FLUKE networks

CertiFiber™ Max

Length/Loss/Polarity Module

Users Manual

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Introduction

The Fluke Networks CertiFiber™ Max Loss/Length/Polarity module attaches to a Versiv™2 main or remote to make a hand-held tester (the Product or the Tester). To differentiate a main tester from a remote tester, they are referred to as the Main or the Remote. The Product can certify, troubleshoot, and document optical fiber cabling installations.

- The Product measures optical power loss, length, and polarity on multi-fiber cables at 1310nm and 1550nm (CFM-SM).
- Connect Interchangeable Uniport™ adapters to the input and output ports to make reference and test connections that meet ISO standards for MPO/MTP and MMC connectors for base 12, 16, and 24 fiber systems.
- Use the built-in visual fault locator (VFL) to find breaks, bad splices, and bends and verify fiber continuity.
- Use an optional FiberInspector™ video probe to inspect fiber endfaces and save the images in test reports.

Contact Fluke Corporation

Fluke Corporation operates worldwide. For local contact information, go to our website: www.flukenetworks.com.

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To register your product, or to view, print, or download the latest manual or manual supplement, go to our website. To register your product, go to https://my.fluke.com/en-US/register-product/. Register your product for access to information on product updates, troubleshooting tips, and other support services. If you purchased a Gold Support plan, registration also activates your plan.

The Fluke Networks Knowledge Base answers common questions about Fluke Networks products and provides articles on cable testing techniques and technology. To access the Knowledge Base, log on to www.flukenetworks.com, then select **SUPPORT** > **Knowledge Base**.

Safety Information

General Safety Information is in the printed Safety Information document that ships with the Product and at www.flukenetworks.com. More specific safety information is listed where applicable.

A **Warning** identifies hazardous conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

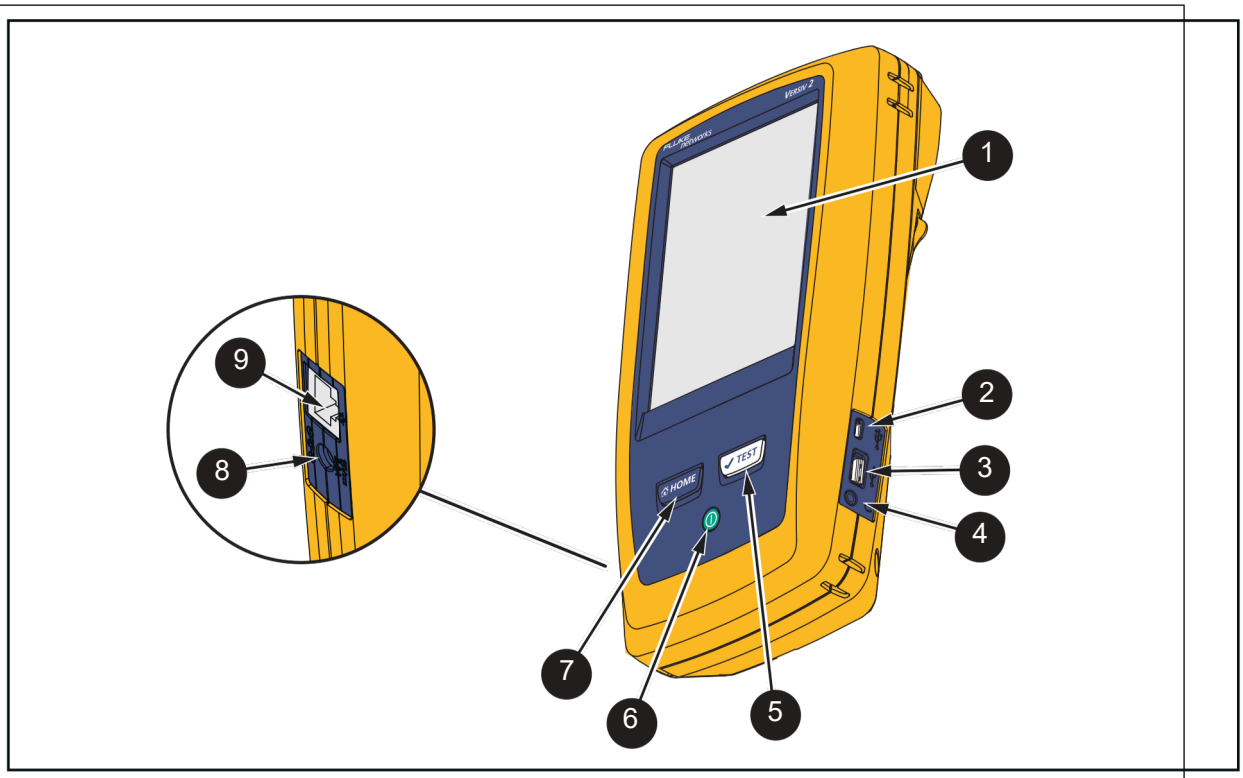
Product

For a list of the contents of your kit, see the list in the box or see the lists of models and accessories on our website.

The Main

Table1 shows the features of a Versiv Main.

Table 1. Main Features



Item	Description
A	Display with touchscreen.
B	Micro USB port: Use to connect the Product to a PC to upload test results to the PC or to install software updates on the Product.

Table 1. Main Features (cont.)

Item	Description
C	USB-A port: Use to save test results on a USB flash drive or to connect a FiberInspector™ video probe to the Product.
D	Headset jack.
E	Push B to start a test.
F	Push E to turn on or off the Product. On a Versiv 2 main, the LED in the power button shows the battery-charge status.
G	Push A to go to the home screen.
H	Ac adapter port. The LED has three colored □ □ □ Red when the battery charges Green when the battery is fully charged Yellow if the battery will not charge
I	RJ45 connector: Use to connect to a network for access to LinkWareLive cloud services or VNC
--	Not shown: The connection port on the back of the Main where a module connects to the Main.

