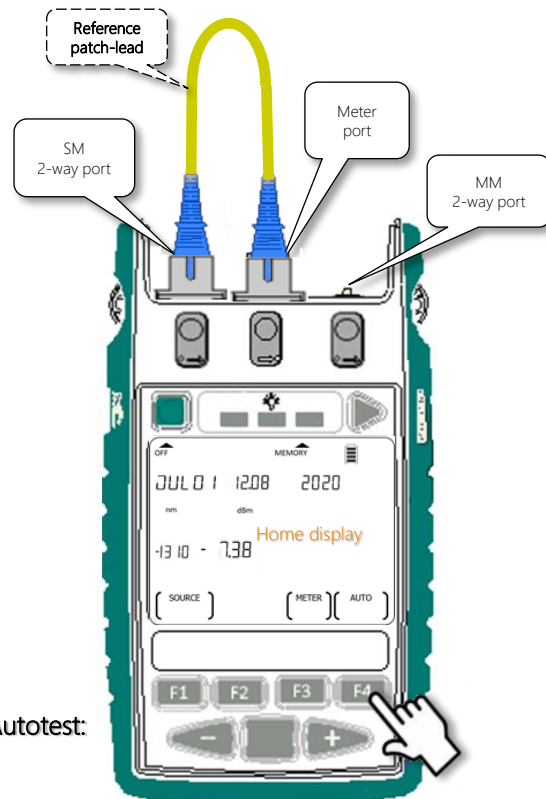
A pair of Instruments

① Connect ports of the 2 instruments with a reference patch-lead as shown below.
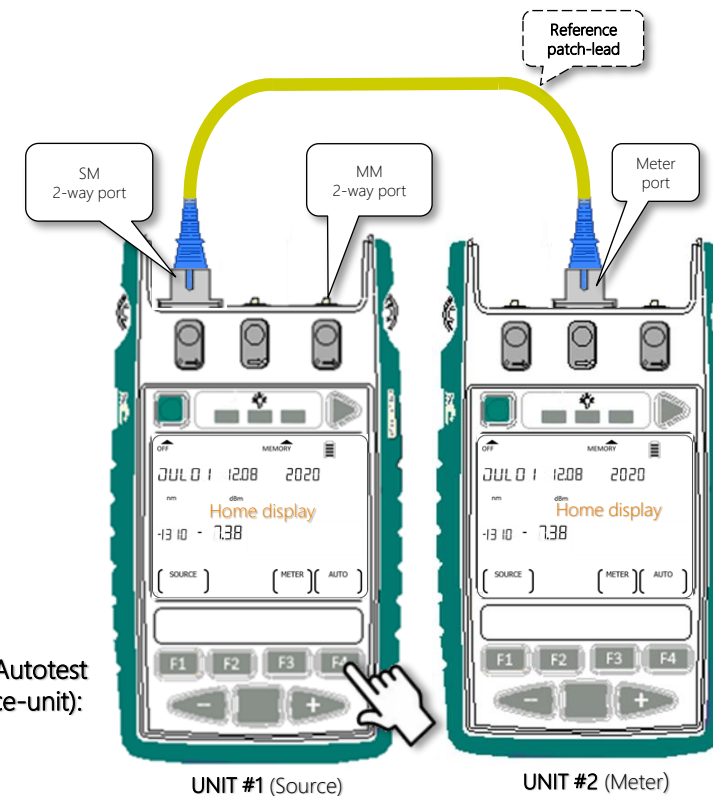
Reference patch-lead

SM 2-way port

MM 2-way port

Meter port

Home display

Home display

Continue next page

② Start Autotest (on Source-unit): press F4.

UNIT #1 (Source)

UNIT #2 (Meter)

KINGFISHER INTERNATIONAL

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

Reference patch-lead

Arrow indicating data row which is being updated.

Indicating 1-way Autotest mode

Flashing "AUTO" indicating unit operating in Autotest mode

Test data and results,
- for all the wavelengths received from source are displayed here.
- for each wavelength are shown in a row.
- for 3 wavelengths can be shown simultaneously at a time. If more than 3 wavelengths, screen will scrow and cycle to show all.

Continue next page

③ **Set reference:** Press F2 on meter-unit until beeping stops.

A pair of Instruments

Reference patch-lead

Cycle to display all active wavelengths

Continue next page

③ **Set reference:** Press F2 on meter-unit until beeping stops.

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

Reference patch-lead

④ Reconnect ports with DUT fiber cable.

When "SET REF" & "bUSY" stop blinking:

➢ Stored reference value is displayed here.

➢ Loss value is zeroed momentarily.

Continue next page

A pair of Instruments

Reference patch-lead

④ Reconnect ports with DUT fiber cable.

Continue next page

KINGFISHER
INTERNATIONAL

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

DUT fiber

Absolute power (dBm)

Loss in dB

Overall test result:
"PASS": if test results for all wavelengths are "✓" or marginal (blinking "X".)
"FAIL": if test result of 1 or more wavelength fails.

Reference power in dBm

Symbol signifying loss pass/fail against the set thresholds (refer Pass/fail Threshold Setting section) for each wavelength:

- "✓" : Pass/fail check is disabled (threshold value is set as "0").
  or
- "✓" (pass): loss value (magnitude) smaller than or equals to PASS threshold.

- Flashing "X" (marginal): loss value (magnitude) greater then PASS threshold but smaller than or equals to MARGINAL threshold.

- "X" (fail): loss value (magnitude) greater than MARGINAL threshold.

⑤ Display absolute power in watt: Press F3 on meter-unit.

> Continue next page

A pair of Instruments

DUT fiber

> Continue next page

⑤ Display absolute power in watt: Press F3 on meter-unit.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

A pair of Instruments

DUT fiber

DUT fiber

Absolute power in Watt

> Continue
> next page

⑥ Return display to show absolute power in dBm & loss in dB: Press F3 again.

> Continue
> next page

⑥ Return display to show absolute power in dBm & loss in dB: Press F3 again.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

A pair of Instruments

Continue next page

Continue next page

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

A pair of Instruments

DUT fiber

Source nominal power

DUT fiber

Continue
next page

Continue
next page

⑦ Display Source's
nominal power: Hold
down Toggle Centre.

⑦ Display Source's
nominal power: Hold
down Toggle Centre.

Instrument Operation
➡ 1-way Autotest operation (continue)

Single Instrument

DUT fiber

Flashing "HOLD" indicates update has stopped.

⑧ Stop / resume display update: Press **F4** repeatedly.

⑨ Stop Autotest: Press **F1**.

Note:
After the next fiber is connected during DUT change-over (without stopping Autotest), allow approx. 10 seconds for the instruments' displays to be updated with data for that newly connected fiber.

A pair of Instruments

DUT fiber

⑨ Stop Autotest: Press F1 on Source-unit or disconnect the fiber for more than 8 seconds.

⑧ Stop / resume display update: Press F4 repeatedly.

Return to TOC

28

KINGFISHER INTERNATIONAL
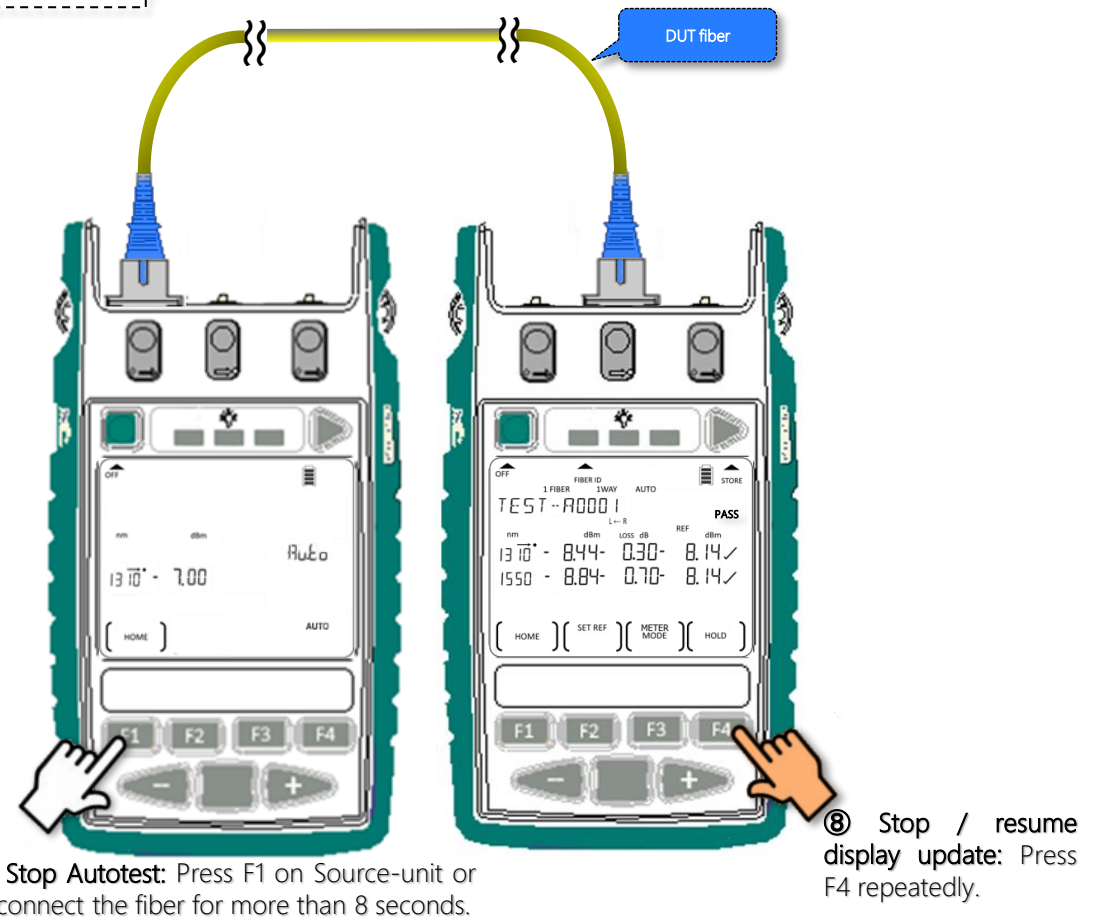
Instrument Operation
➨ Restricted wavelength Autotest operation

There are two different ways (Method 1 & Method 2) to restrict the number of active λ in an Autotest.

Method 1 (only applicable to instrument with 2-way ports) :

a. To start λ-restricted Autotest: for SM port only
(e.g., 1310-1550 nm on a Quad instrument):
At Home display, press '-'and F4 simultaneously.
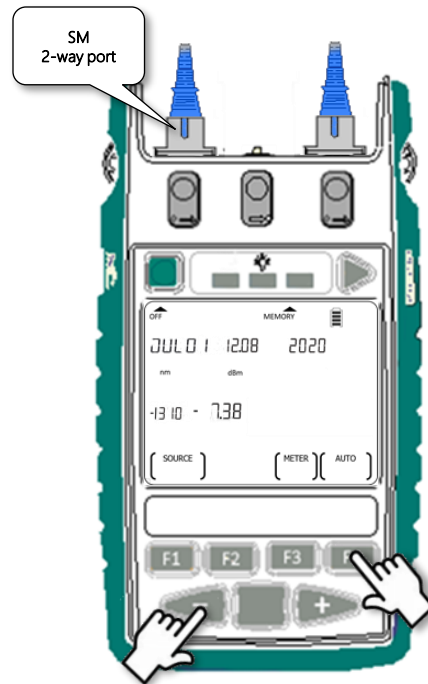
b. To start λ-restricted Autotest: for MM port only
(e.g., 850-1300 nm on a Quad-instrument) :
At Home display, press '+' and F4 simultaneously.

SM
2-way port

MM,
2-way port
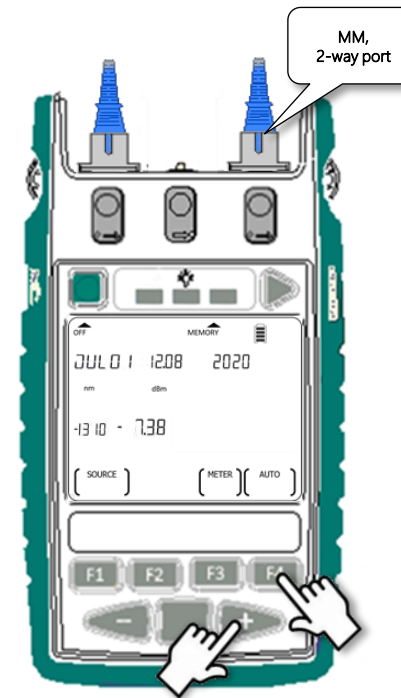
Instrument Operation
➡ Restricted-wavelength Autotest operation (continue)

Method 2:

① Excluding (deactivating) wavelength for Autotest:

❶ At Source mode, select the wavelength to be included from Autotest e.g., 1550 nm: press '+'or '-".

❷ View status of selected wavelength: hold down F4.
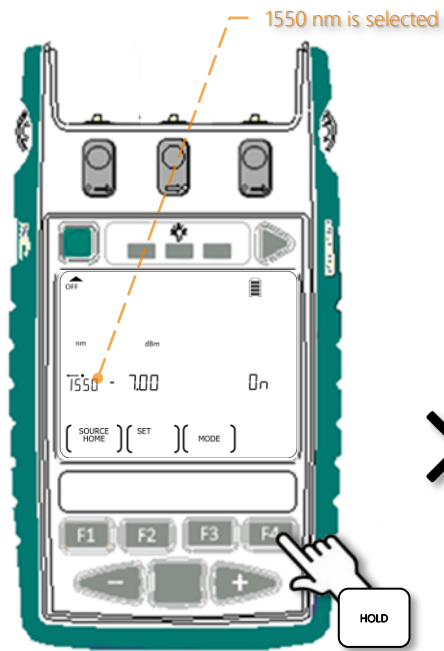
❸ "Deactivate" the selected wavelength: continue to hold down F4 then press Toggle Centre.

❹ Release F4.

1550 nm is selected

"in" indicating 1550 nm is currently activated (included for Autotest).

"Out" indicating 1550 nm is "deactivated" (excluded for Autotest).
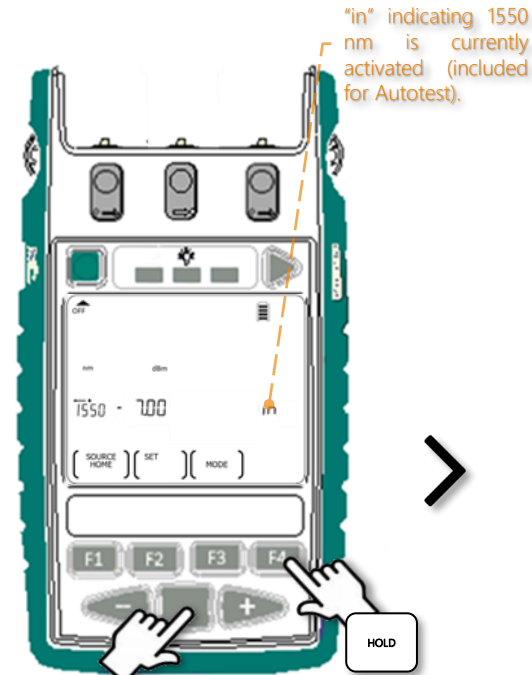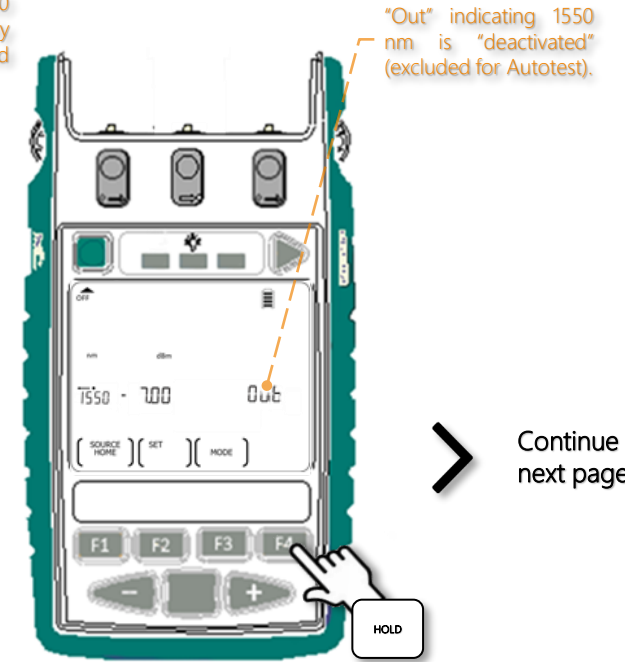
UNIT #1

UNIT #1

UNIT #1

UNIT #1

Continue next page

Return to TOC

Instrument Operation

➥ Restricted-wavelength Autotest operation (continue)

Method 2 (continue):

② Start restricted-λ Autotest (with the selected wavelength excluded)

❺ Exit Source mode: press F1
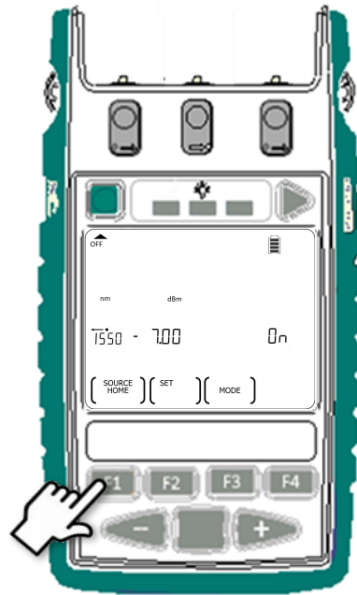
❻ Start restricted-wavelength Autotest: press Toggle Centre and F4 simultaneously, *on the unit which wavelength deactivation was performed*.
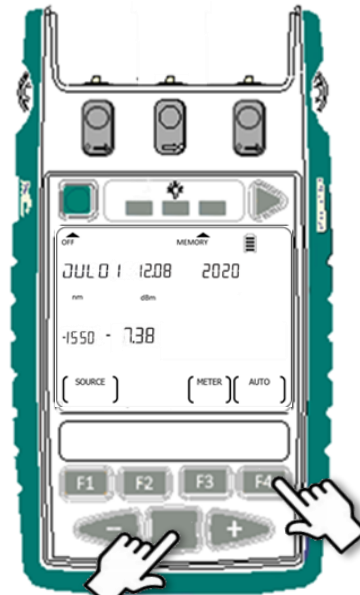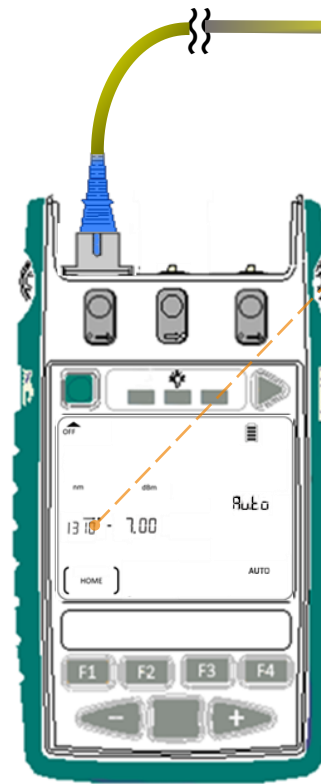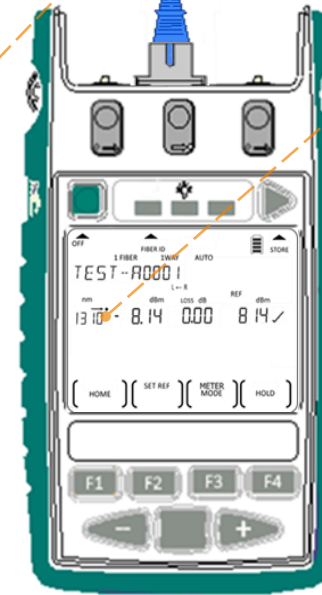
E.g., If the Source-instrument is a 2 wavelengths models with 1310-1550 nm sources, only "1310" displays here indicating that Autotest is running in restricted mode with only 1310 nm.

E.g., In a 1-way Autotest operation, only test data and result for 1310 nm will be displayed. on Meter-instrument.

UNIT #1   UNIT #1   UNIT #1   UNIT #2

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation

➡ Autotest user-to-user communication operation

Apply to 2-way Autotest only.

① *Near-end unit to signal Far-end unit during 2-way Autotest:*

Press F4

"HOLD" flashing & display update stops.

Unit beeps once and, "HOLD" flashing & display update stops.

Near-end Instrument

Far-end Instrument

Near-end Instrument
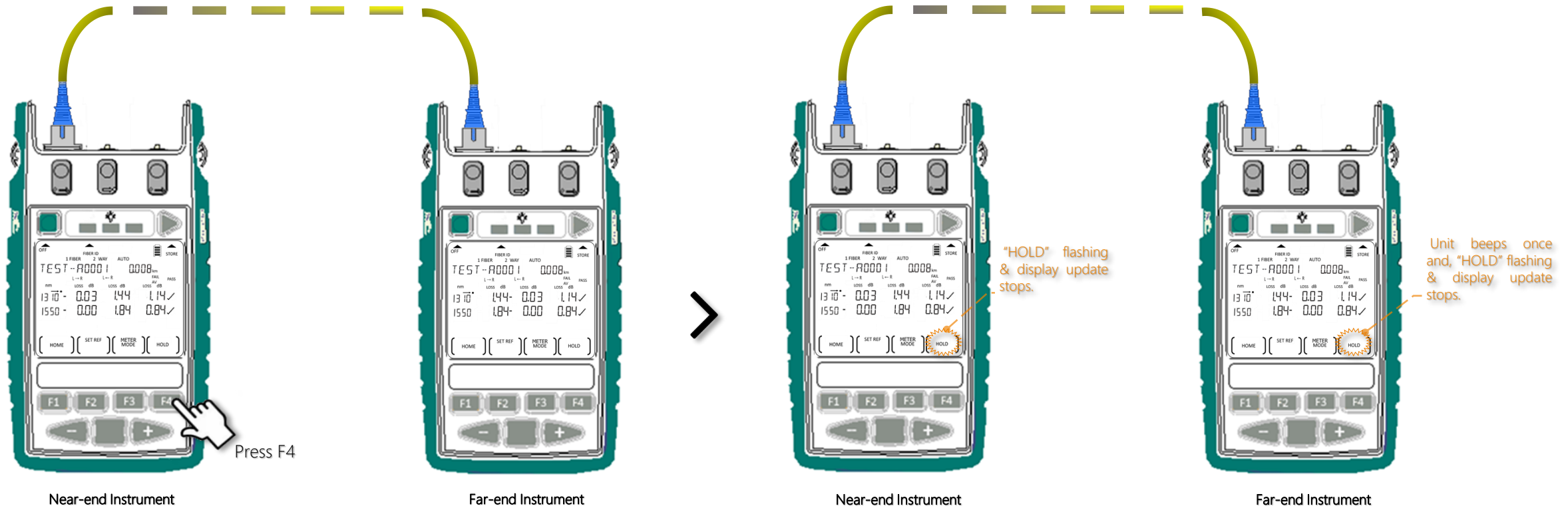
Far-end Instrument

Instrument Operation

➡ Autotest user-to-user communication operation (continue)

② *Far-end unit to respond to Near-end unit during 2-way Autotest :*

Press F4

Unit beeps once and, "HOLD" stops flashing & display update resume.

"HOLD" stops flashing & display update resumes.

Near-end Instrument   Far-end Instrument   Near-end Instrument   Far-end Instrument
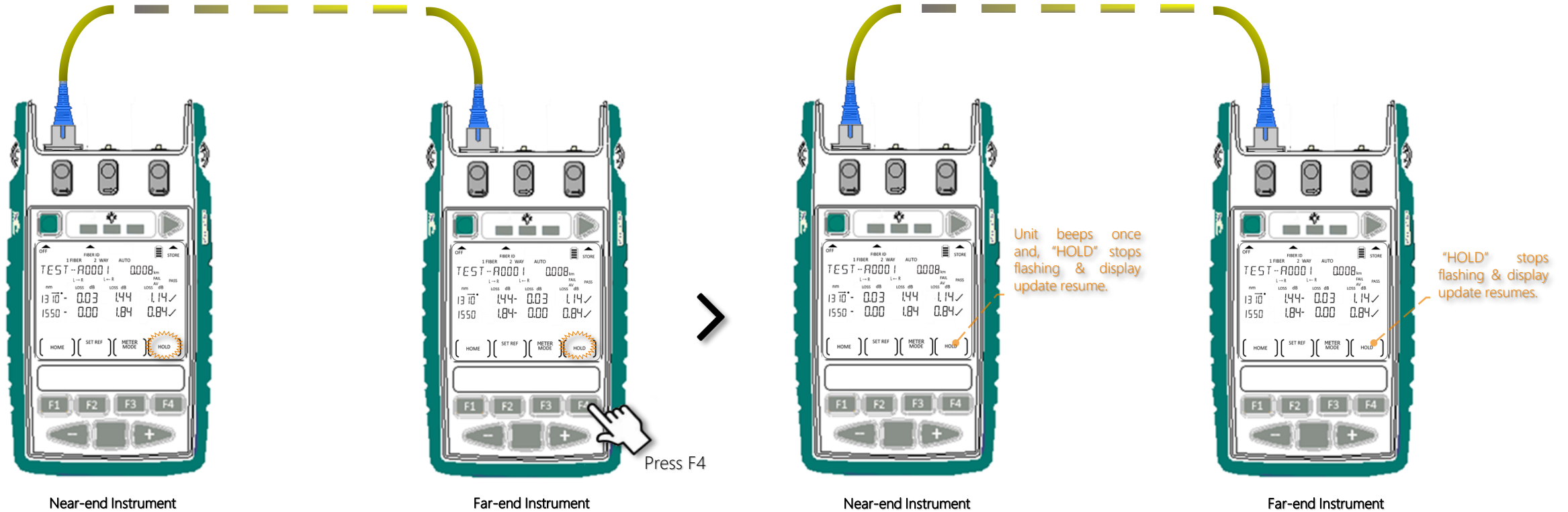
Instrument Operation
➡ Light source manual operation

Enter Source mode:

At Main menu (Home display), press F1.

CW mode
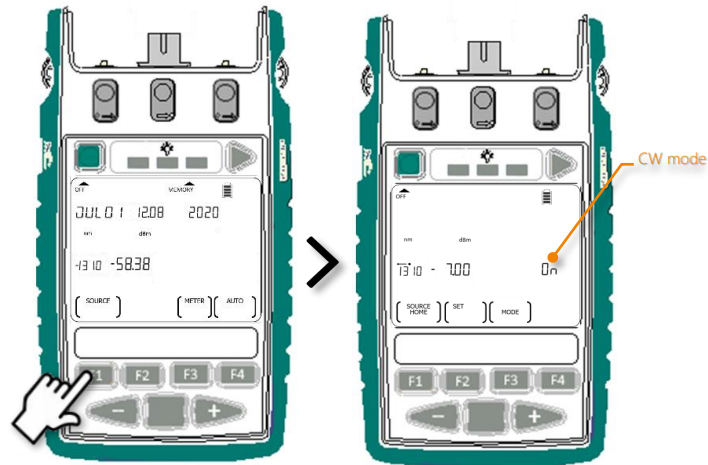
Available functions:

a. Select wavelength or on/off output

b. Adjust output power of selected wavelength

c. Select between CW (Continuous Wave) or Tone (modulation) output mode

d. Exit Source mode

a. Select wavelength or on/off output:

❶ Press '+' or '-' to cycle through & select an operating wavelength or, turn the output on/off off .

❷ Press Toggle Centre will turn output on or off.

Return to TOC
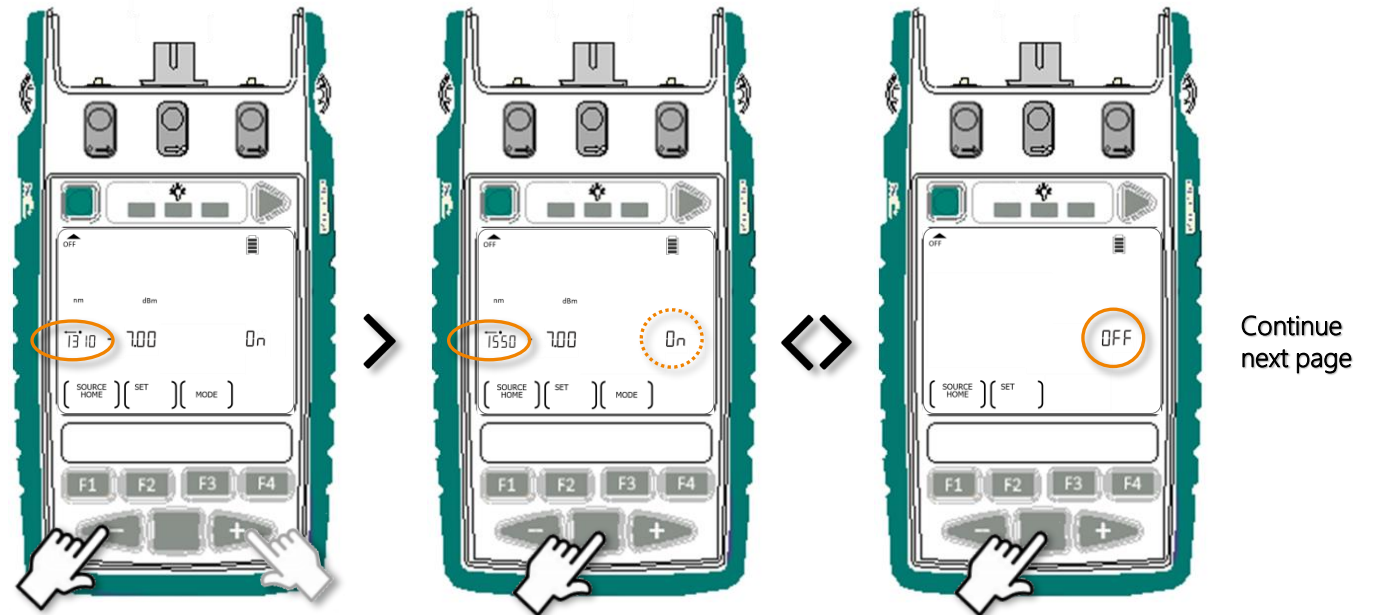
Instrument Operation

➡ Light source manual operation (continue)

b. Adjust output power of the selected wavelength:
- for laser source only
- output power can be adjusted in 0.01 dB steps for 7 dB.

❶ **To adjust power level:** hold down F2, then press '+' or '-'.

Holding down '+' or '-' to speed up incremental or decremental of power levels.
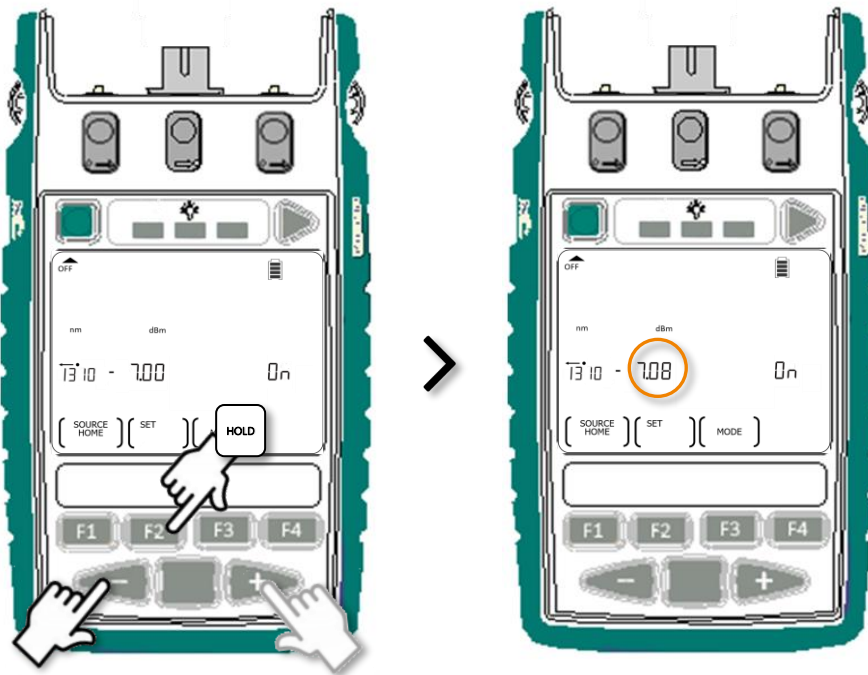
❷ **To toggle to max and min power levels:** hold down F2 then, press Toggle Centre repeatedly.

Continue next page

Return to TOC
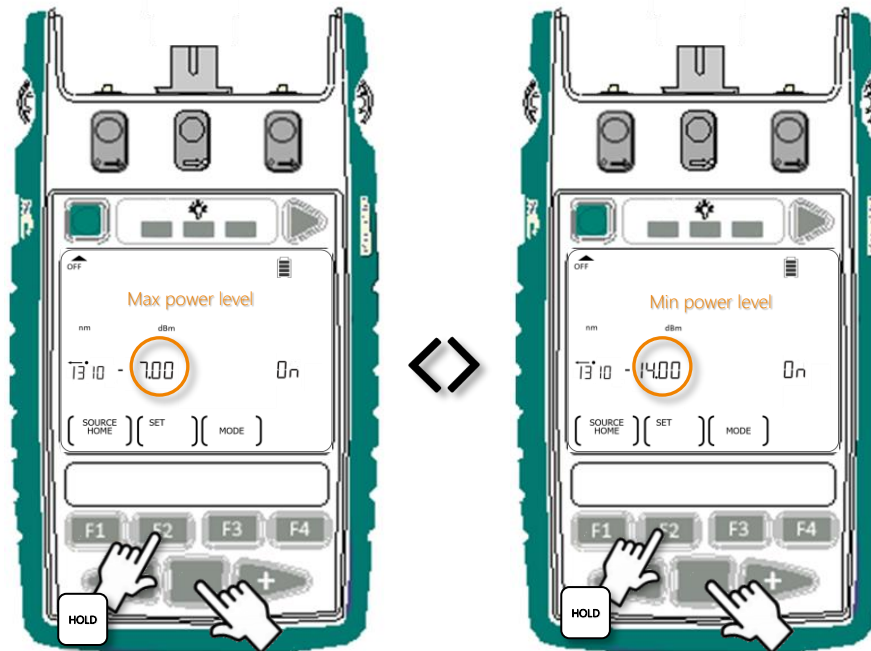
Instrument Operation

➡ **Light source manual operation (continue)**

C. Select between CW (Continuous Wave) or Tone (modulation) output mode:

Available test tones/id tones selectable in this sequence: *On (CW),* 270 Hz, 1000 Hz, 2000 Hz, id1 (300 Hz), id2 (400 Hz), id3 (500 Hz), id4 (600 Hz), id5 (700 Hz), id6 (800 Hz), id7 (900 Hz), id8 (1100 Hz), id9 (1200 Hz), id10 (1300 Hz), id11 (1400 Hz), id12 (1500 Hz).

✔ To start test/Id tone mode:
At CW output mode, press F3 repeatedly to scroll through & select one from the available test/id tones.

Alternatively, hold down F3 and then press '+' or '−'.

✔ To end tone (modulation) output mode:
Hold down F3 for 3 seconds.

Alternatively, hold down F3 then, press Toggle Centre.

Continue next page
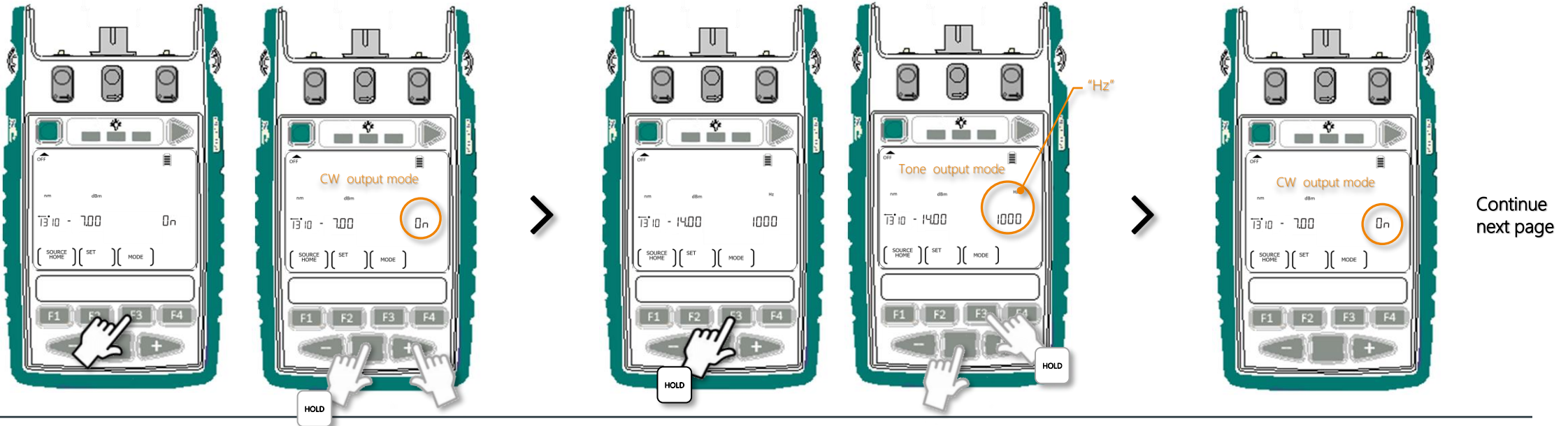
Instrument Operation

➥ Light source manual operation (continue)

d. Exit Source mode:

Press F1 to exit Source mode & return to Home display (Main menu).
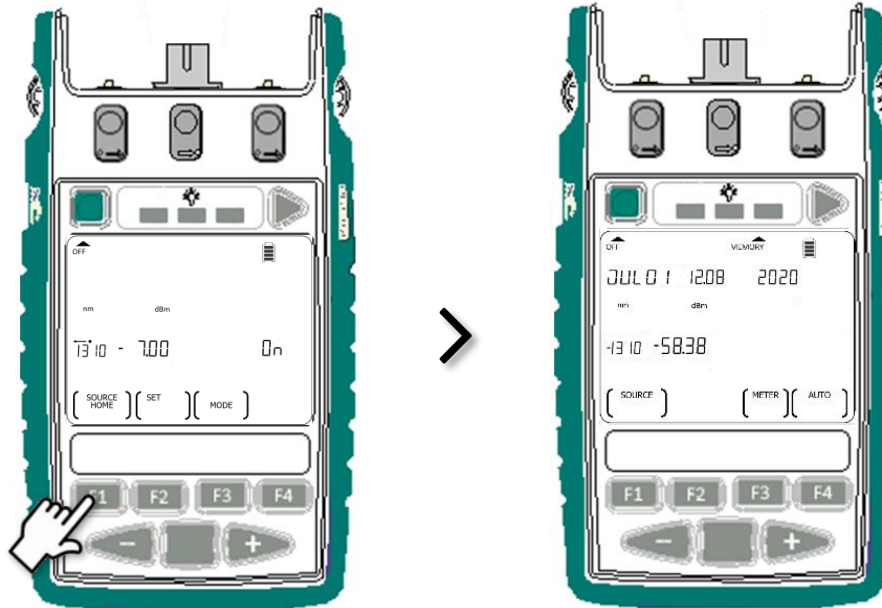
Note:
The output remains 'on' at the mode (i.e. CW mode in this example) before F1 was pressed.

To ensure that output is off after exiting Source mode, turn off output as per the instructions on slide 18, before F1 is pressed.

Instrument Operation

➡ Power meter manual operation

Measure power with a single instrument or a pair of instruments

---

Single Instrument

① Connect ports on the same instrument with a reference patch-lead &,
select Source to output at CW mode at a wavelength (refer to Light Source Manual Operation section.)

Reference patch-lead

Meter port

SM 2-way port

MM 2-way port

Reference patch-lead

E.g. 1550 nm is selected for output.

Source mode display

nm   dBm

1550 - 7.00   On

SOURCE HOME   SET   MODE

② Exit Source: *mode:* press F1.

F1 F2 F3 F4

OFF   MEMORY

JUL 01 12.08   2020

nm   dBm

-13 10 - 7.38 Home display

SOURCE   METER AUTO

③ Enter Meter mode: press F3.