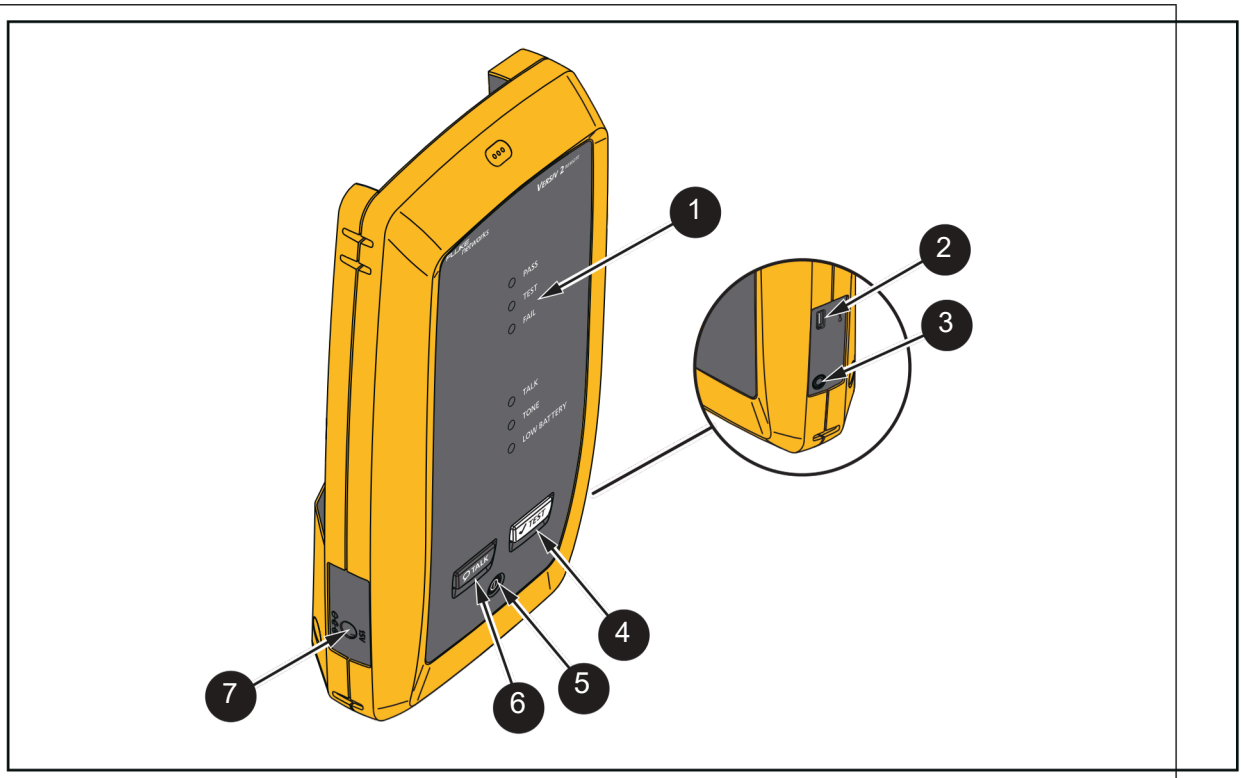
The Remote

Table2 shows the features of a Versiv Remote.

Note

If you have two main testers, you can use one as a remote. To select the remote function, tap ***TOOLS*** > ***Main as Remote****.*

Table 2. Remote Features

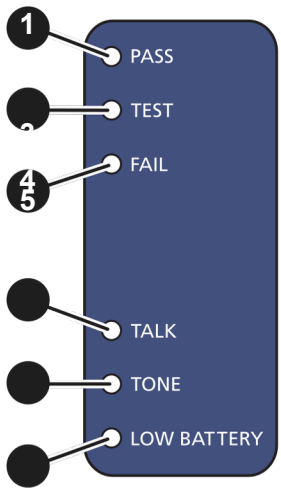


Item	Description
A	LED panel. See *Remote LED Panel*.
B	Micro USB port: Use to connect the Product to a PC to upload test results to the PC or to install software updates on the Product.
C	Headset jack
D	Push B to start a test.
E	Push E to turn on or off the Product.
F	If available for the installed module, push F to use a headset to talk to the person on the end of a link connected to the Main. Push again to adjust the volume. Push and hold F to turn off the talk function.
G	Ac adapter port.
--	Not shown: The connection port on the back of the Remote where a module connects to the Remote.

Remote LED Panel

Table3 describes the typical functions of the LEDs on the Remote.

Table 3. Remote LED Panel



Item	Description
A	The **PASS** LED turns on when a test passes.
B	The **TEST** LED turns on while a test is in progress or when you manually turn on the output port.
C	The **FAIL** LED turns on what a test fails.
D	When connected to a module that supports the TALK function. The **TALK** LED turns on when the talk function is on. The LED flashes until the Main accepts the request to talk.
E	The **TONE** LED flashes and the tone generator turns on if you push B on the Remote and a Main is not connected to the Remote. This feature is not available for use with all modules. The **LOW BATTERY** LED turns on when the battery is low.
F	

The LEDs have additional functions:

- The battery level indicator when you first turn on the Remote.
- Volume indicator for the **TALK** function. (Only on select modules.)
- Software update progress indicators.