F1 F2 F3 F4

> Continue next page
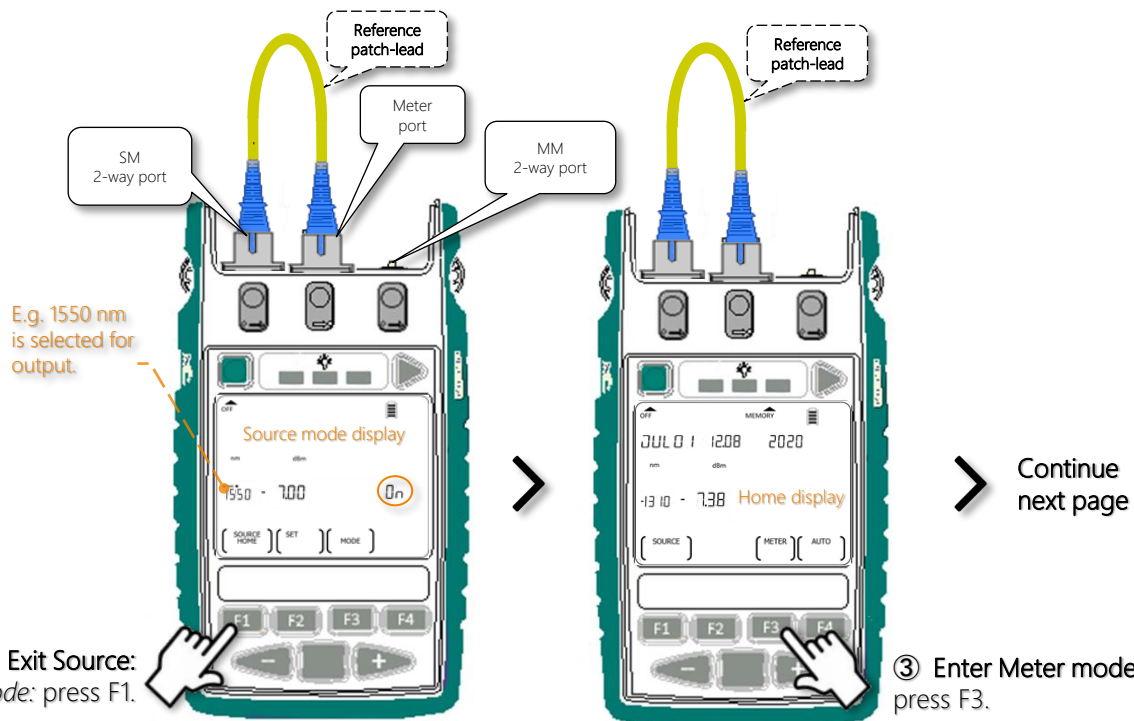
A pair of Instruments

① Connect ports of 2 instruments &,
select source-instrument to output at CW mode at a wavelength (refer to Light Source Manual Operation section.)

Reference patch-lead

SM 2-way port

MM 2-way port

Meter port

Source mode display

nm   dBm

1550 - 7.00   On

SOURCE HOME   SET   MODE

F1 F2 F3 F4

UNIT #1 (Source)

OFF   MEMORY

JUL 01 12.08   2020

nm   dBm

-13 10 - 7.38 Home display

SOURCE   METER AUTO

F1 F2 F3 F4

UNIT #2 (Meter)

② **Enter Meter mode:** Press F3

> Continue next page

KINGFISHER INTERNATIONAL

Instrument Operation
➡ **Power meter manual operation (continue)**

Single Instrument

A pair of Instruments

Reference patch-lead

Reference patch-lead

Wavelength (nm)
Absolute power (dBm)
Loss (dB)
Reference power (dB)

Text ID Tag (refer to Test ID Tag Operation Slides (61~66).

Meter mode display

> Continue next page

> Continue next page

④ Select the matching λ of source: press '+' or '-'.

③ Select λ (same as that on source): press '+' or '-'.

UNIT #1 (Source)   UNIT #2 (Meter)

KINGFISHER INTERNATIONAL

Instrument Operation

➡ Power meter manual operation (continue)

Single Instrument

Reference patch-lead

E.g.: Wavelength 1550 nm is selected to math that of the Source.

> Continue next page

⑤ Set reference: press and hold F2 until beeping stops.

A pair of Instruments

Reference patch-lead

> Continue next page

④ Set reference: press and hold F2 until beeping stops.

UNIT #1 (Source)   UNIT #2 (Meter)

Return to TOC

Instrument Operation

➡ **Power meter manual operation (continue)**

<u>Single Instrument</u>

<u>A pair of Instruments</u>

Reference patch-lead

Loss value is zeroed.

Stored reference value displayed here.

⑥ Display absolute power in watt: press F3.

> Continue next page

Reference patch-lead

⑤ Display absolute power in watt: press F3.

> Continue next page

UNIT #1 (Source)   UNIT #2 (Meter)

Return to TOC

Instrument Operation

➡ Power meter manual operation (continue)

Single Instrument

DUT fiber

Absolute power (dBm).

Absolute power (Watt).

> Continue next page

⑦ Display min and max absolute power values in watt: press '+' & '−' simultaneously.

A pair of Instruments

DUT fiber

> Continue next page

⑥ Display min and max absolute power values in watt: press '+' & '−' simultaneously.

UNIT #1 (Source)   UNIT #2 (Meter)

Return to TOC

Instrument Operation

➡ Power meter manual operation (continue)

Single Instrument

DUT fiberd

Max absolute power in dBm & watt respectively

Min absolute power in dBm & watt respectively

Continue next page

⑧ Display min and max absolute power & loss values in dBm & dB: press F3.

A pair of Instruments

DUT fiber

Continue next page

⑦ Display min and max absolute power & loss values in dBm & dB: press F3.

UNIT #1 (Source)   UNIT #2 (Meter)

Instrument Operation
➡ **Power meter manual operation (continue)**

Single Instrument

DUT fiber

Max absolute power in dBm & watt respectively

Min absolute power in dBm & watt respectively

Continue next page

⑨ To exit max/min values display:
Press '+' & '−' simultaneously again.

A pair of Instruments
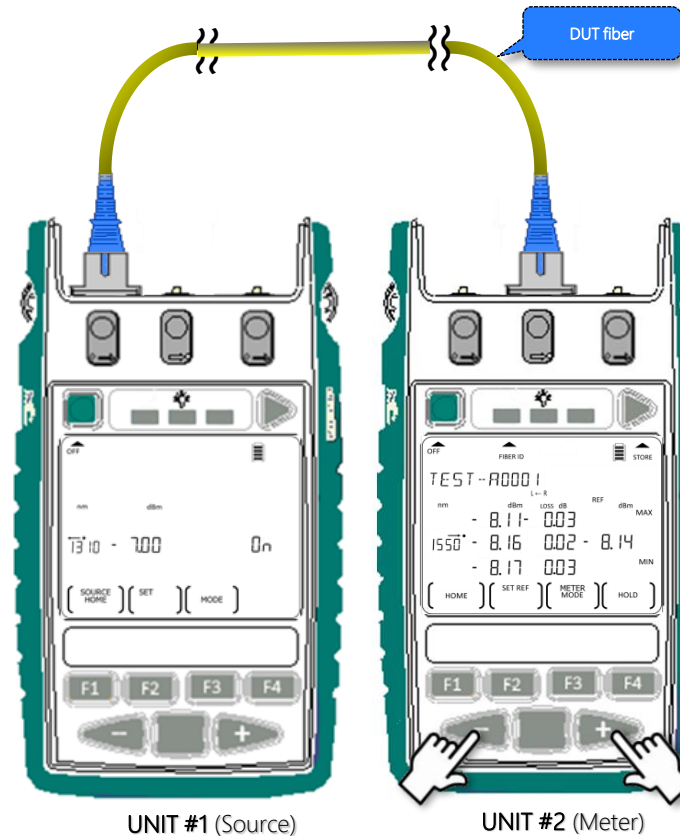
DUT fiber

Continue next page

⑧ To exit max/min values display:
Press '+' & '−' simultaneously again.

UNIT #1 (Source)   UNIT #2 (Meter)

KINGFISHER INTERNATIONAL

Instrument Operation

➡ **Power meter manual operation (continue)**

Single Instrument

DUT patch-lead

TEST–A0001

1550 – 8.14 0.00 – 8.14

> Continue
> next page

⑩ To stop / resume
display update:
press F4 repeatedly.

A pair of Instruments

DUT patch-lead

1310 – 7.00   0n

TEST–A0001

1550 – 8.14 0.00 – 8.14
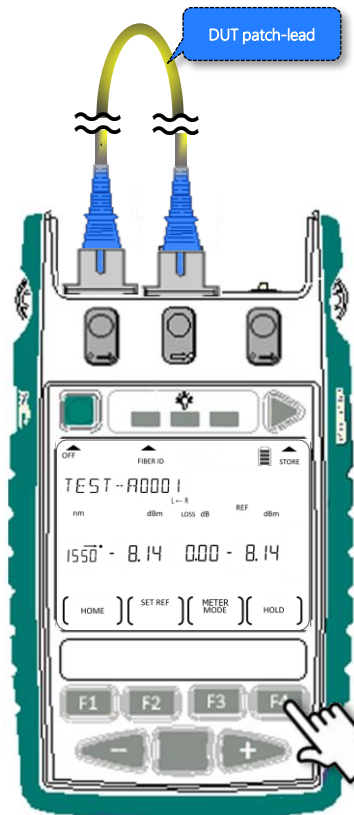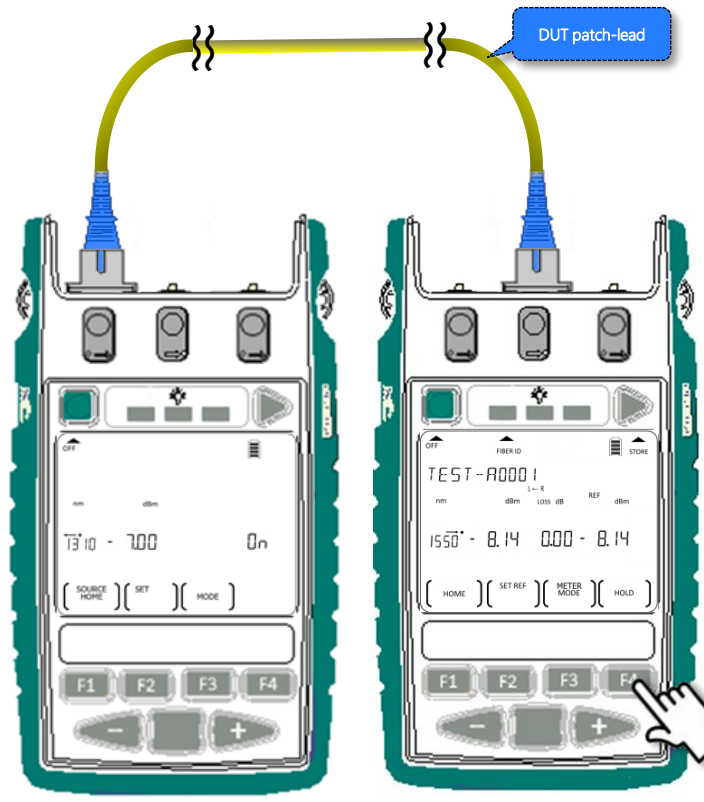
> Continue
> next page

⑨ To stop / start
display update:
press F4.

UNIT #1 (Source)   UNIT #2 (Meter)

Instrument Operation

➡ Power meter manual operation (continue)

Single Instrument

DUT fiber
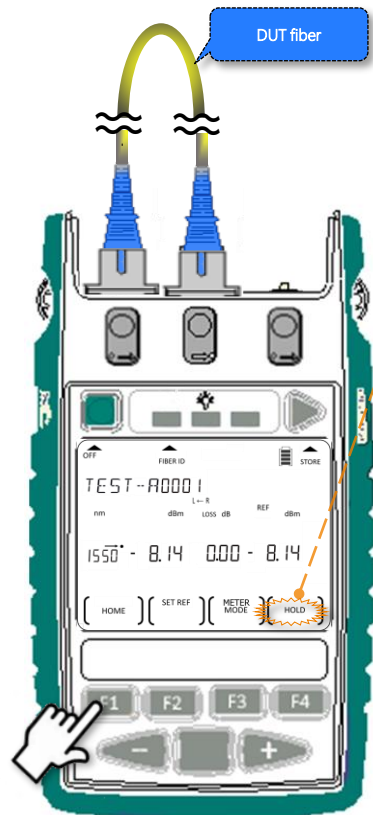
" HOLD" flashes indicating display update stops.

To resume display update, press F4 again.

⑪ To exit Meter mode: *Press* F1 (LCD will return to Home display).

A pair of Instruments

DUT fiber

⑩ To exit Meter mode: *Press* F1 (LCD will return to Home display).

UNIT #1 (Source)   UNIT #2 (Meter)

Instrument Operation
➡ ORL Meter (optional) manual operation

① Enter ORL measurement mode:
At Home Display , press F2
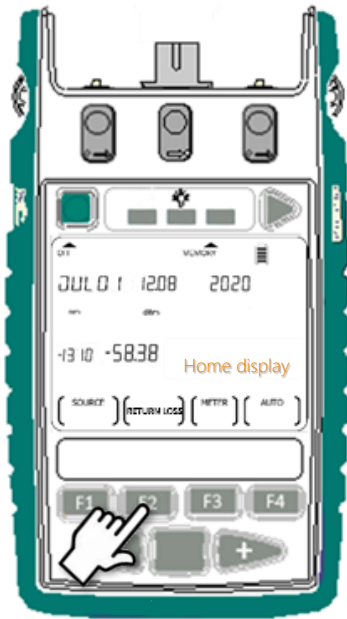
② Connect DUT onto the appropriate 2-way port
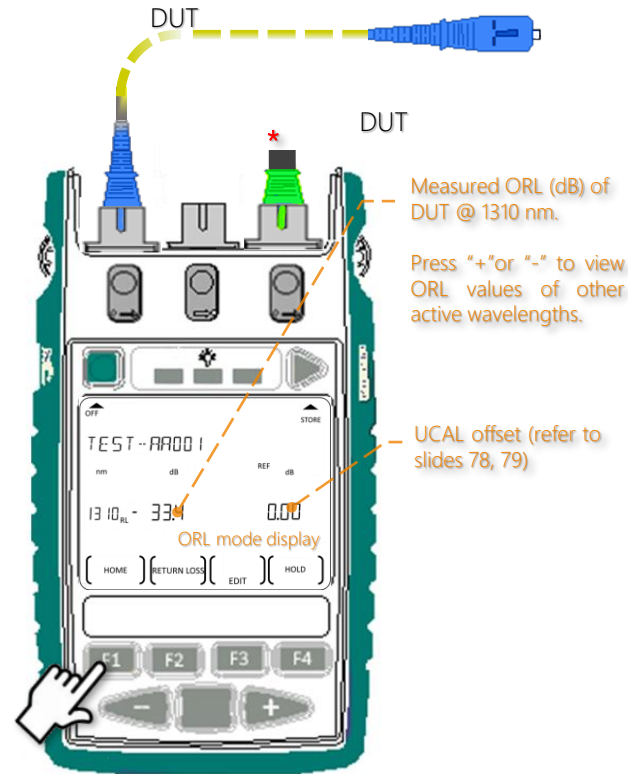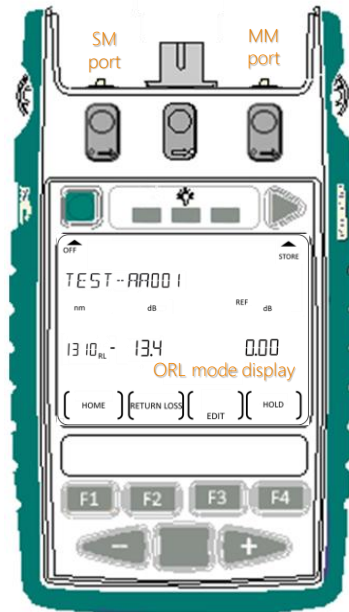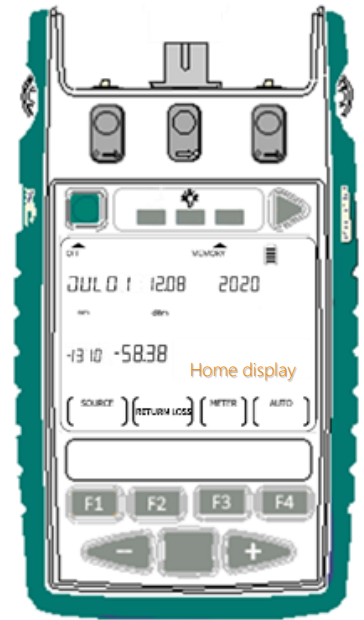
DUT

DUT

*

Measured ORL (dB) of DUT @ 1310 nm.

Press "+"or "-" to view ORL values of other active wavelengths.

SM port

MM port

UCAL offset (refer to slides 78, 79)

Home display

ORL mode display

ORL mode display

Home display

③ Exit ORL measurement mode:
Press F1 to return to Home Display.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation
➥ Tone detection operation

Tone detection starts automatically when,

- Instrument's Meter port is connected to Source port of the same or a different instrument.

    &

- The output of the Source port is a standard test tone or Id tone.

    &

- Instrument is at Home display (Main menu) or in Meter mode.

This feature is useful for quick continuity/polarity checking of fibers.

Single Instrument

Upon detecting a tone:

- the frequency and/or Id is displayed here.

- Instrument beeps to signify continuity.

Loopback

nm   dBm

T3'10 - 14.00   Id01

SOURCE HOME   SET   MODE

A pair of Instruments

Test or Id tone from another instrument
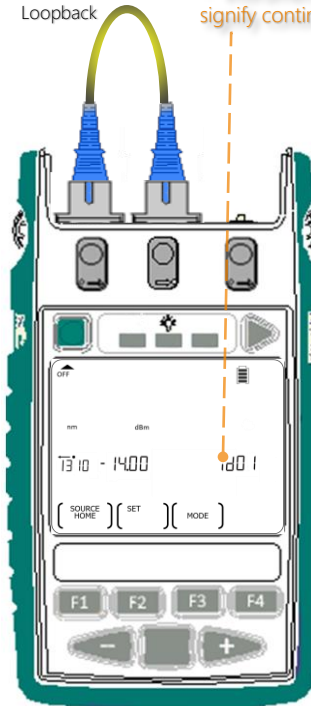
Upon detecting a tone:

- for standard test/Id tone: the frequency and/or Id is displayed here.

- for non-standard tone: the actual measured frequency in Hz is displayed here (150 ~ 9999 Hz.)

- Instrument beeps to signify continuity.

L ← R   Hz

Id01   300
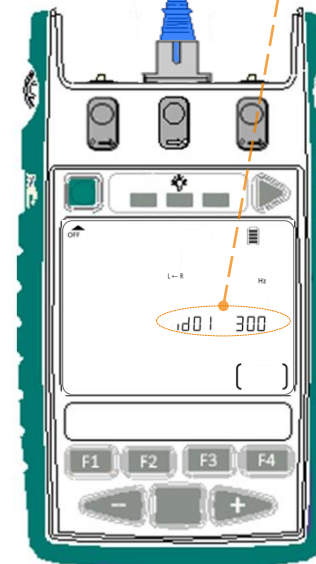
To stop tone detection:
- Turn off Test/Id Tone mode of the Source (refer to Slide 36).

    or

- Turn on Slow Mode (refer to next slide).

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation
➡ Slow Mode operation

In Slow Mode:
- Beeping stops.
- Display show average optical power of the modulated signal, using a long average.

Test or Id tone from source port of the same (loopback) or another instrument.

For single-unit operation (loopback):
When in Tone Detection mode, press F1 to go to this display.

Flashing symbol indicating Slow Mode is activated.

Selected wavelength,. Press + or – to select other active wavelengths.

The average power (dBm) of detected tone.

Press F3 to change to display tone power in nW.
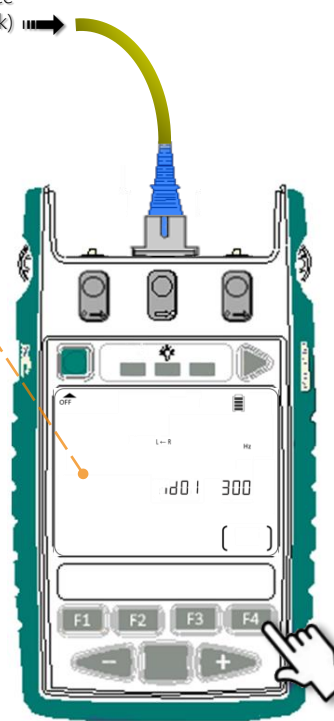
① **Enter Slow Mode:**
press F4 to go into Slow Mode.
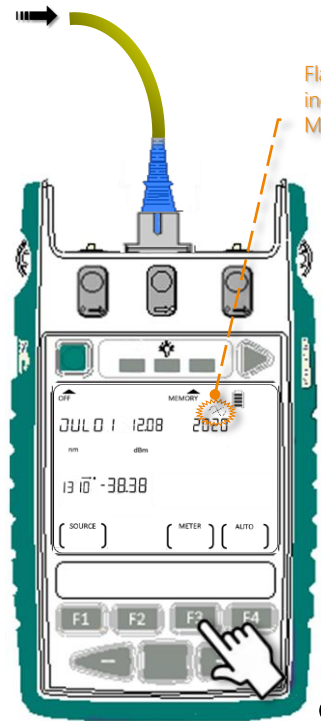
② **To enter Meter menu:**
Press F3
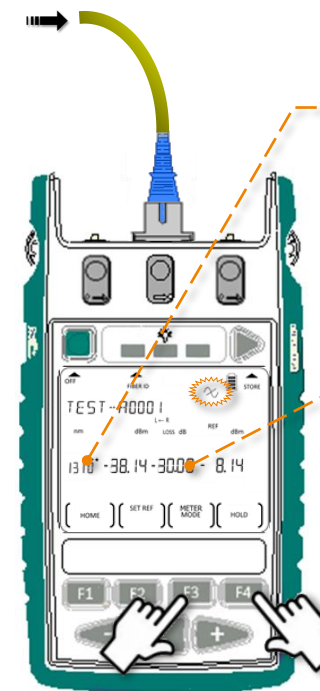
③ **To exit Slow Mode:**
Press F3 and F4 simultaneously to return to Tone Detection mode.