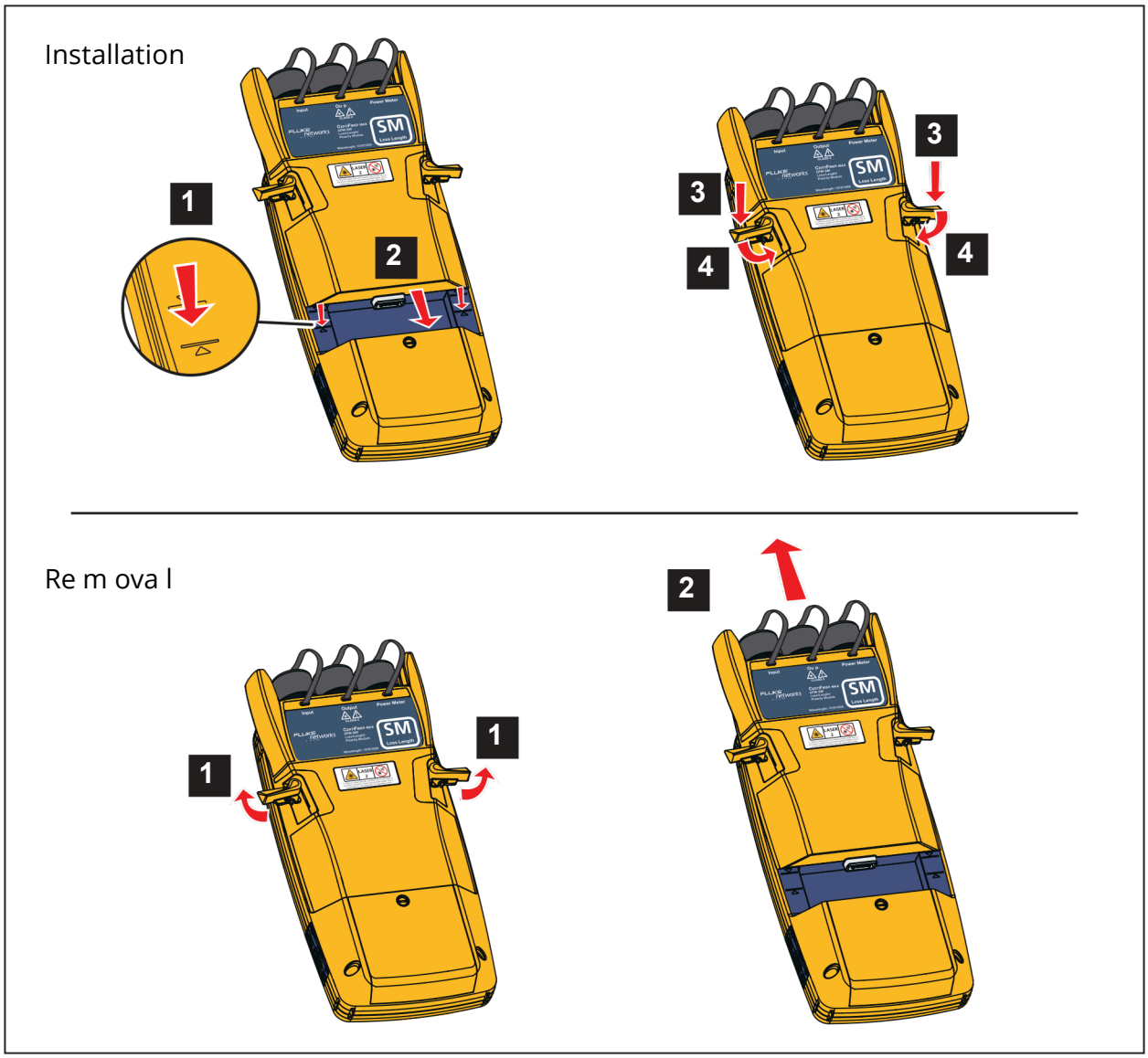
Install and Remove a Module

Figure1 shows how to install a module.

Caution

To prevent damage to the Main or Remote, push the latches down before you turn them.

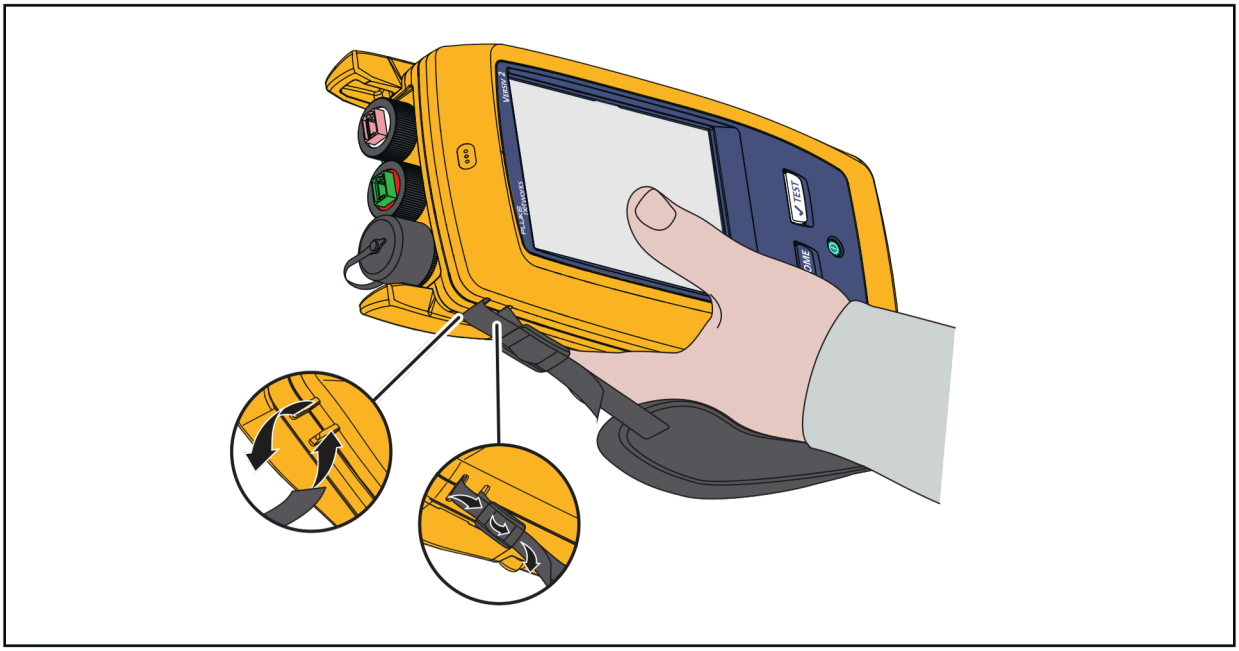
Figure 1. Install and Remove a Module



Install a Strap

A hand strap and an optional carry strap are available. Use the hand strap to hold the Product. Use the carry strap to carry or hang the Product. Figure2 shows how to install a strap and how to use the hand strap.

Figure 2. Install a Strap and Use the Hand Strap



Use the Touchscreen

To use the touchscreen, use your fingertip or a stylus that is made for projected capacitance touchscreens.

Note

The touchscreen does not respond if you tap the screen with a fingernail, use an incorrect type of stylus, or wear non-conductive gloves.

Caution

For correct operation and to prevent damage to the touchscreen:

- **Touch the screen only with your fingers or with a stylus that is made for projected capacitance touchscreens.**
- **Do not use too much force.**
- **Do not touch the screen with sharp objects.**

To use the touchscreen:

- To select an item on the screen, tap the item lightly with your fingertip.
- To scroll a screen, lightly touch the screen and move your fingertip in the direction you want the screen to move.

Use Projects

Use the ProjX™ management system to set up projects to monitor a job and make sure your work agrees with the requirements of the job.

Use a project to:

- Specify the tests that are necessary for a job. Specify settings for tests. Specify an operator for the job. Make sets of sequential IDs to use as names for test results. Automatically save test results with IDs from a set. Add the results from other necessary tests to each saved result in the project. See which IDs do not have results for a specified test. See what percentage of a job is completed. See how many links passed and how many failed. Keep the test results from a job in one place for easy access.

When you use a project, you can do tests and use IDs that are not specified in the project if necessary. You can also easily change the settings in a project if necessary.

Note

You do not need to install a module to set up a project for the module. The project settings are saved in the Main. To manage projects in the cloud, use LinkWareLive software.

Project Screen

Use the project screen to set up a project. See Table4.

Table 4. Project Screen

Item	Description
A	The name of the project. Projects from LinkWare Live include the organization name These projects can also include a sub-project name.
B	Operator - The name of the person who will do the tests for the project. For each operator, you can also enter the email address that the operator uses to sign into LinkWare Live.
C	Shows a summary of the test results in the project: Indicates the number of tests that passed. Indicates the number of tests that failed.