KINGFISHER INTERNATIONAL

Instrument Operation

➡ **Memory operation**
   ➡ **Store data into internal memory**

When instrument is operating in Meter or Autotest mode, press triangular button above "STORE" to save current measurement data in internal memory.
Note:
When data is being stored, the displays shows "bUSY" and will not respond to any keypress.
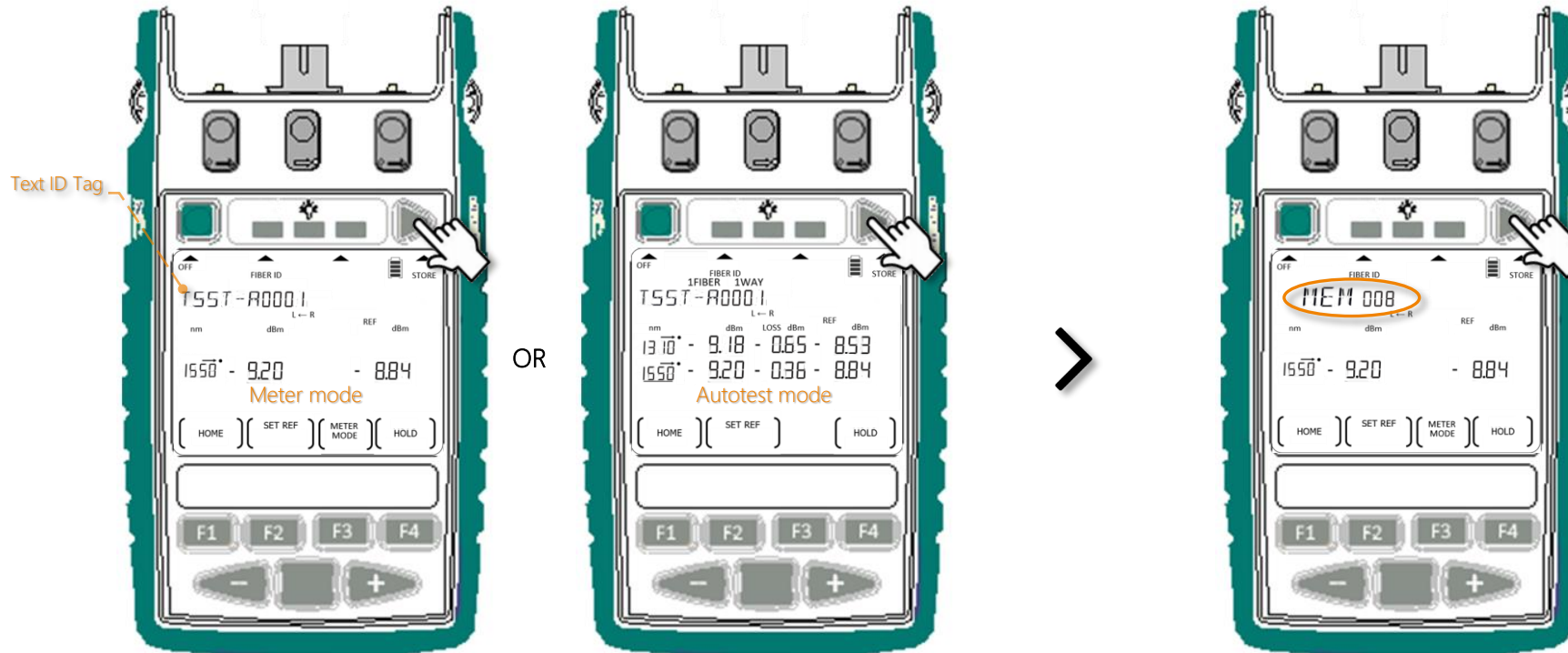
E.g., Data in Meter mode is saved along with the Text ID Tag, "TSST-A0001" in memory location '8'.

The memory location-pointer and the Text ID Tag are incremented after each save operation. In this example, the next data will be saved along with Text ID Tag "TSST-A0002" in location '9' .

Internal memory capacity:
8,000 fibers for one-way loss tests
4,000 fibers for two-way loss tests

Text ID Tag

Meter mode

Autotest mode

OR

Once button is released, display will return to the last operation mode.

Return to TOC

Instrument Operation

➥ **Memory operation**

➥ **Recall stored data from internal memory**

At Home display (Main menu), press button above "MEMORY" to enter Memory mode.
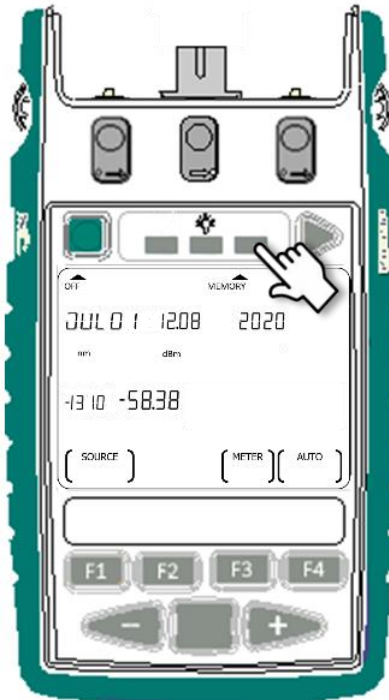
The content of the last memory location stored with data will be recalled and displayed i.e., location '6' in this example.

Press **–** or **+** to select the memory location to display data. Location '1' has been selected in this example.

Alternately displaying memory location & the Text ID Tag (if any) associated with the data.
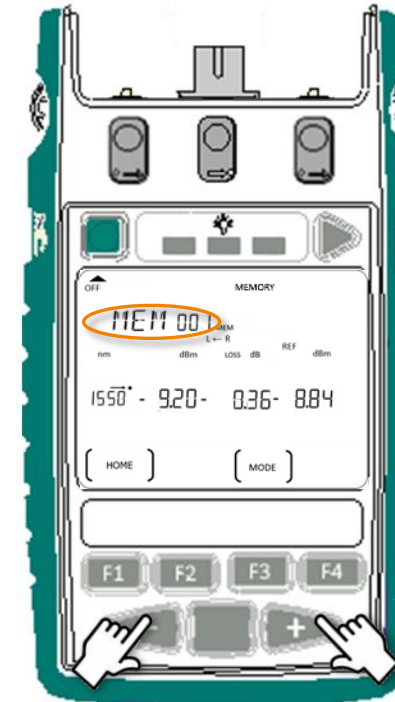
Continue next page for viewing options for *data saved in Meter mode.*

Instrument Operation

➥ Memory operation

➥ Recall stored data from internal memory (continue)

Viewing options for data saved in Meter mode:

Press F3 to toggle display to show absolute power in watt only or, in both dBm and watt.
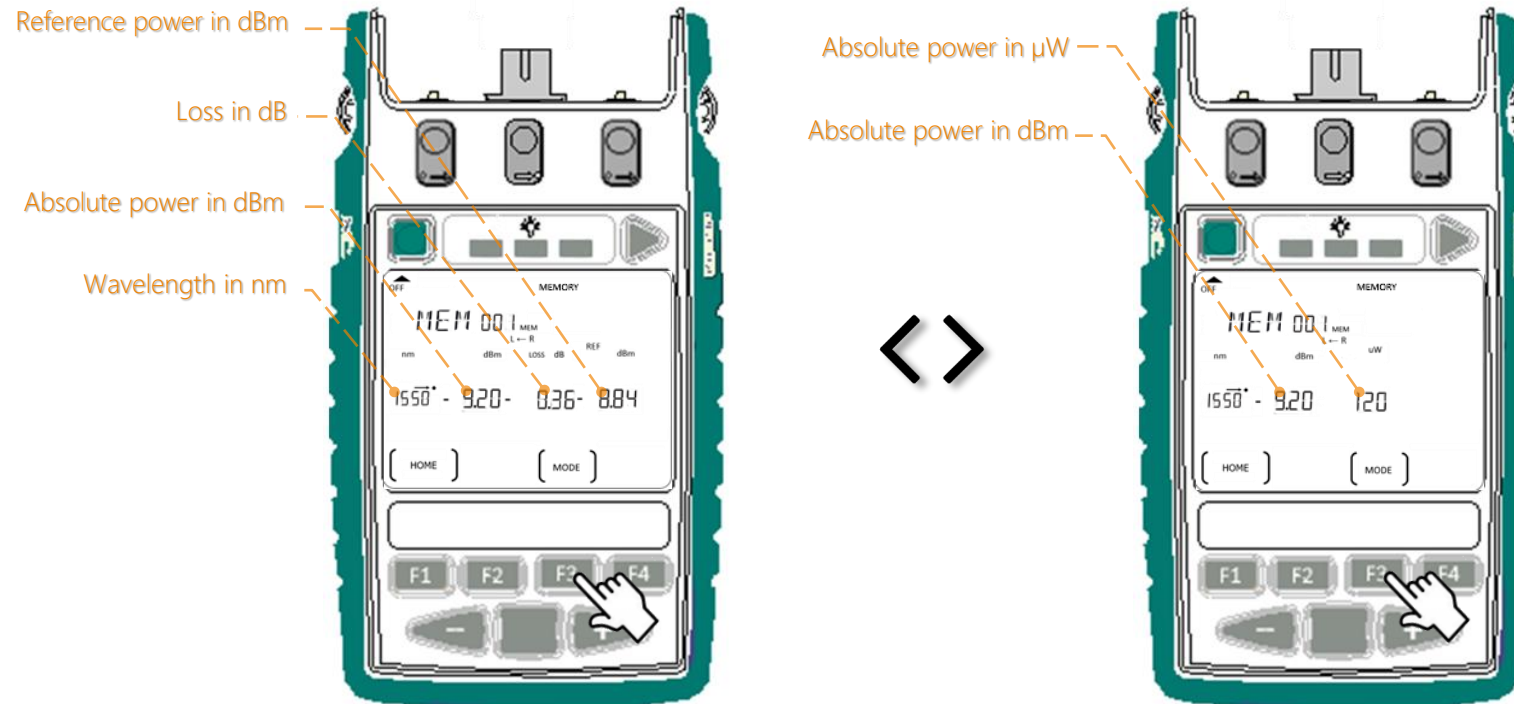
Reference power in dBm

Loss in dB

Absolute power in dBm

Wavelength in nm

Absolute power in µW

Absolute power in dBm

⟨⟩

Continue next page for viewing options for *data saved in 1-way Autotest mode.*

Instrument Operation

➡ Memory operation

 ➡ Recall stored data from internal memory (continue)

Viewing options for data saved in 1-way Autotest mode:

Press F3 to toggle display to show absolute power in watt only or, in both dBm and watt.

Absolute power in 'dBm'.

Absolute power displayed in both 'dBm' & 'watt'.

Continue next page for viewing options for *data saved in 2-way Autotest mode*.

Instrument Operation

➡ **Memory operation**

   ➡ **Recall stored data from internal memory (continue)**

      Viewing options for data saved in 2-way Autotest mode:

        Press F3 to toggle display to show between,

          - Test summary (showing loss of each direction & their average by wavelength)

          - Test detail (showing absolute power, loss, reference power for each direction by wavelength)

          - ORL values (only for instrument models built with this option)

Loss value (dB) measured on remote unit @ 1310 nm

Measured cable length (Km)

Loss value (dB) measured on local unit @ 1310 nm

Average loss (dB) @ 1310 nm

Symbol signifying loss test results (refer to Slide 16)

Test Summary Display

Absolute power (dB) measured on local unit @ 1310 nm

Loss (dB) value measured on local unit @ 1310 nm

Reference power (dB) of local unit @ 1310 nm

Test direction: remote-to-local

Symbol signifying loss test results (refer to Slide 17)

Test direction & data for local-to-remote unit.

Test Detail Display

Press F4 continuously to show data of all active wavelengths.

Data @ 1550 nm

If ORL option is available, press F3 to view relevant data.

Test Detail Display

Return to TOC

Instrument Operation

➡ Memory operation

    ➡ Recall stored data from internal memory (continue)

*Viewing options for data saved in **2-way Autotest mode**: ORL data*

Continue from last slide

ORL value (dB) measured on local unit @ 1550 nm

ORL value (dB) measured on remote unit @ 1550 nm

UCAL offset values for 1550 nm set on local unit (refer to slides 77, 78)

UCAL offset values for 1550 nm set on remote unit (refer to slides 77, 78)

Symbol signifying ORL test result for a wavelength:
- "✓" – Pass/fail check is disabled (threshold is set at "0.00")

  or
- "✓" *(pass)* – passed ORL test
- "X" *(fail)* – failed ORL test fails.

2-way Autotest ORL data display

Instrument Operation

➡ **Memory operation**

　➡ Recall stored data from internal memory (continue)

Viewing ORL data saved in manual ORL mode:

UCAL offset values for 1550 nm set (refer to slides 77, 78)

ORL value (dB) measured @ 1550 nm

Manual ORL data display

Instrument Operation

➡ Memory operation

  ➡ Recall stored data from internal memory (continue)

Viewing time stamp of saved data:

While viewing data saved in any of the 3 modes (Meter, 1-way Autotest, 2-way Autotest), hold down Toggle Centre.

OR

OR

>

Data saved in Meter mode

Data saved in 1-way Autotest mode

Data saved in 2-way Autotest mode
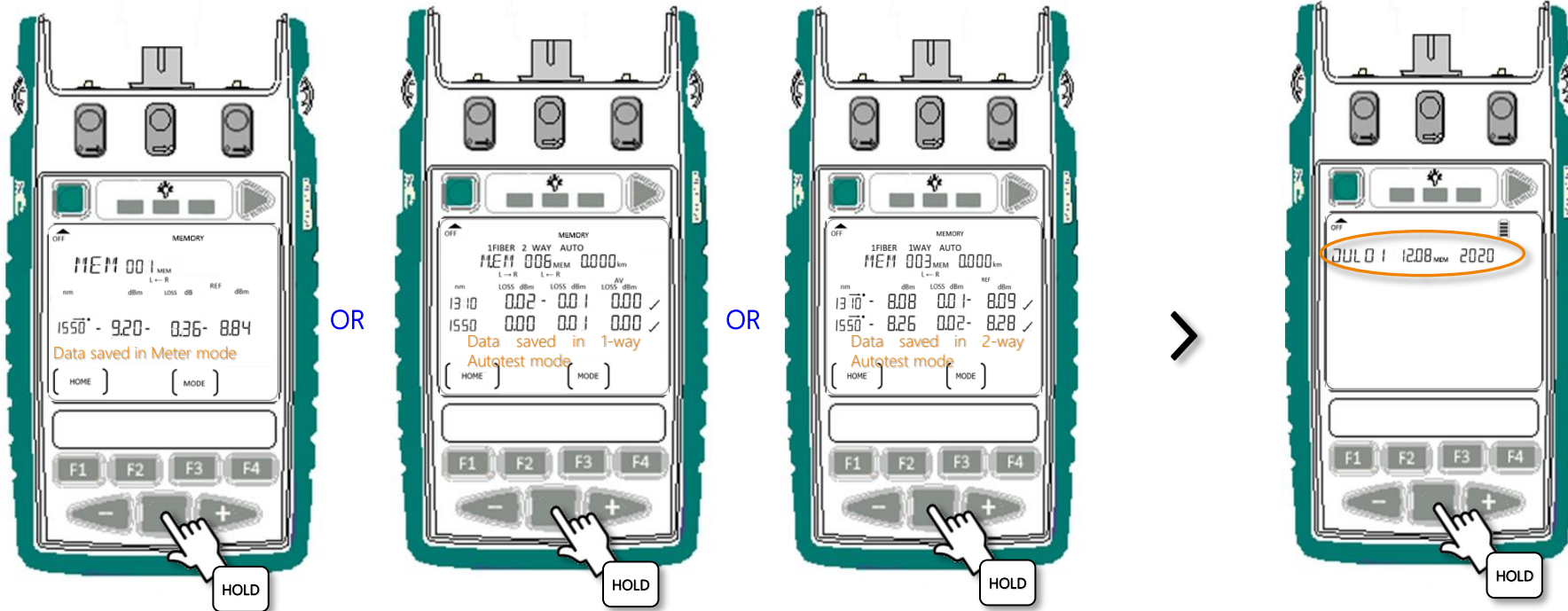
Continue next page for viewing nominal source power.

Release Toggle Centre now will return to the previous memory viewing display.

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Operation

➡ **Memory operation**

  ➡ **Recall stored data from internal memory (continue)**

Viewing nominal source power:

While viewing data saved in 1-way Autotest or 2-way Autotest, hold down the left most rectangular button (above LCD).

Data saved in 1-way Autotest mode
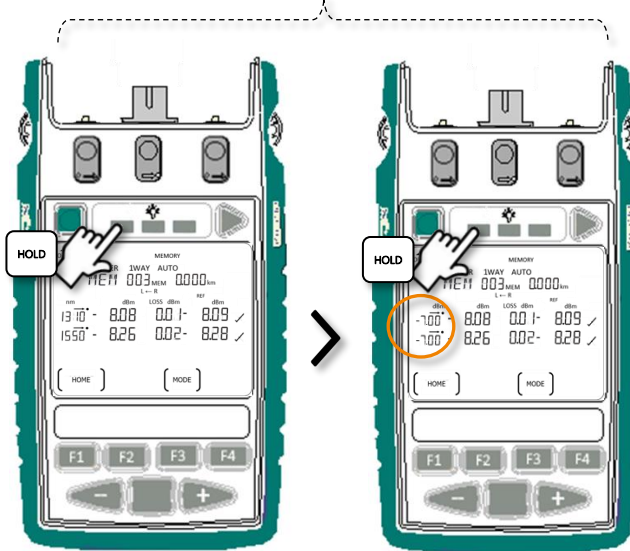
Data saved in 2-way Autotest mode
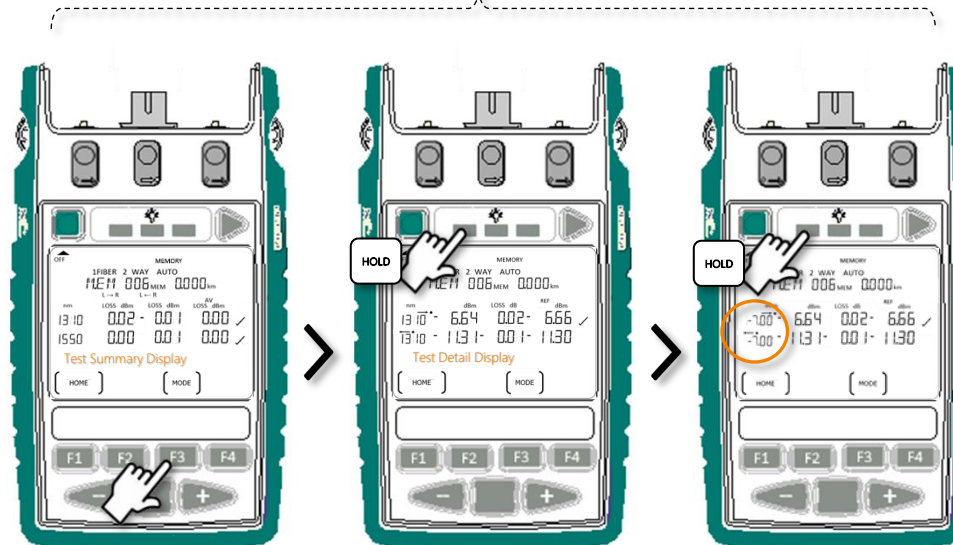
Press F3 to show result in Test Detail Display.

To Exit Memory mode:
Press F1 and return to Home display (Main menu).