Table 4. Project Screen (cont.)

Item	Description
D	Test Setup - The tests that are available for the project. To add a test to a project, tap **NEW TEST**.
E	Cable ID Sets - The sets of IDs the tester can use for the names of test results. Each ID set is for either copper or fiber cable. To add a set of IDs to the project, tap **NEW ID SET**.
F	To use a different project or create a new project, tap **CHANGE PROJECT**.
G	Use **TRANSFER** to export or import projects to or from a flash drive and delete projects on the flash drive. The project data includes all project settings and test results. The **TRANSFER** function also lets you sync project setups and results with LinkWare Live.
H	Use **MANAGE** to rename, copy, or delete a project that is in the tester.
I	To delete the test setup or ID set, tap  . To copy the test setup or ID set so you can edit it to make a new one, tap  .

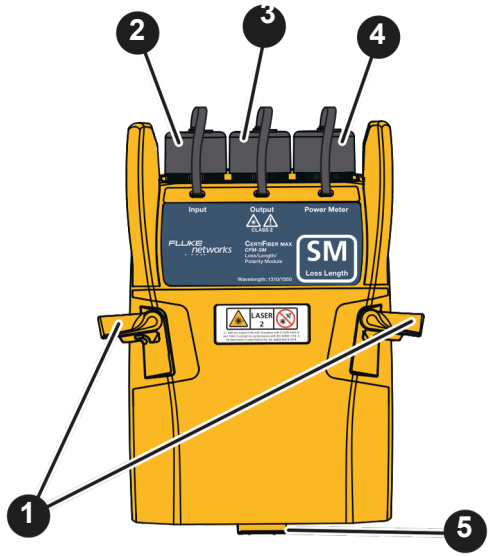
CertiFiber Max Module

Table5 shows the features of the CertiFiber Max module.

Caution

Do not connect Pinned connectors to Pinned UniportTM adapters (B and C). You can damage the connectors.

Table 5. CertiFiber Max Features



Item	Description
A	Latches
B	Input port with removable Uniport adapter and dust cap. This port receives optical signals for loss, length, and power measurements.
C	Singlemode output port with removable Uniport adapter and dust cap. The port transmits optical signals for loss, length, polarity, and VFL measurements.
D	Single-ferrule power meter port with removable adapters and dust cap. Use the port to measure power with single-ferrule connectors such as SC, LC, SN, and MDC at 1310nm and 1550nm.
E	The module connector, which connects the module to the Main or the Remote.

Remove and Install the Uniport™ Connector Adapters

To connect the MPO or MMC fiber connectors, change the INPUT Uniport connector adapter on the module to match your system under test. Change the Power Meter adapter to the appropriate interface to use the power meter.

To remove a Uniport adapter, see Table6:

1. Turn the collar of the adapter (D through F) counter-clockwise until it is unscrewed and then pull it straight out.
2. Once it is removed, protect the adapter by placing dust caps on each end and place in a protected carry case.

To install a Uniport adapter see Table6:

1. Inspect the adapters and the module ports to make sure the Uniport adapters and the module ports are clean. See Table7 for guidance on how to inspect each connector.
2. Align the keys and insert the adapter into the port.
3. Screw the collar clock-wise until fully seated.

Note

Each adapter is keyed so that it will only fit into its appropriate location (Power Meter, Output, Input).

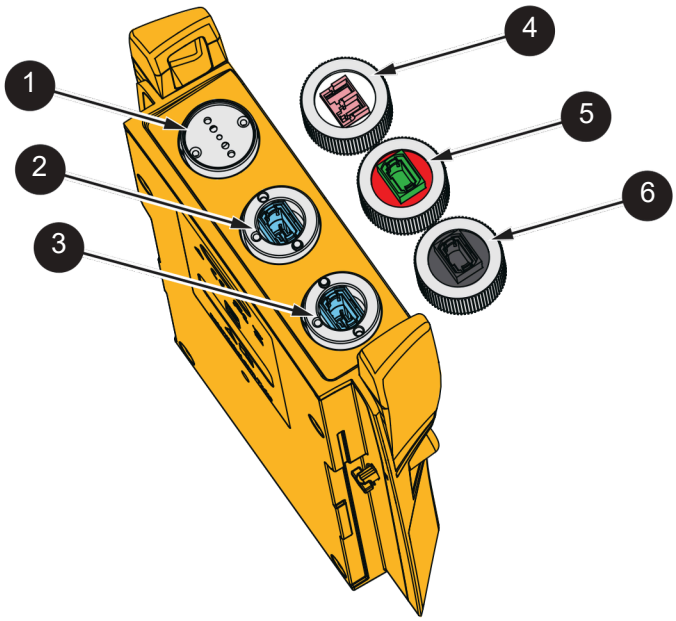
24 fiber Uniport adapters are specific to Main and Remote modules.

Caution

To protect the Uniport connectors:

- **Keep adpaters in their containers until you need to install them. Keep the adapter cover on the adapter until you need to install the adapter. To remove or install the adapter, turn only the collar on the adapter. Do not use tools to remove or install the adapters.**
- **Do not touch the photodiode lens. Put the key in the slot before you turn the adapter.**

Table 6. Connector Adaptors



Item	Description
A	Power Meter Port
B	Output Port
C	Input Port
D	Power Meter Uniport Adapter
E	Output Uniport Adapter
F	Input Uniport Adapter

Use Table7 to help inspect the adapters.

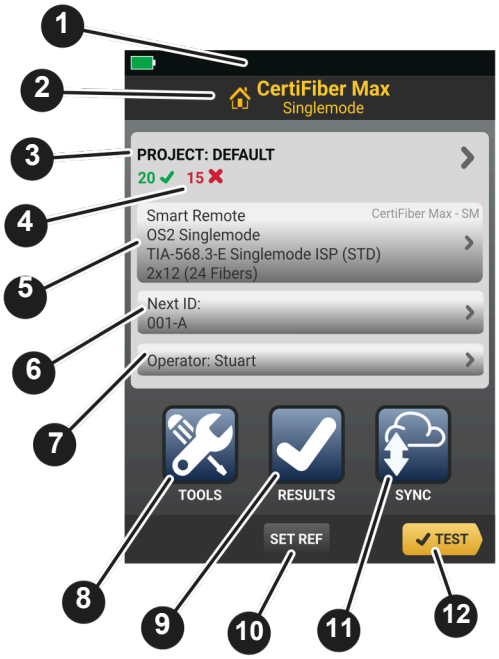
Table 7. Inspection Chart

Output Port (MPO16 APC)	Output ofModule w/o Uniport	TX Uniport Adapter Inside	TXUniport Adapter Outside	TX Branch
Inspection Tip	AMPO 12-32 u n keye d	AMPO 12-32 u n keye d	AMPO 12-32 unkeyed	AMPO 12-32 u n keye d
End Type Setting	MPO16	MPO16	MPO16	MPO16
Coupler	NA	MPO12	NA	MPO16
Orientation	Normal	Normal	Normal	Normal
Input Port (MPO 12/16)	**Input to Module w/o Uniport**	**RX Uniport Adapter Inside**	**RX Uniport Adapter Outside**	**RX Branch TRC**
Inspection Tip	AMPO 12-32 u n keye d	M12U UPC	AMPO 12-32 unkeyed	AMPO 12-32 u n keye d
End Type Setting	MPO16	MPO16	MPO12/16	MPO12/16
Coupler	NA	MPO12	NA	MPO12/16
Orientation	Reversed	Normal	Reversed	Normal
Input Port (MPO24)	**Input to Module w/o Uniport**	**RX Uniport Adapter Inside**	**RX Uniport Adapter Outside**	**RX Branch TRC**
Inspection Tip	AMPO 12-32 u n keye d	M12U UPC	MPO UPC	AMPO 12-32 u n keye d
End Type Setting	MPO16	MPO16	MPO 24	MPO 24
Coupler	NA	MPO12	NA	MPO12
Orientation	Reversed	Normal	Normal	Normal
Input Port (MMC16)	**Input to Module w/o Uniport**	**RX Uniport Adapter Inside**	**RX Uniport Adapter Outside**	**RX Branch TRC**
Inspection Tip	AMPO 12-32 u n keye d	MPO UPC	MMCE unkeyed	MMC ADP
End Type Setting	MPO16	MPO16	MMC 16	MMC 16
Coupler	NA	MPO12	NA	NA
Orientation	Reversed	Normal	Reversed	Normal
Input Port (MMC16)	**Input to Module w/o Uniport**	**RX Uniport Adapter Inside**	**RX Uniport Adapter Outside**	**RX Branch TRC**
Inspection Tip	AMPO 12-32 u n keye d	MPO UPC	MMC UPC	MMC ADP
End Type Setting	MPO16	MPO16	MMC 24	MMC 24
Coupler	NA	MPO12	NA	NA
Orientation	Reversed	Normal	Normal	Normal

Home Screen

Table8 shows the items that can show on the home screen.

Table 8. Home Screen



Item	Description
A	The header shows on all screens. The battery status, date, and time always show. Other icons can show on the header based on which user preferences you selected in the TOOLS menu.
B	The type of module installed in the Main or the Remote.
C	The project panel shows the name of the project. Tap the project panel to edit the project settings, select a different project, or add a new project. Test results save to the project.
D	Shows a summary of the test results in the project: Indicates the number of tests that passed. Indicates the number of tests that failed.
E	The test setup panel shows the settings the Product uses when you do a test.

Table 8. Home Screen (cont.)

Item	Description
F	The Next ID panel shows the ID that the Product gives to the next test results you save. Tap Next ID to: □ For bi-directional testing, save a test at END1 and END2 with the same Cable ID name. The results will then be merged. □ Enter an ID, select a different ID in the ID set, select a different set of IDs, or make a new set. The Product adds the IDs and ID sets you make to the project that shows on the home screen. Turn Auto Save on or off. □
G	The operator panel shows the name of the person who does the job. You can enter a maximum of 20 operator names. For each operator you can also enter the email address that the operator uses as an ID to sign in to LinkWareLive.
H	Tap to open the TOOLS menu to set user preferences.
I	Tap to open the RESULTS menu to see and manage the test results that are saved on the Main.
J	Tap to set the reference and to verify the test reference cords for loss, length, and polarity.
K	While connected to a network, tap SYNC to save files from the Main to LinkWareLive cloud software.
L	Tap to start a test.

TOOLS Menu (CertiFiber Max)

Table9 is a list of the functions that show in the TOOLS menu for CertiFiber Max.

Table 9. TOOLS Menu (CertiFiber Max)

Option	Description
Set Reference	Select **Set Reference** to open the Set Reference Wizard. Follow the instruction in the wizard. See also *About the Reference for Fiber Tests*.
Power Meter/Light Source	To measure the light at the Power Meter port.
Main as Remote	If you have two main testers, you can use one as a Remote.
VFL	The VFL transmits from the OUTPUT port. Select between **CW**, **Pulse**, and **Off**.
FiberInspector	Start a fiber inspection test. Select a FiberInspector test to enable the analyze option.
Test Counter	Use this option to keep track of the number of tests run on a TRC and/or the time elapsed between tests. Turn on this option. Then **EDIT** to configure the TRC Test Count Limit and/or the Time Limit. Push **Reset TRC Counter** when a new TRC is installed. The Time Counter starts when the Reference is set, and reset each time a test is run. The CFM will continue to make measurement even if the counters have expired.

Requirements for Reliable Fiber Test Results

To get reliable fiber test results and make sure the Product meets the required accuracy specifications:

- Use proper inspection and cleaning procedures, if necessary, before connecting fibers.
- Set the reference frequently. See *When to Set the Reference*.
- Use the latest version of the software for the Product. The latest software is available on our website. See (Software Update).
- Select the correct fiber type and test limit for the job.
- Select the correct index of refraction for the fiber. See Table11.
- Charge the battery fully.
- Send the modules to a Fluke Networks service center every 12 months for factory calibration.

About the Reference for Fiber Tests

The reference procedure for fiber cable sets a baseline power level for loss measurements. If the power level that enters the fiber from the source changes, the reference and your loss measurements will be incorrect. The power level can change, for example, when the temperature at the job site increases or decreases or when you disconnect then reconnect a test reference cord at the tester's output port. So, it is important to set the reference frequently.

When to Set the Reference

Note

At the job site, turn on the Mains and Remotes that you will use and let them sit for a minimum of 15 minutes before you set the reference with the output branch of the TRCs connected. Let them sit longer if they are above or below ambient temperature.

The Product requires you to set the reference when you:

- Change the Test Setup, for example from 12 to 24 fibers.
- Change the CertiFiber Max module in the Main or the Remote.
- Use a different Remote.
- Change the **Reference Method** in the test setup.