Instrument Operation

➡ Memory operation

    ➡ Retest or overwrite results

❷ Go to memory location to retest (overwrite data)
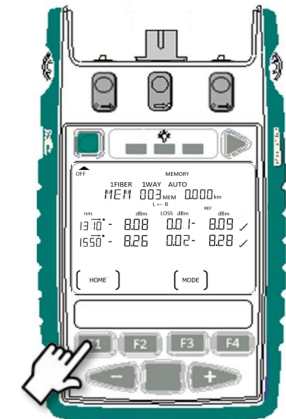
❶ Note current memory location

① Enter Memory mode:
At Home display (Main menu), press button above "MEMORY" to enter memory mode.
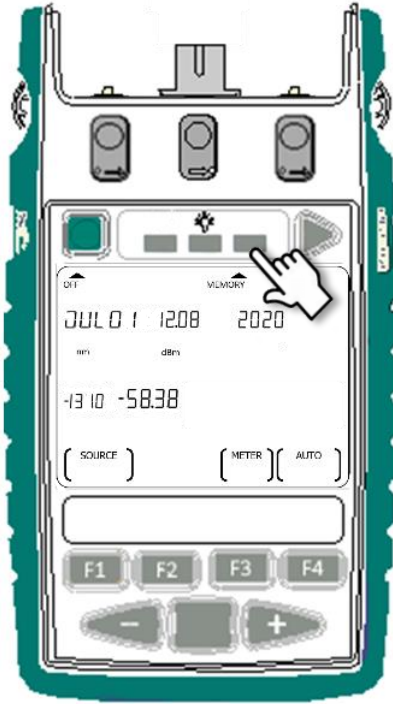
② Note currently displayed memory location:
E.g., the current location is '6' is to be noted.

③ Select memory location to overwrite data:
Press '–' to go the location, then hold down button above "MEMORY" and press F2 for three seconds or until it stops beeping.
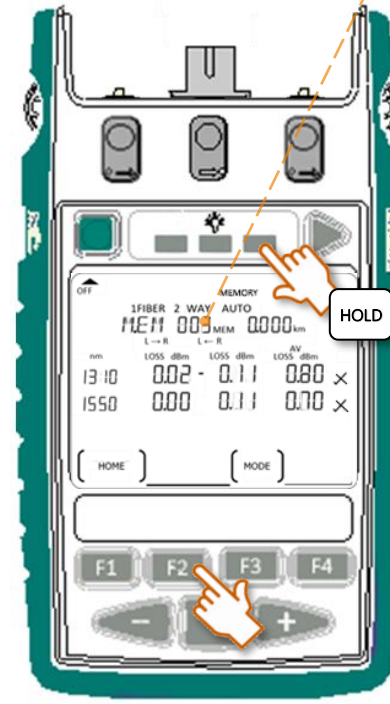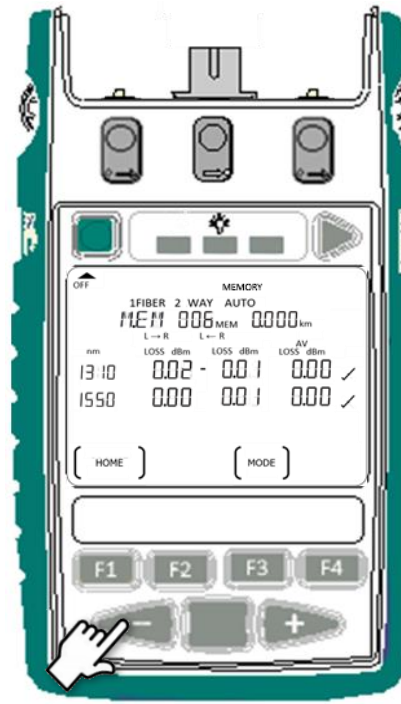
E.g., Memory location '3' has been selected for retest (data overwriting).

HOLD

Continue next page

Instrument Operation

➡ **Memory operation**

   ➡ **Retest or overwrite results (continue)**

❸ Retest and save (overwrite) data

④ **Exit memory mode:**
Press F1.
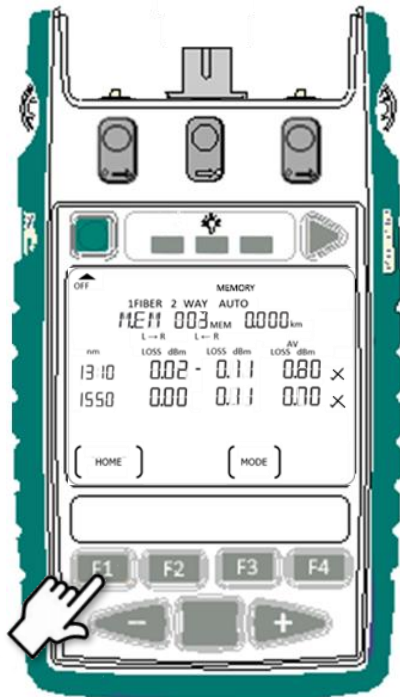
⑤ **Perform retest:**
E.g., enter Meter (press F3) or Autotest (press F4) as needed.
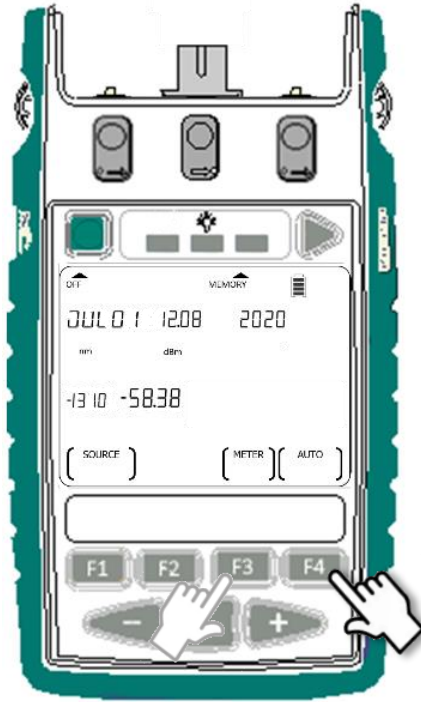
E.g., Retest is performed in Autotest mode (F4 was pressed).
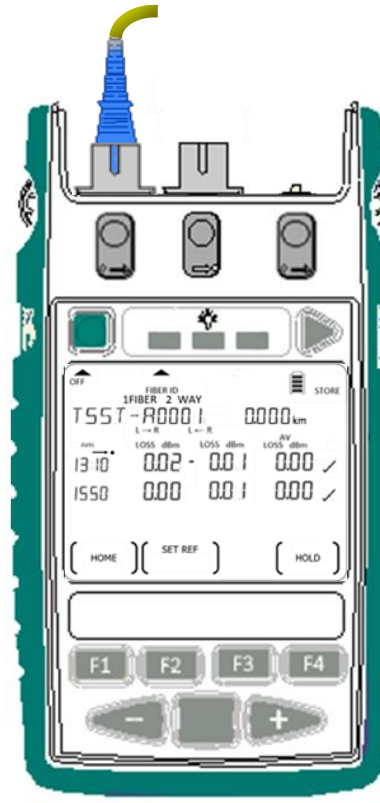
⑥ **Save retest data:**
Press triangular button above "STORE".

This retest data will overwrite the saved data in location '3' selected in step ❸
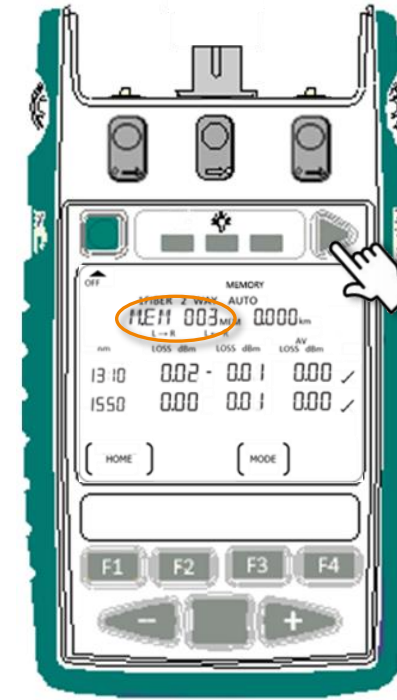
Continue next page

Return to TOC

KINGFISHER
INTERNATIONAL

Instrument Operation

➡ **Memory operation**

➡ **Retest or overwrite results (continue)**

❹ Return memory location pointer for next storage to where it was before retest

⑦ **End retest:**
E.g. end Autotest by pressing F1.

⑧ **Enter Memory mode:**
Press button above "MEMORY".

⑨ **Set memory location pointer for next storage:**
Press '+' to select location pointer '7' in this example, as location '6' was "noted" in step ②.
Then, hold down button above "MEMORY" and press F2 for three seconds or until it stops beeping.
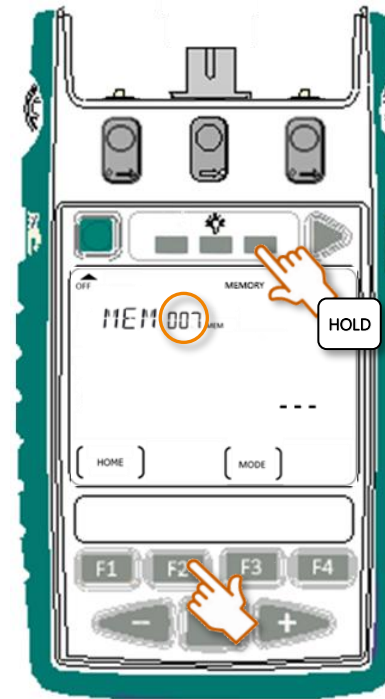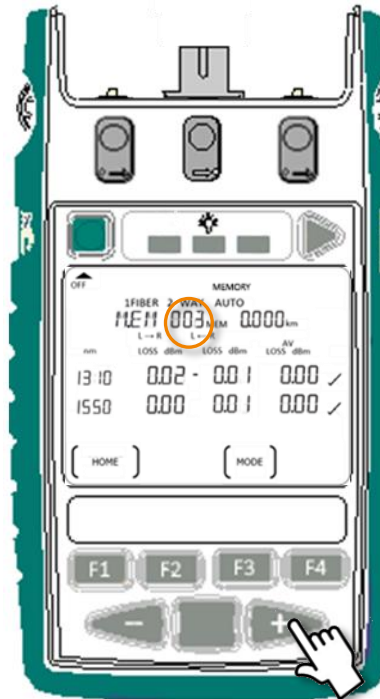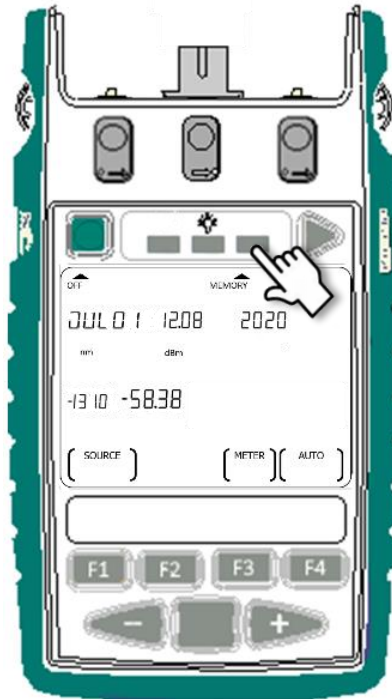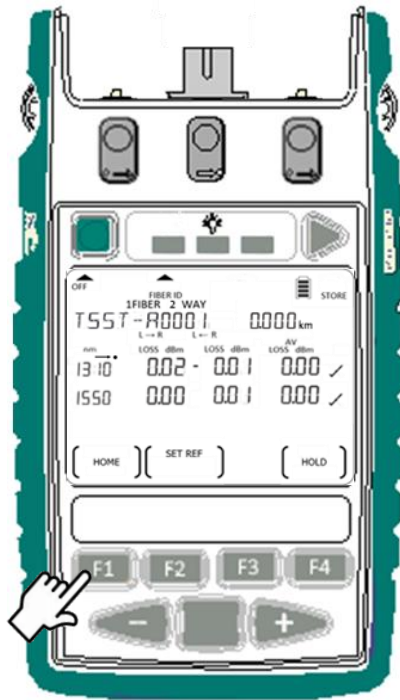
Next store operation will save data into location '7'.

Press F1 now will exit Memory mode and return to Home Display(Main menu).

Instrument Operation

➡ **Memory operation**

  ➡ **Transfer internally stored data onto USB stick**

① At Home display (Main menu), insert USB stick onto instrument's connector marked "MEM".
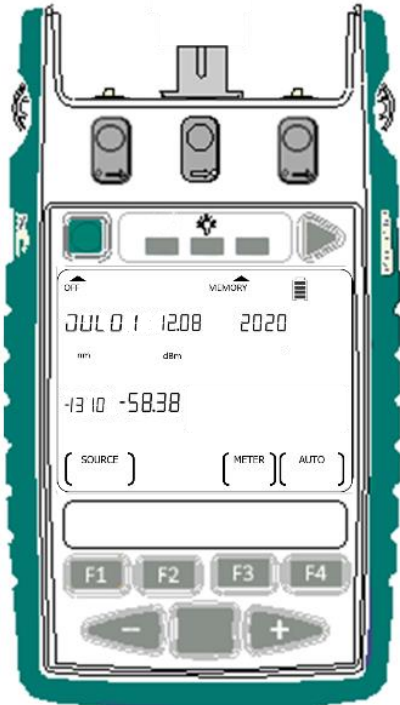
② Press button above "MEMORY" to enter memory mode and, power up USB stick. "USB" will be displayed. You may need to wait for a few second for USB to fully initialize before moving on to the next step.
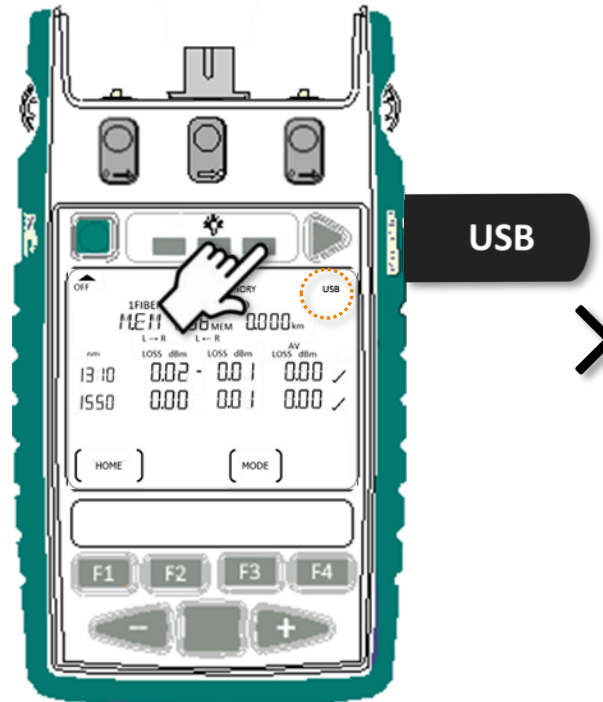
③ **Press Triangle-button** to start data transfer.
Data transfer is completed when instrument stops beeping and/or USB stick stops flashing.

Press F1 to power down USB stick before unplugging it from instrument.
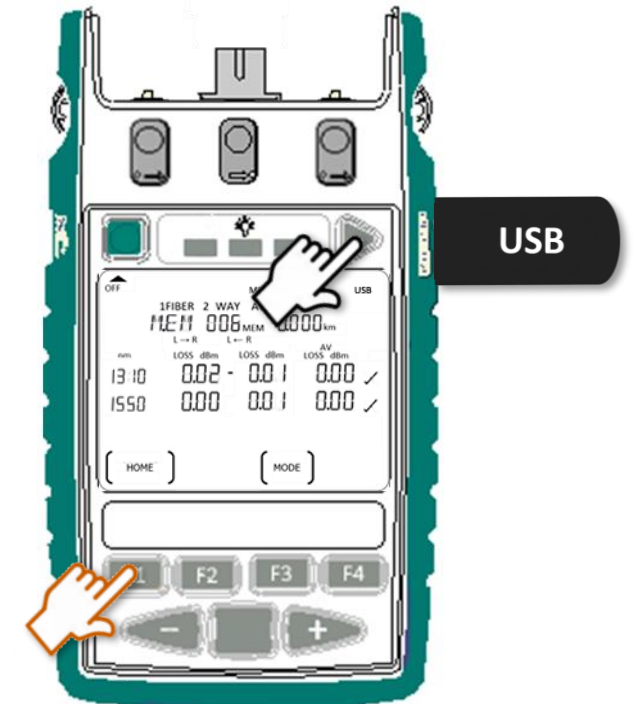
Instrument Operation

➡ **Memory operation**

   ➡ **Clear internal memory**

① At Home display (Main menu), press button above "MEMORY" to enter memory mode.
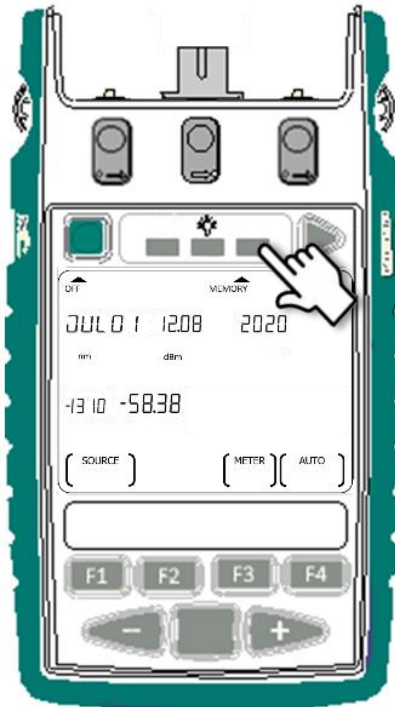
② Hold down button above "MEMORY" then, press and hold F2 followed by F4 until "Clr" is displayed.
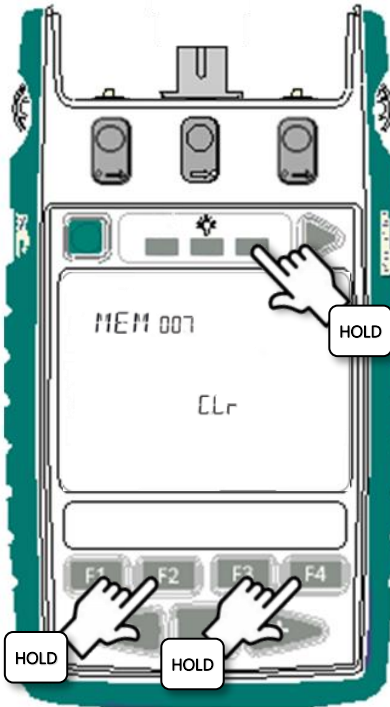
When unit stops beeping, content saved in all memory locations is erased.
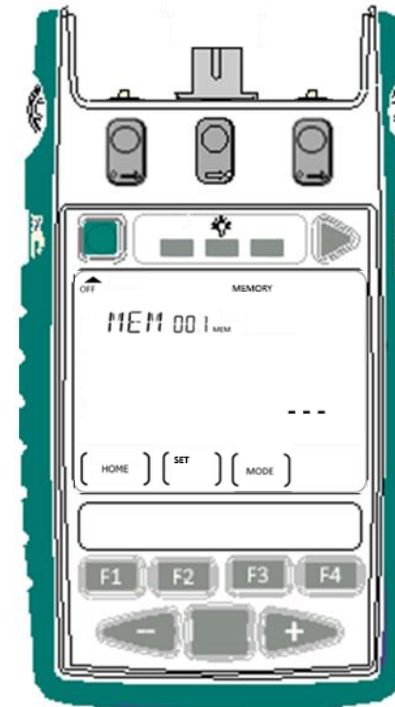
Press F1 now will exit Memory mode and return to Home Display(Main menu).

Instrument Operations

➥ ## Instrument Data Sanitization

This will erase all data in memory, reset all pass/fail thresholds to "0", reset all reference values to "0", reset Text ID Tag to "TEXT-A0001" , reset ORL UCAL & NF (for Zero Function) to factory defaults.

③ Press and hold [MEMORY] & F2 simultaneously then, quickly press and hold **F4 & Toggle Centre** simultaneously for 3 seconds until beeping stops.

① Switch on instrument:
Press green button.

② Enter Memory mode:
Press button above 'MEMORY'.
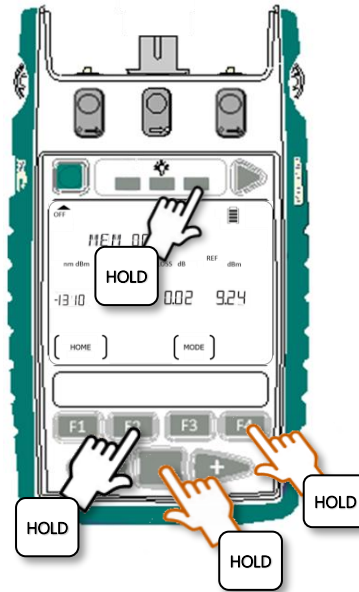
Sanitization in progress.
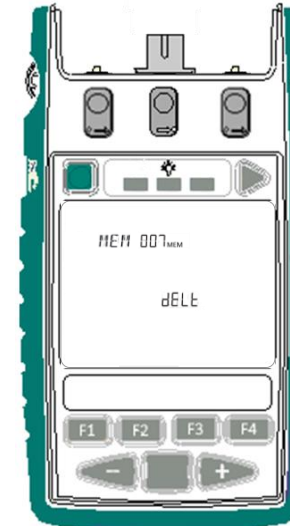
Instrument will turn off

Note: Previously set date/ time & saved Text ID Tag will not be erased.

KINGFISHER INTERNATIONAL

Instrument Operation

➡ Text ID Tag operation

A useful auto-naming feature to systematically pre-configure (project) text names for test results stored in memory.

① Create a New Text ID Tag:

❶ In Meter or Autotest mode, press button above "FIBERID".

❷ Enter Text ID Tag creation mode, press F4.

❸ Select new alphanumeric character, press '+'or '-'.
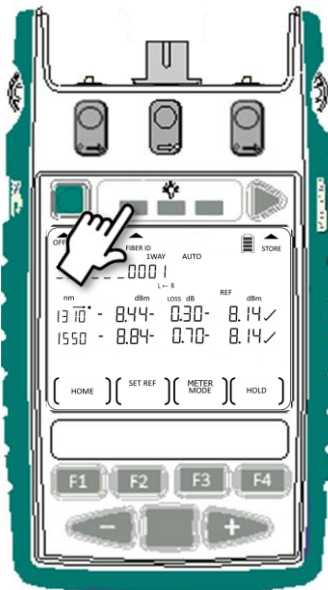
Flashing "- - - - - -0001" If no Text ID Tag has previously been created & stored.
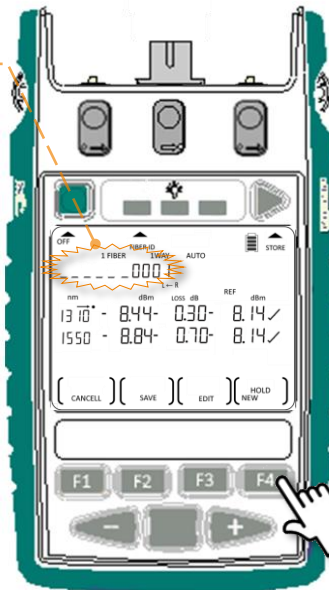
"AAAAAA001" is displayed with its 1'st character highlighted (flashing) for modification.
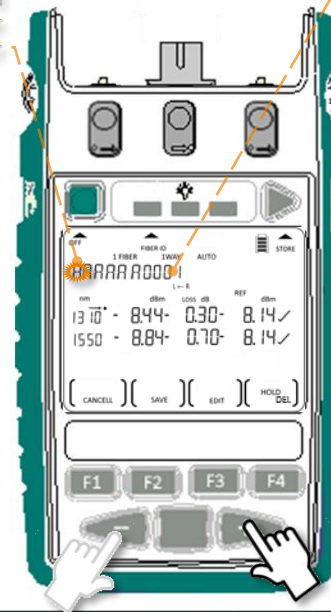
Possible characters selectable for Text ID Tag:
First 6 digits: "blank", "-", "A~B", "0~9"
Last 4 digits (for fiber indexing): " 0~9".

>

>

Continue next page

KINGFISHER INTERNATIONAL

Instrument Operation

➡ Text ID Tag operation (continue)

① Create a New Text ID Tag (continue):

❹ Move on to enter the next character, press Toggle Centre.
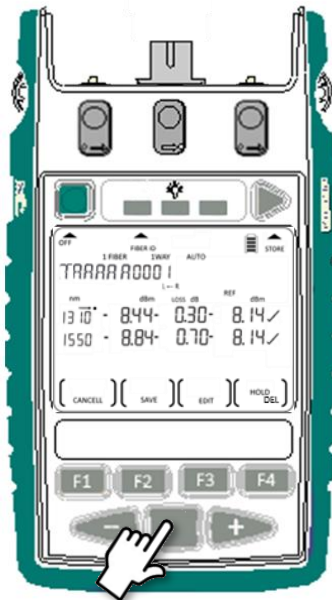
❺ Store the newly created Text ID, press F2.
Press F1 will quit without saving.

Up to 20 user-created Text ID Tags can be stored.

Newly created and stored Text ID Tag.
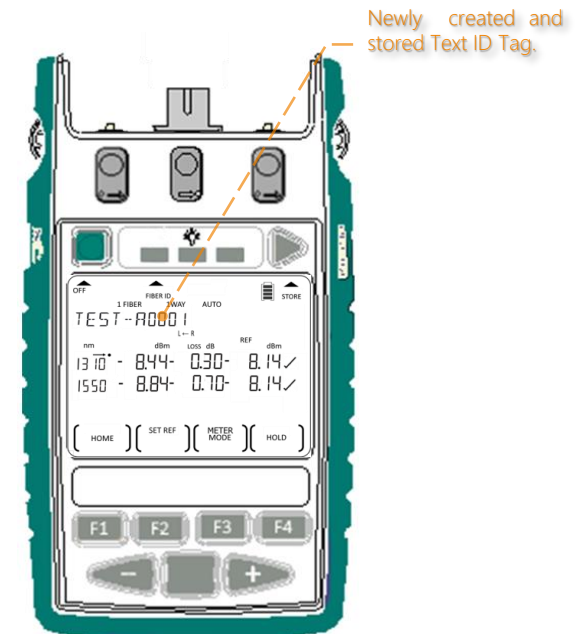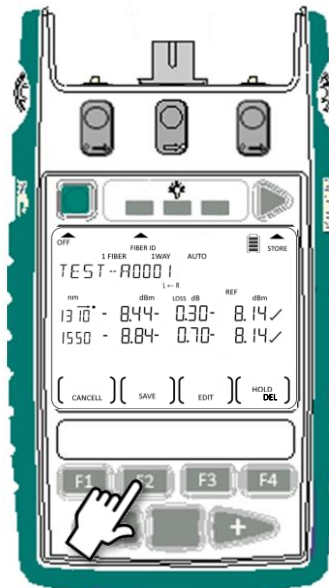
Instrument Operation
## ➡ Text ID Tag operation (continue)

② To use a Text ID Tag:

❶ In Meter or Autotest mode, press button above "FIBERID".
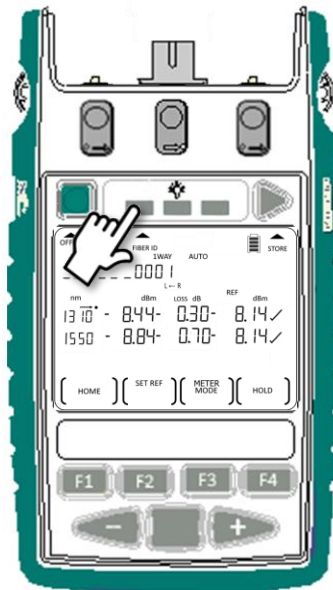
❷ Select a stored Text ID Tag, press '+'or '-'.
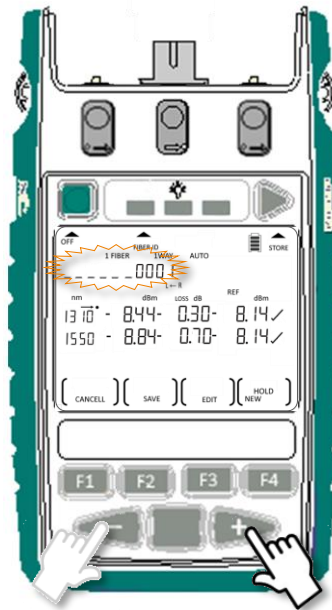
❸ Confirm selection, press F2.
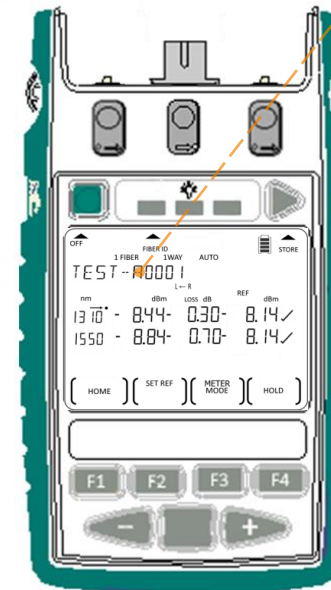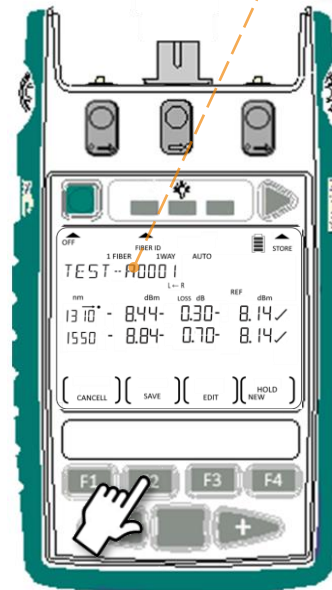
E.g.,"TEST-A0001" has been selected

Selected Text ID Tag for use.

Note:
During the next data storing operation, this will be saved along with data into internal memory.
The last 4 fiber indexing digits of the tag will increment after each memory store operation.

Instrument Operation

➡ Text ID Tag operation (continue)

③ To modify a Text ID Tag:

❶ In Meter or Autotest mode, press button above "FIBERID".
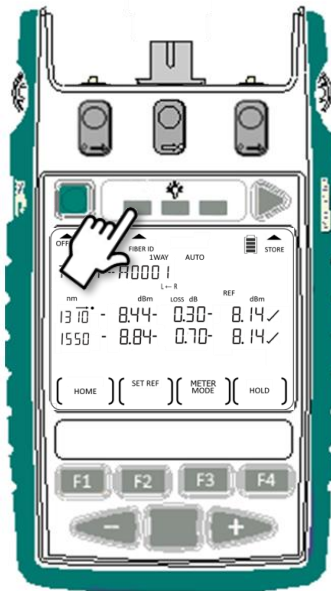
❷ Select the Text ID Tag for modification, press '+' or '-'.
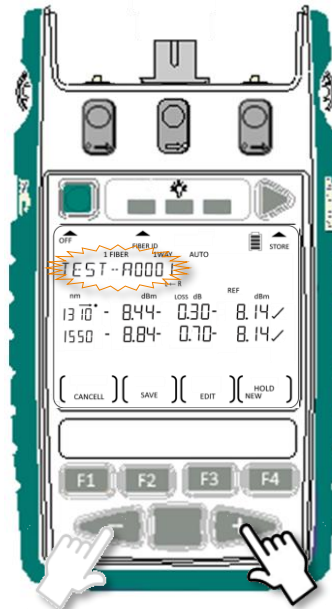
❸ Enter edit mode, press F3.
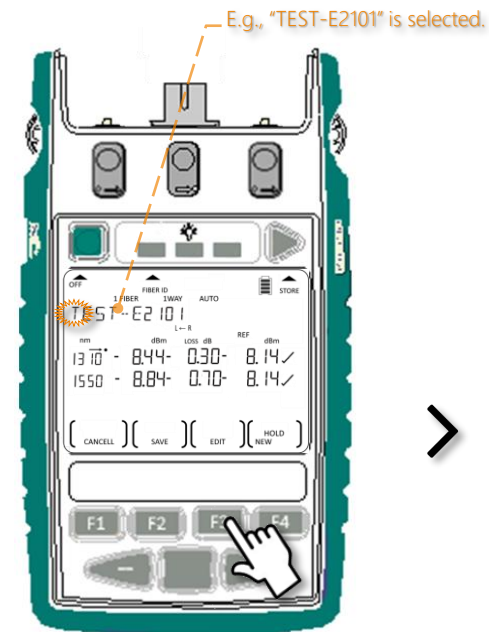
❹ Move to the character/s to modify, press Toggle Centre.

E.g., "TEST-E2101" is selected.

Continue next page

KINGFISHER INTERNATIONAL

Instrument Operation
➥ Text ID Tag operation (continue)

③ To modify a Text ID Tag (continue):

❺ Modify selected character, press '+'or '-'.
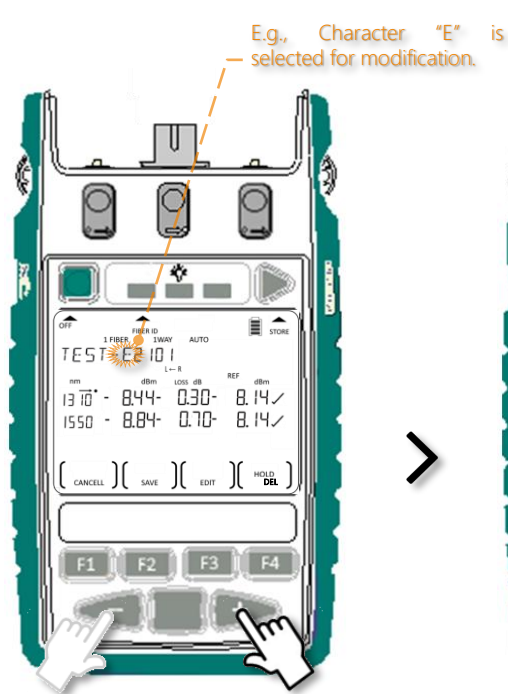
❻ Reset the Fiber Indexing digits to "0001", press F3.
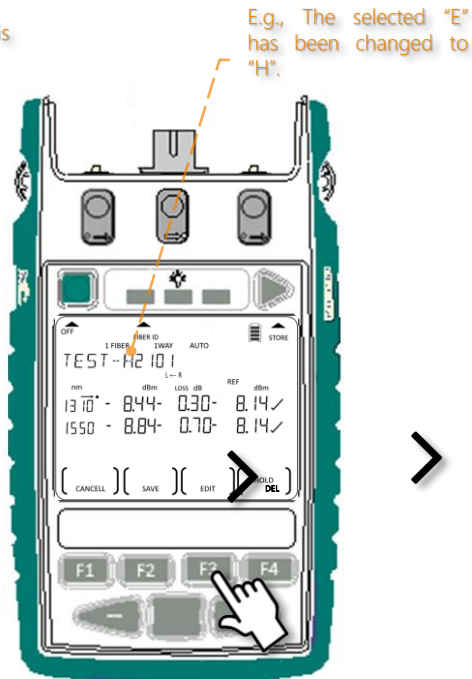
❼ Save modification, press F2.

Press F1 will quit without saving.

E.g., Character "E" is selected for modification.

E.g., The selected "E" has been changed to "H".

The last 4 digits are reset to "0001".

E.g., Text ID Tag has been modified to "TEST-H0001".
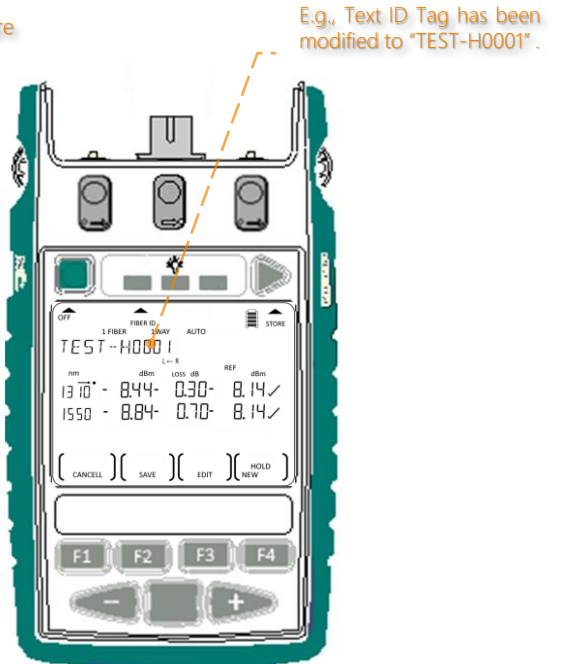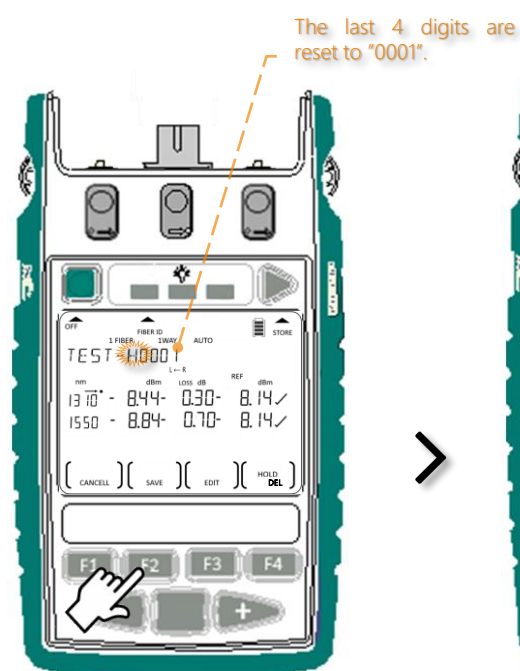
Instrument Operation

➥ Text ID Tag operation (continue)

④ To delete a stored Text ID Tag:

❶ In Meter or Autotest mode, press button above "FIBERID".

❷ Select a stored Text ID Tag to delete, press '+'or '-'.

❸ Enter edit mode, press F3

❹ Delete the selected Text ID Tag, press F4

❺ Confirm deletion, press F2.

E.g., "TEST-H0001" has been selected for deletion.
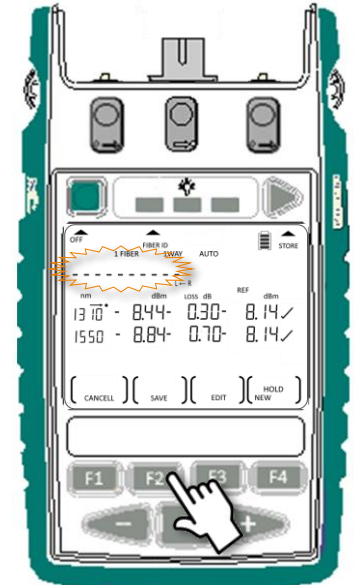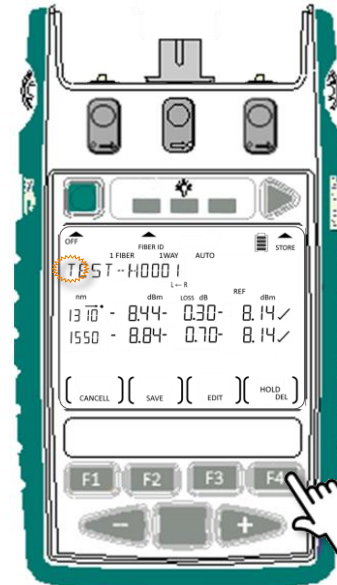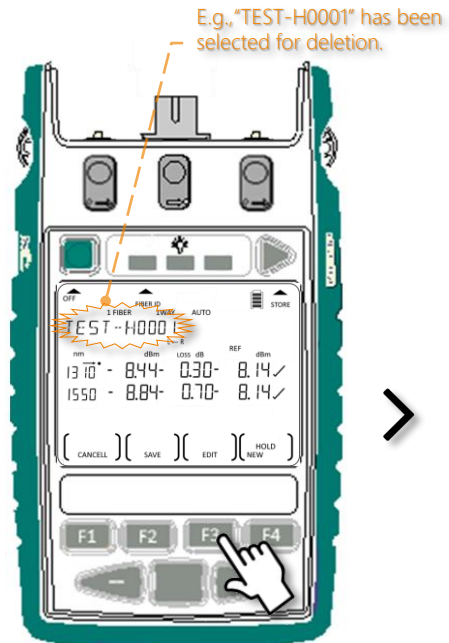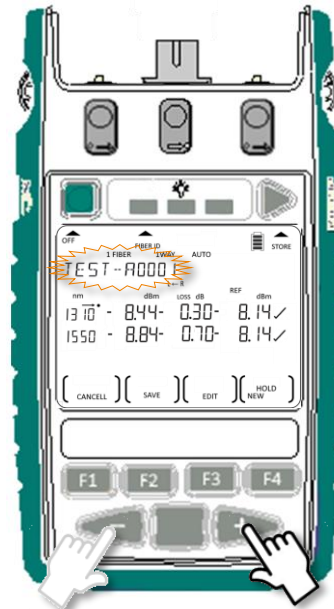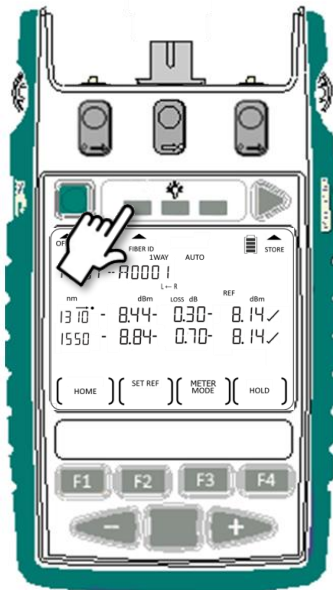
Instrument Operation
➡ Visible laser operation

① Enter Source mode: At Home display, press F1.
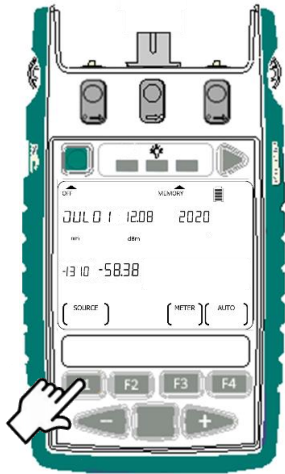
② Select 650 nm: Press '+'or '-'.
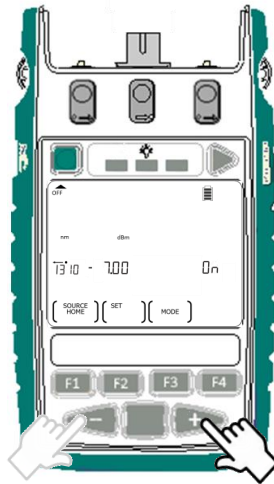
③ Select blinking output mode: Press F3 to select "2 Hz" tone.
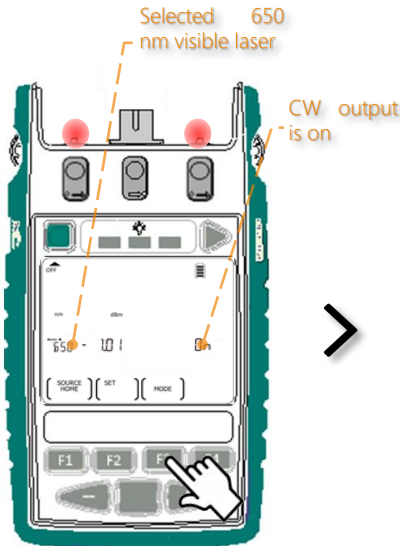
④ Return to CW output mode: hold down F3 for 3 seconds.