Additionally, set the reference:

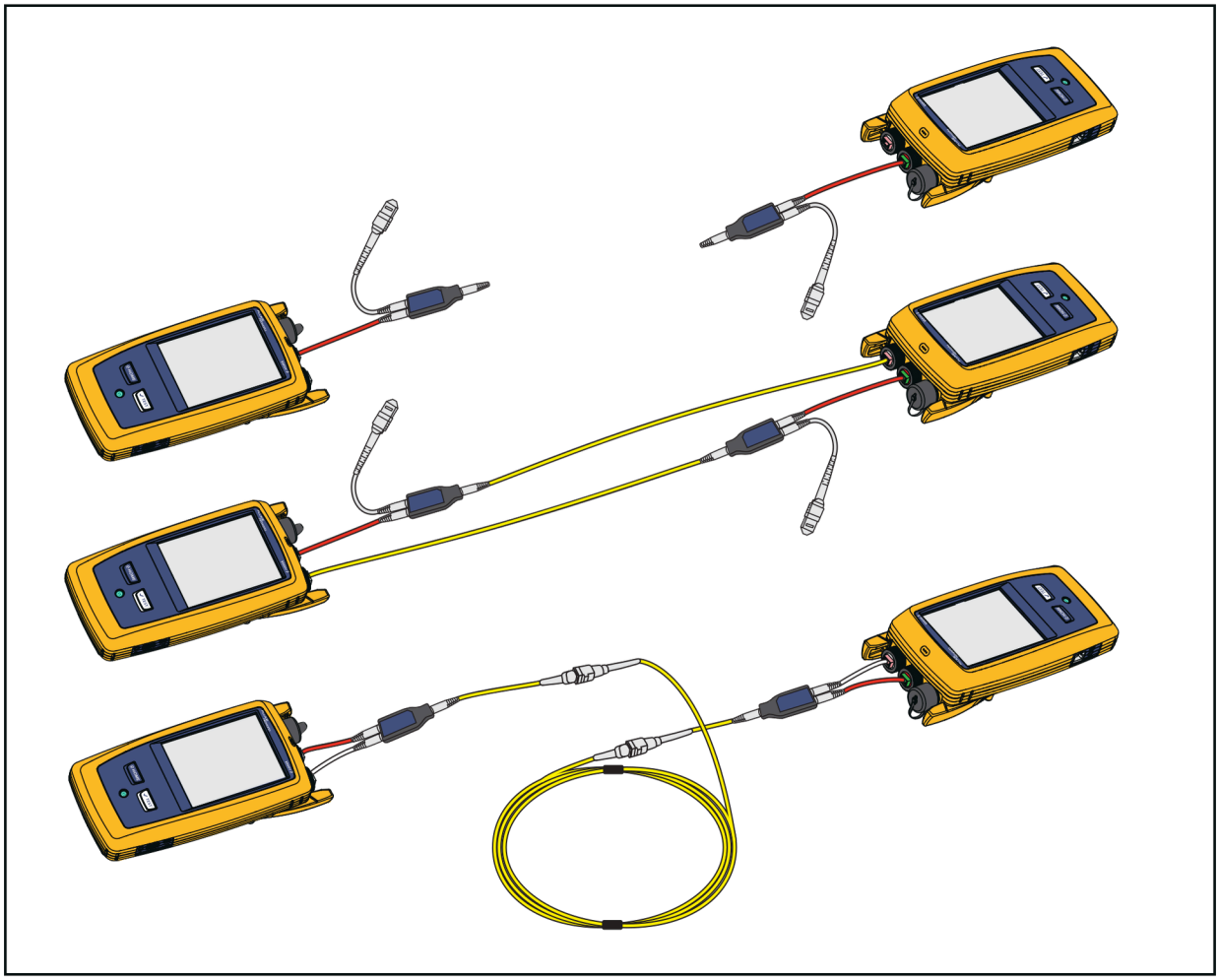
- At the start of each day, at the job site, then at regular intervals during the day. For example, set the reference when you start tests on a different series of fibers.
- When you connect a test reference cord to the output port of the module or to another source, even if you connect the same test reference cord you connected previously.
- When a message shows on the display that says the reference is out of date.
- When a loss measurement is excessively negative. This occurs when there was a problem when you set the reference. For example, an endface was dirty or the Product was cold.

Caution

After you set the reference, do not disconnect the test reference cords from the output port of the module. This can change the amount of optical power that enters the fiber and the reference might not be correct.

Figure3 shows the TRCs necessary for tests on links with APC connectors. When setting a reference, connect the transmit branch (red brand) to the output port, then connect the yellow branch to the INPUT port. and set the reference. Then remove the yellow branch from the INPUT and connect it to the DUT, and connect the third branch (black/grey/white branch) to the INPUT port.

Figure 3. Set Reference Configurations



Good Reference Values

For **Smart Remote** mode, the typical ranges for Single-mode fiber reference values are -11.0dBm to -15.0dBm

If the reference value is outside of the applicable range, clean and inspect all connectors, then set the reference again. Do this even if the Product lets you use the value.

How to See the Reference Values

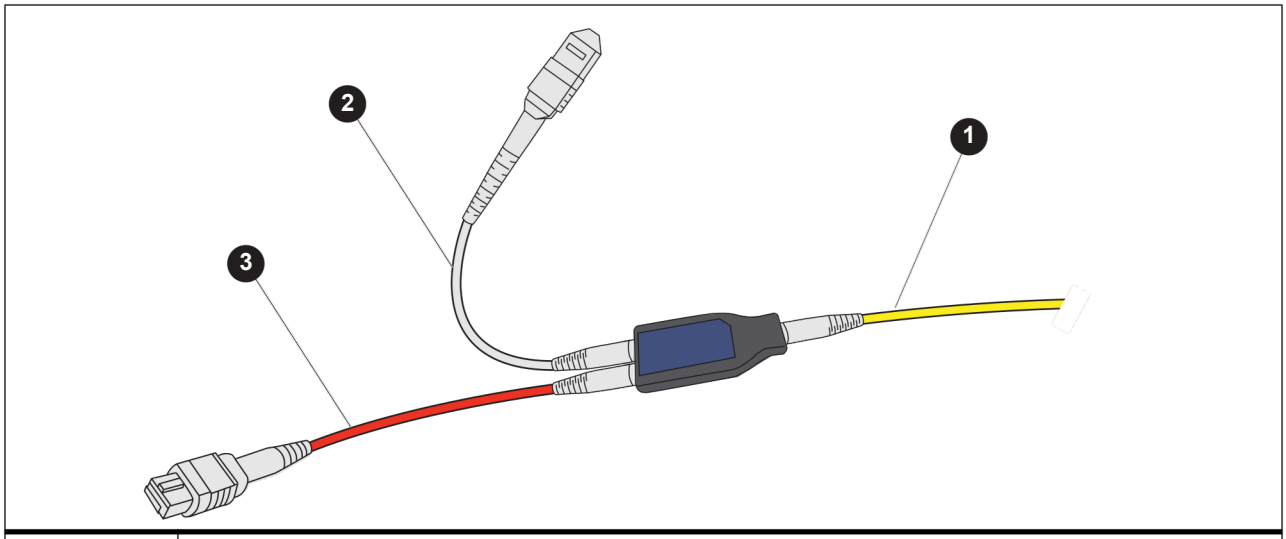
After you set the reference, tap **View Reference** on the SET REFERENCE screen.