Selected 650 nm visible laser

CW output is on

2 Hz blinking output of 650 nm
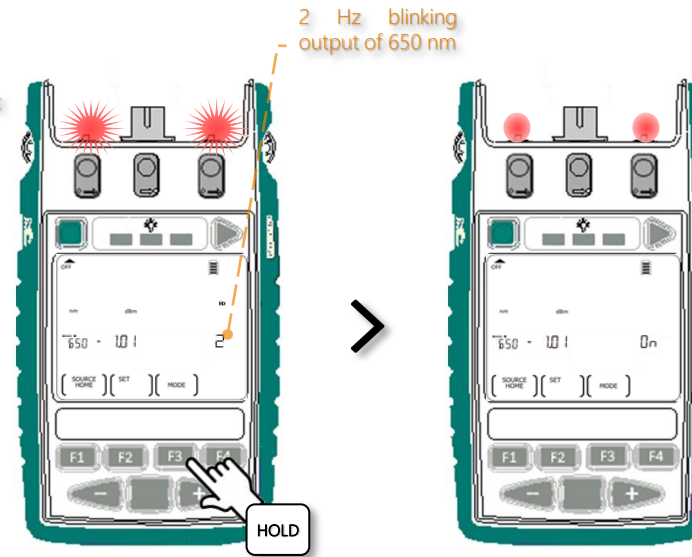
⑤ Turn off Visible laser & exit Source mode: Press Toggle Centre then press F1.

HOLD

Instrument Settings
➡ Date & time

④ Save settings:
Press F2.

*Press F1 [CANCELL] will return to Main menu without saving the new settings.*

① Enter date & time setting mode:
When instrument is *off*, hold Toggle Centre then press green button.

② Select item to change:
Press Toggle Centre to select item. Selected item will flash.

Items toggle in the sequence,
Hour > Minute > Month > Day > Year

③ Change value of selected item:
Press – or + key.
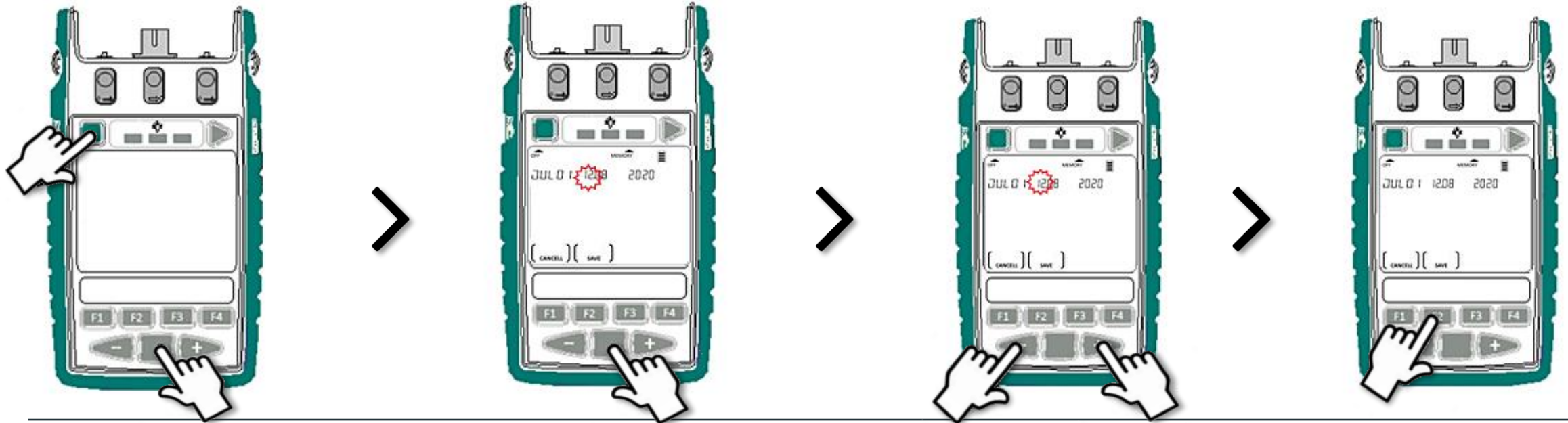
Instrument Settings
➥ To deactivate beeping

① When instrument is off, hold down F2 then press green button.
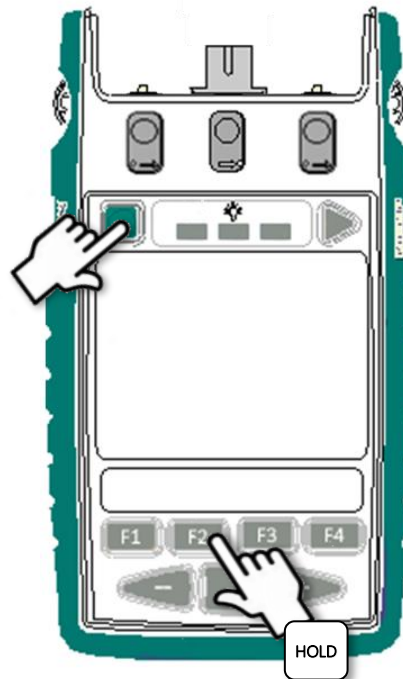
② Continue to hold down F2.

③ Release F2.

Beeping-deactivated indicator
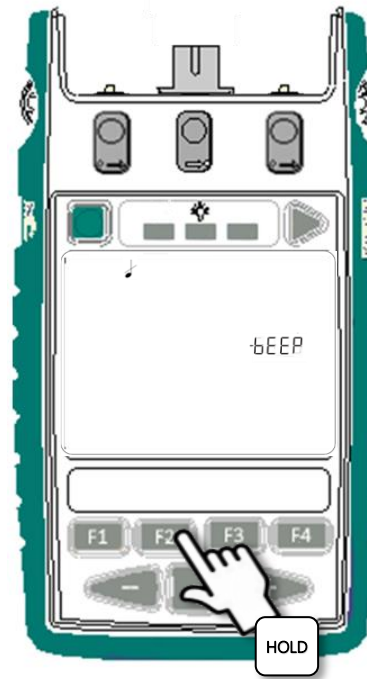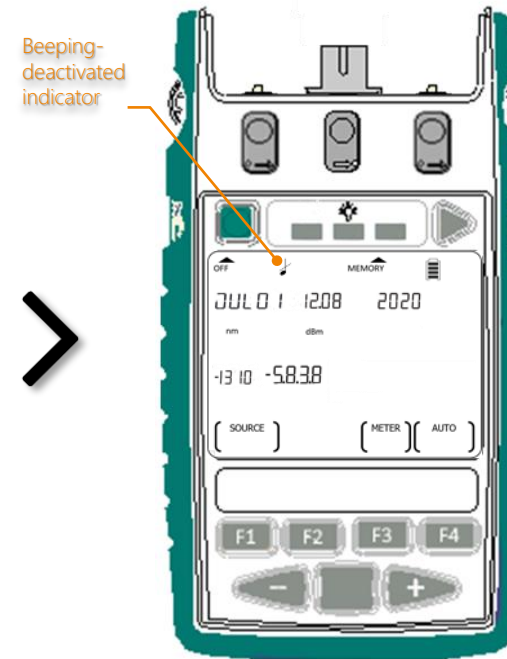
To reactivate beeping: Switch instrument off and back on.

HOLD

HOLD

KINGFISHER INTERNATIONAL

Instrument Settings
➡ To activate Slow Mode at instrument switch-on

① When instrument is off, hold down F3 then press green button.
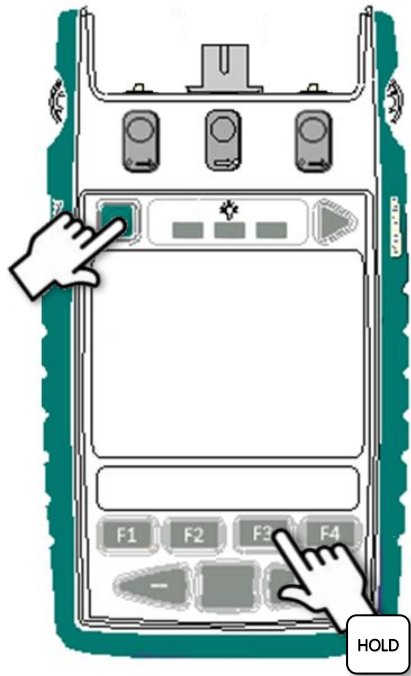
② Continue to hold down F3.
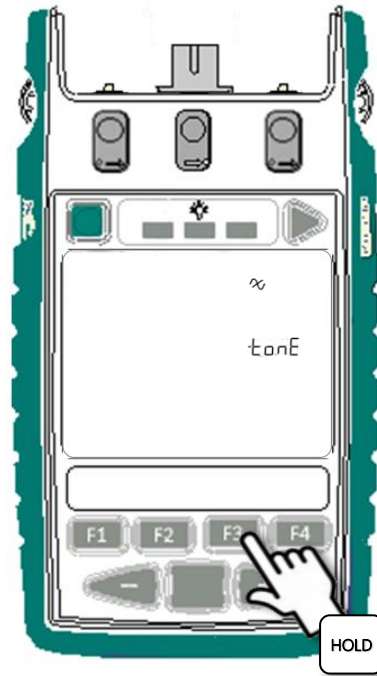
③ Release F3.
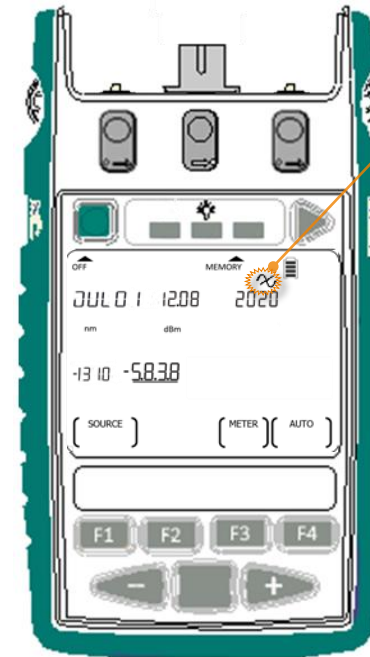
Slow Mode-activated indicator (flashing)

To deactivate Slow Mode: Switch instrument off and back on.

Instrument Settings
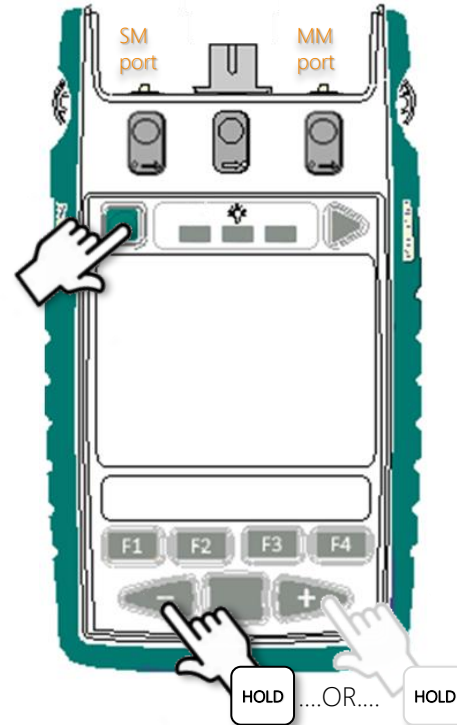## ➡ Pass / fail thresholds setting

- Pass / fail thresholds (for loss, optional cable length, optional ORL) can be set directly on instrument or downloaded from KITS software.

  Note:
  1. Auto Pass/fail checks for *loss* only works for 1-way or 2-way Autotest.

  2. Auto pass/fail checks for *length* and *ORL* only works for 2-way Autotest.

  3. *For accurate auto pass/fail result on instrument models without ORL & cable Length measurement options, set all the corresponding threshold values to "0".*

- To download the thresholds from KITS, refer to KITS software manual (coming soon!).

- To setup the thresholds directly on instrument, refer to the instructions on this and the following pages.

① Enter pass/fail setting mode:
When instrument is *off*,
[For SM @ left 2-way port]: Hold down "**–**" and then press green button.
[For MM @ right 2-way port]: Hold down "**+**" and then press green button

Note: Only release "**–**" or "**+**" when threshold setting display shows up.

"IMPORTED" will show if a threshold setting has been imported from KITS and, change to "SETUP" if any changes are made locally.

SM port   MM port

....OR....
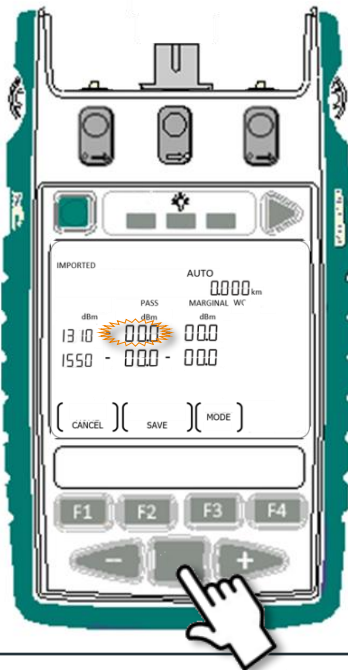
HOLD   HOLD

> Continue next page

Return to TOC
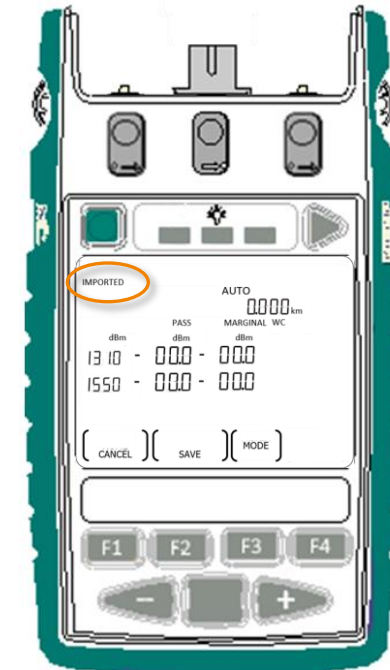
Instrument Settings

➡ Pass / fail thresholds setting (continue)

For loss & optional cable-length:

② **Select item:**
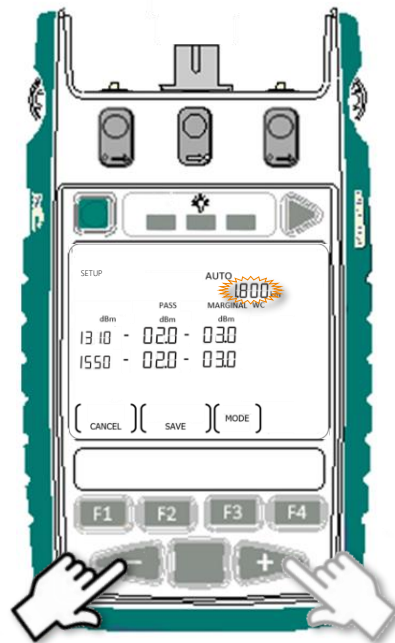Press Toggle Centre to select item (among PASS, MARGINAL, *length*). Selected item will flash.

③ **Edit value of selected item:**
Press – or + to change values of selected item.

Note:
a. For accurate auto pass/fail result, the set values (magnitude) for MARGINAL must always be greater than that for PASS.

b. If value of a selected item is set at 0, auto pass/fail check for that item is disabled.

④ **Select pass / fail method:**
Toggle F4 to select between AV (Average method) or WC (Worst Case method).

Note: Worst Case method always apply for 1-way Autotest regardless of whether AV or CW has been selected.
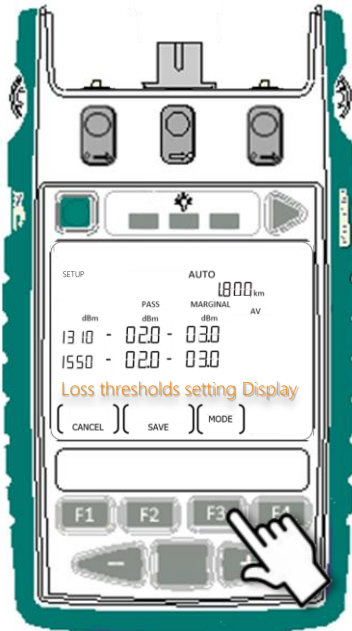
WC or AV mode
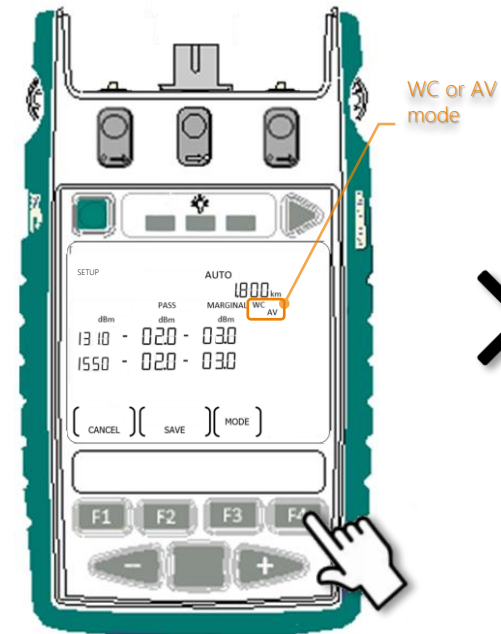
Continue next page.....
- *to set ORL thresholds (if this option is available)*
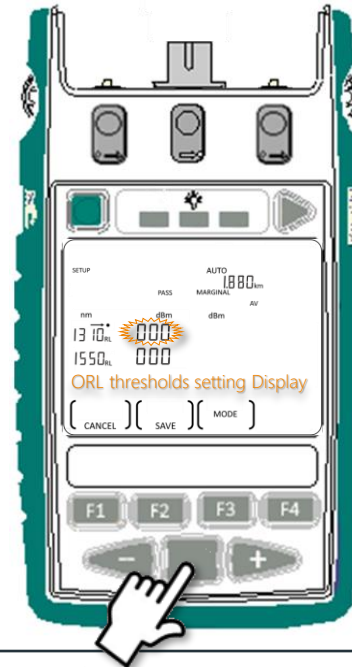- *to save settings*

Return to TOC

KINGFISHER INTERNATIONAL

Instrument Settings

➡ Pass / fail thresholds setting (continue)

*For optional ORL:*

⑦ **Edit value of selected item:**
Press **–** or **+** to change values of selected item.

Note: if value of selected item is set at 0, pass / fail check for ORL for that item is disabled.
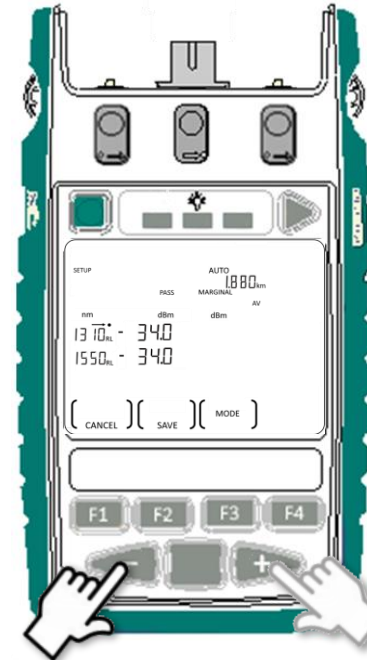
⑧ **Save settings:**
Press F2 (screen will return to Home Display).