After you do an Autotest, tap the result window for a fiber, then tap **VIEW REFERENCE**.

About Test Reference Cords

We recommend the use of only Fluke Approved Test Reference Cords.

Table 10. Test Reference Cord



Item	Description
A	DUT branch has 12, 16, or 24 fibers.
B	Transmit branch.
C	Receive branch, color code to indicate the number of fibers of DUT.

The Y-Cable Test Reference cords have a color code to help identify them.

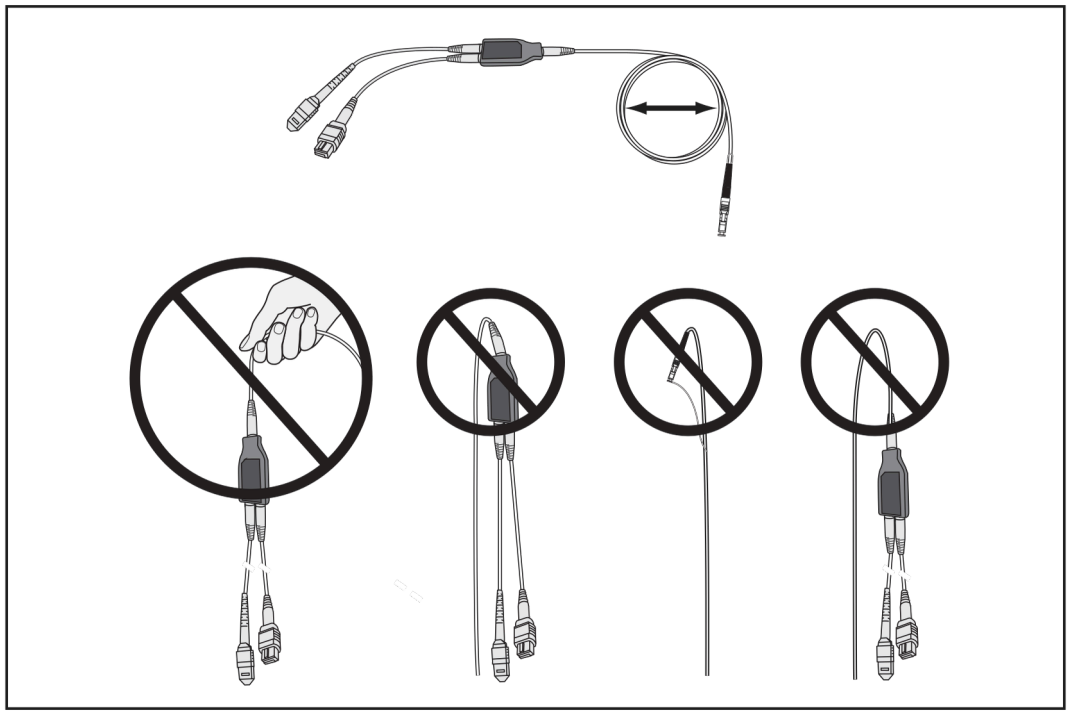
- The branch that will connect to the Device Under Test (DUT) will be yellow.
- The branch that connects to the output port of the tester is red, as is the output port.
- The receive branch of the Y-cable will be black for 12-fibers, grey for 16-fibers, and white for 24-fibers.

These color codes will be the same whether the connector is MPO or MMC.

Use only test reference cords (TRCs) that have low loss:

- Inspect the endfaces frequently and clean when necessary.
- Use the **TRC VERIFICATION** wizard available for the **1Jumper** and **3Jumper** reference methods to measure the losses of the TRCs. The wizard saves the results of the TRC tests to show that your TRCs were good. IDs for these results start with TRC, show the date and time of the test, and are automatically saved. Leave these results in your files with the other loss values to show that the TRC were in good condition and had continuity on all of the fibers.

Figure 4. Prevent Damage to the TRC y-Cables



Caution

Minimum bend diameter: 30mm (1.2in)

About APC Connectors

When you do tests on links with APC (angled physical contact) connectors, use only test reference cords with APC connectors on the ends connected to the link. If you connect non-APC connectors to the link, the connectors will cause large reflections that make loss measurements inaccurate. For tests on links with APC connectors, use test reference cords that also have APC connectors on the ends connected to the tester's input ports. This is necessary for the 1 jumper reference method. You can connect APC connectors to the tester's input ports because the fiber does not touch the lens on the input port.