Or press F1 will exit to Home Display without saving the new settings.

⑤ **Enter ORL thresholds setting display :**
Press F3

⑥ **Select item:**
Press Toggle Centre to highlight value of item to be edited.

Loss thresholds setting Display

ORL thresholds setting Display
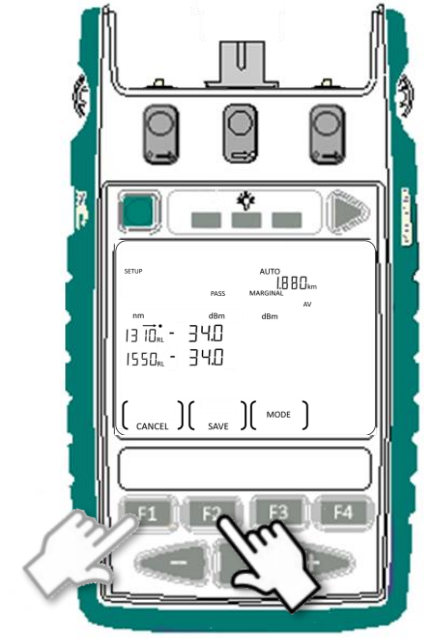
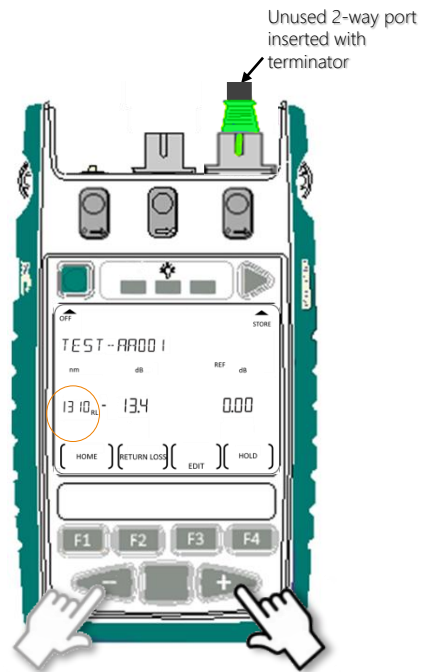# Instrument Settings

➡ **ORL UCAL (User CALibration) setting**

This sets up the instrument with an optical reference condition to compensate for optical loss in a test jig.

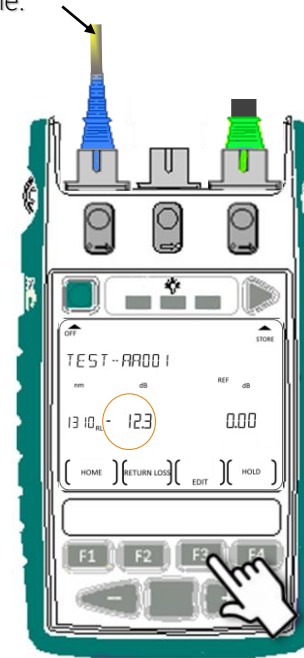① Enter ORL (RETURN LOSS) measurement mode:
At Home Display, press F2.
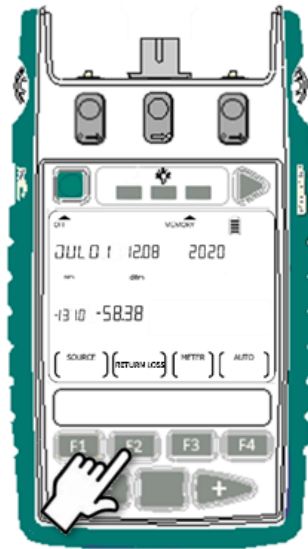
② Select wavelength for setting:
Press – or +

1310 nm has been selected in this example.

③ Connect test jig (or launch cord etc.) to the 2-way port.

Read & note ORL reading on display, -12.3 dB in this example.

④ Enter UCAL setting mode:
Press F3.

Unused 2-way port inserted with terminator

> Continue next page

KINGFISHER
INTERNATIONAL

Return to TOC

Instrument Settings
➡ ORL UCAL (User CALibration) setting……continue

⑤ **Enter/e**dit value of UCAL offset:
Press – or + to enter the required offset (possible range:-9.99~9.99) on instrument.
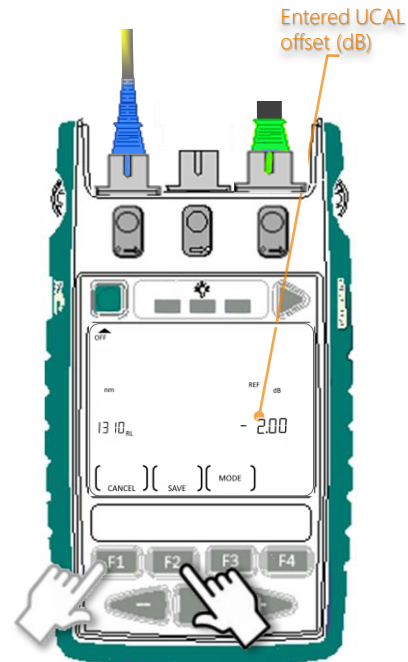
In this example, UCAL offset of -2 dB is required, as ORL of test jig is measured at -12.3 dB when compared to the expected -14.3 dB of a known good reference SMF test cord.
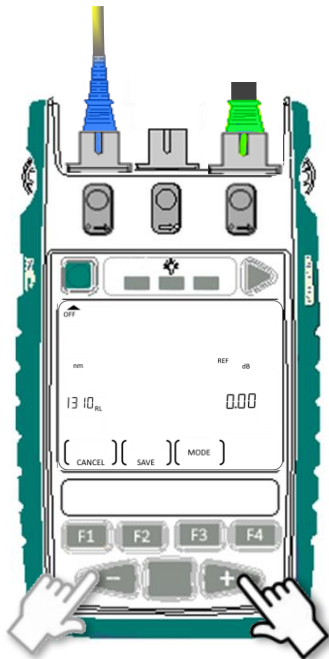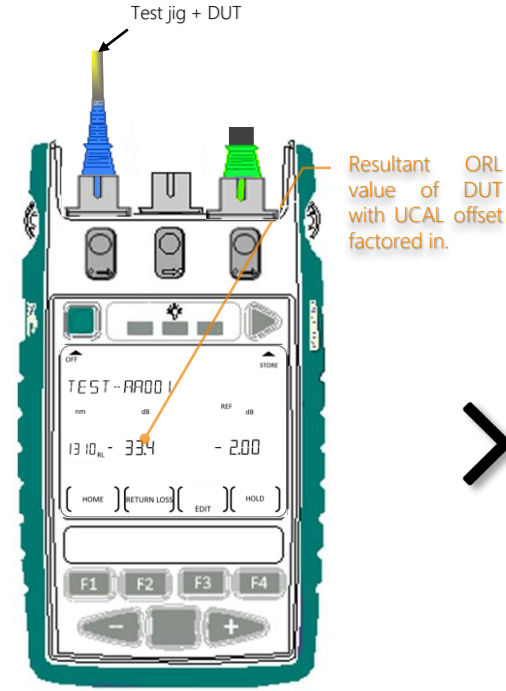
⑥ **Save settings:**
Press F2 to save and return to ORL measurement mode.

Or press F1 to return to ORL measurement mode without saving.

⑦ Connect DUT to the test jig (or launch cord etc.).

Entered UCAL offset (dB)

Test jig + DUT

Resultant ORL value of DUT with UCAL offset factored in.

> > >

⑧ **To exit ORL measurement mode:** Press F1 to return to Home Display.

KINGFISHER INTERNATIONAL

Return to TOC

Instrument Settings
➡ ORL Zero Function

- *This compensates for stray (residual) reflections to allow testing of weak reflection levels. Using this feature, the instrument can read accurately up to 10 dB below the stray reflection level. However, this feature causes increased noise, so when using this feature, ORL test resolution is decreased.*

- *This setting is default at –65 dBm. For instrument with Ge meter detector, " lo" will be the displayed value.*
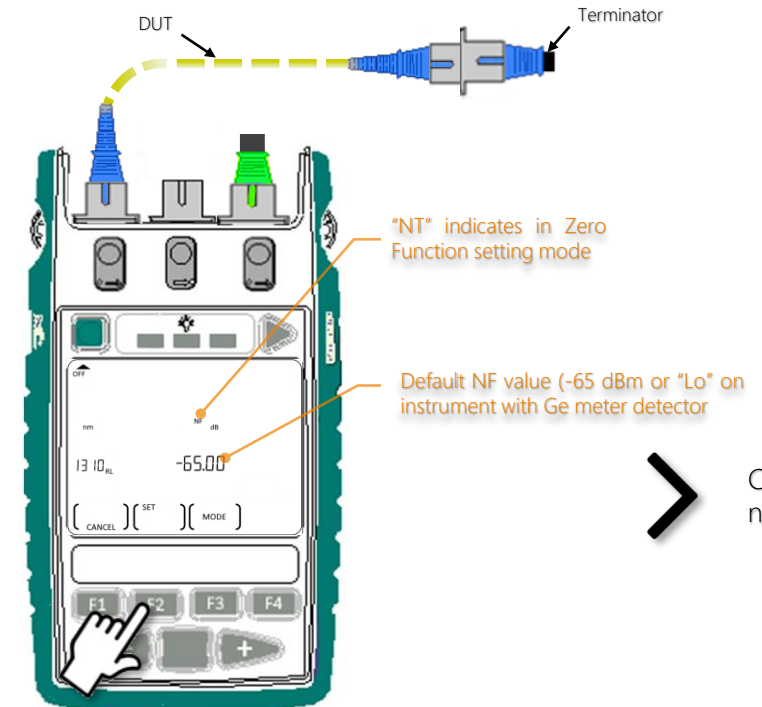
① Enter ORL (RETURN LOSS) measurement mode:
At Home Display, press F2.
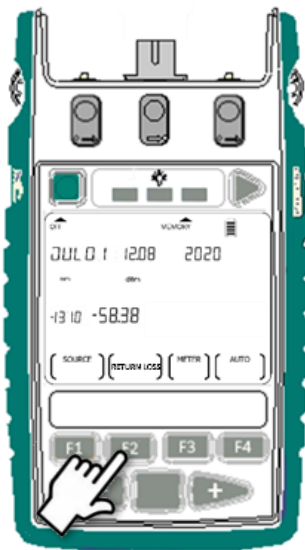
② Enter Zero Function setting mode:
Press F3 *twice*.
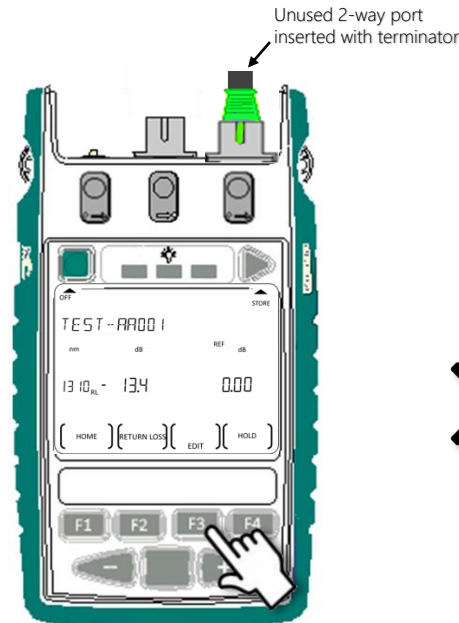
③ Determine Noise Floor (NF) of DUT:
Connect DUT to the 2-way port, connect far end of DUT with an appropriate Terminator.

Unused 2-way port inserted with terminator

DUT   Terminator

"NT" indicates in Zero Function setting mode

④ Set NF of the instrument:
Press and hold F2 until it stops beeping.

Note:
This will automatically set and save NF of all active wavelengths on instrument.

Default NF value (–65 dBm or "Lo" on instrument with Ge meter detector

Continue next page

KINGFISHER INTERNATIONAL

Instrument Settings
➡ ORL Zero Function (continue)

⑤ Measure actual ORL of DUT:
Removed Terminator from DUT and read DUT's ORL from display.

DUT

With Terminator removed

DUT

ORL value of DUT

Display will returns to ORL measurement mode with, new NF values automatically saved for *all wavelengths*.
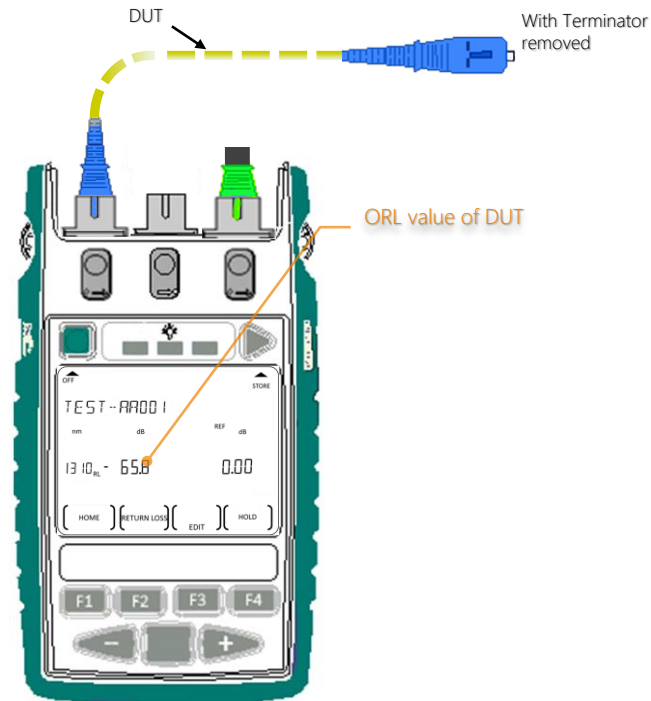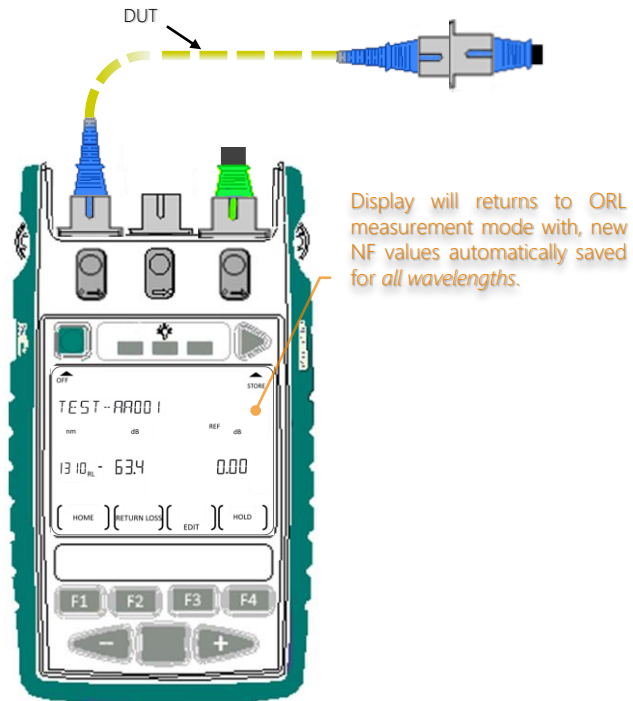
⑥ To exit ORL measurement mode: Press F1 to return to Home Display.

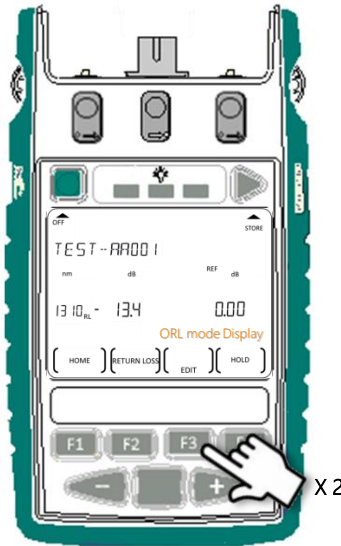Return to TOC

Instrument Settings
➥ Reset ORL UCAL & NF (for Zero Function) to factory defaults

③ Reset NF & UCAL to default values (NF=65.00 dB, UCAL offset=0.00 dB):

① Enter ORL (RETURN LOSS) measurement mode:
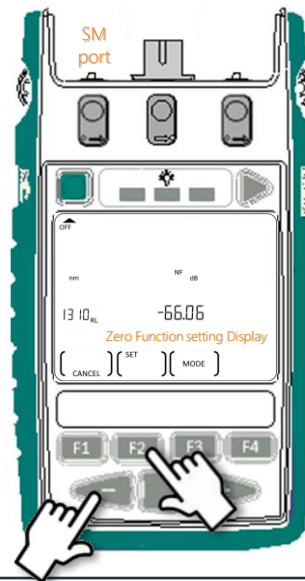At Home Display, press F2.
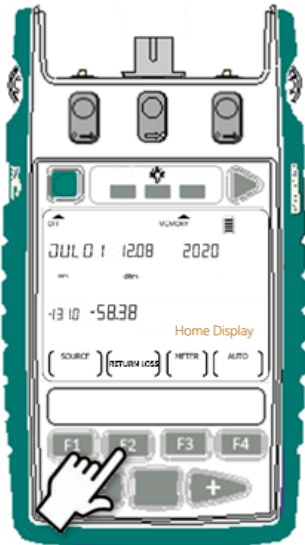
② Enter Zero Function setting mode:
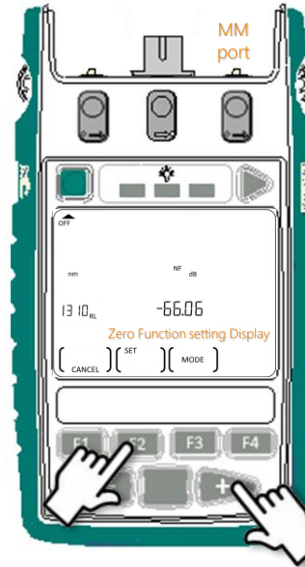Press F3 *twice (select EDIT followed by MODE).*

For instrument model with two 2-way ports (SM & MM):

For instrument model with a single 2-way port (SM or MM):

For **SM port**– Hold down F2 followed by "-" until it stops beeping.

*For **MM port**–* Hold down F2 followed by "+" until it stops beeping.

Hold down F2 followed by Toggle Centre until it stops beeping.

or

or
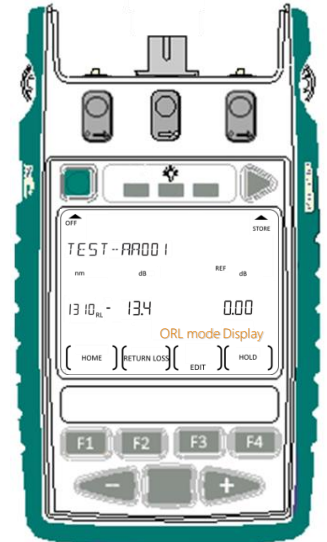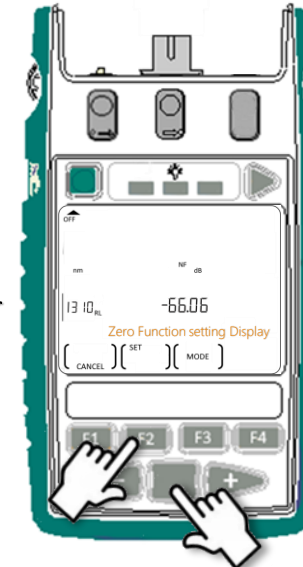
10 Instrument Care

- Keep the instrument in a carry case during storage and transport

- Use only high-quality batteries.

- For prolonged storage remove batteries.

- The instrument is resistant to normal dust and moisture however, it is not waterproof.

- If moisture gets into the instrument, remove batteries & dry it out carefully before using it again.

- Where possible, keep instrument away from strong sunlight.

- Clean the instrument case using Isopropyl-alcohol (IPA) or other non solvent cleaning agents.

- DO NOT use Acetone or other active solvents.

KINGFISHER
INTERNATIONAL

Application Notes

Comprehensive selection available at

https://kingfisherfiber.com/application-notes/

Questions and Comments

Thank you for your attention

@kingfisherfiber   kingfisherfiber.com

K NGFISHER
INTERNATIONAL

Revision record:

Revision	Date	Editor	Change descriptions
7	22Mar2022	TO Ng	i. *Slide 64: Latest FW now reset all reference values to "0" and turn instrument off at the end of sanitizations.*