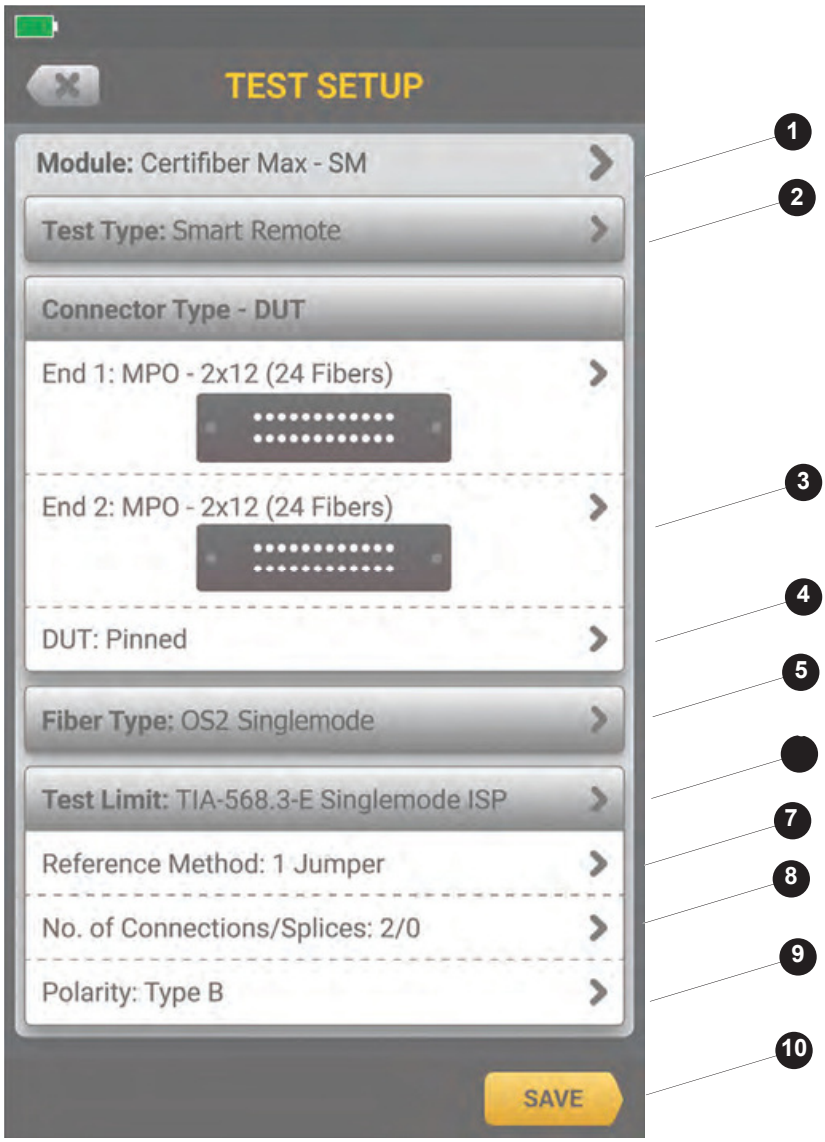
Caution

Only connect pinned to unpinned connectors. Connecting two pinned connectors together can damage the pins or the end-face of the connector. Connecting two unpinned connectors will most likely result in an alignment issue where you may get no connection or an unreliable connection.

Setup a Fiber Test

Use the Test Setup screen to configure a Fiber Test. See Table11. You may need to scroll on the Product to see all the options.

Table 11. Fiber Test Setup



Item	Setting	Description
A	**Module**	Select the CertiFiber Max module to use.
B	**Test Type**	Use **Smart Remote** mode for tests on multi-fiber cabling.

Table 11. Fiber Test Setup (cont.)

Item	Setting	Description
	Connector type-DUT	
C	**Connector Type**	Select the type of connector, such as MPO 12 or MMC 24, used in the cabling. The Product saves this setting to record the type of connector you used. This setting does not change your test results.
D	**DUT**	Select the connector type to Pinned or Unpinned based on the DUT configuration.
E	**Fiber Type**	Select a fiber type that is correct for the type you will test. To see a different group of fiber types, tap **MORE**, then tap a group. To make a custom fiber type, tap **Custom** in the **Fiber Groups** list. See the Technical Reference Handbook.
F	**Test Limit**	Select the correct test limit for the job. To see a different group of limits, tap **MORE**, then tap the name of a group. To make a custom limit, tap **Custom** in the **Limit Groups** list. See the *Technical Reference Handbook*.
	Reference Method	
G	**Jumper Reference**	Enter the number of jumpers you will use to set the reference. The dotted lines in the diagram on the screen show you which parts of the link are included in the test results. The number of jumpers you use effects the loss measurements: □ **1 Jumper**: Loss measurements include the connections at both ends of the link. The figures in this manual show **1 Jumper** connections. □ **3 Jumper**: Loss measurements do not include the connections at the ends of the link. The tester measures only the loss of the fiber.

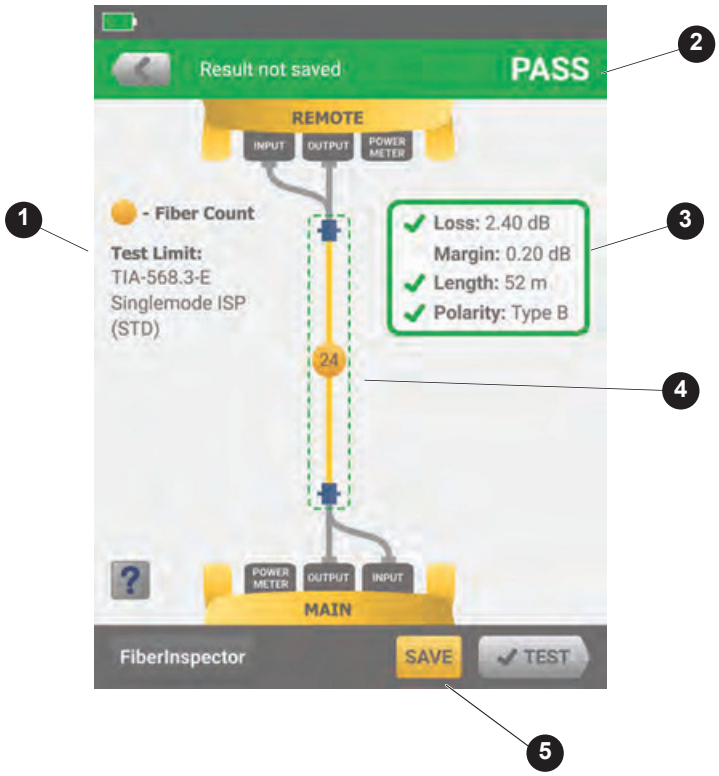
Table 11. Fiber Test Setup (cont.)

Item	Setting	Description
G	**Jumper Reference** (continued)	This setting does not change the loss measurements, but it can change the **PASS**/**FAIL** result for test limits that use a calculated loss limit. For all test limits, the tester saves this setting to show the reference method you used. **Caution** **Most cable manufacturers will give you a warranty on a fiber installation only if you use the 1 Jumper reference method when you certify the installation.** *Note* *Different standards use different names for the methods.*
	TRC LENGTH (Test reference cord length)	You can enter length of your test reference cords when you set the reference. To enter this value, tap **TRC LENGTH** on the **SET REFERENCE** screen. The length you enter does not change the test results. The tester saves the length with the results to meet TIA reporting requirements.
H	**No. of Connectors/ Splices**	The **Total Connections** and **Splices** settings are applicable only if the selected test limit uses a calculated limit for loss. **Total Connections**: Enter the total number of connections that are in each path of the link. Do not adjust the number for the **Reference Method** you use. For example, if the link has 3 connections, enter "3" even if you use the **1 or 3 Jumper** reference method. When the tester calculates the loss limit, it automatically removes the losses of the connections you used to set the reference. *Note* *The CertiFiber Max automatically adjusts the number of connections for the Reference Method you use.* **Splices**: Enter the number of splices in each path of the link.
I	**Polarity**	Select the expected polarity of the Cabling system under test, such as Type A or Type B. Single or dual row connector styles have different polarity options.
J	**SAVE**	Use the **SAVE** to save the Test Setup.

Run Tests

Once the test setup is complete, and the reference is set, push **TEST** to start a test. The results are displayed on a test result summary page. Tap the summary result bubble to see detailed results from the test. Tap **SAVE** on the summary screen to save the test results.

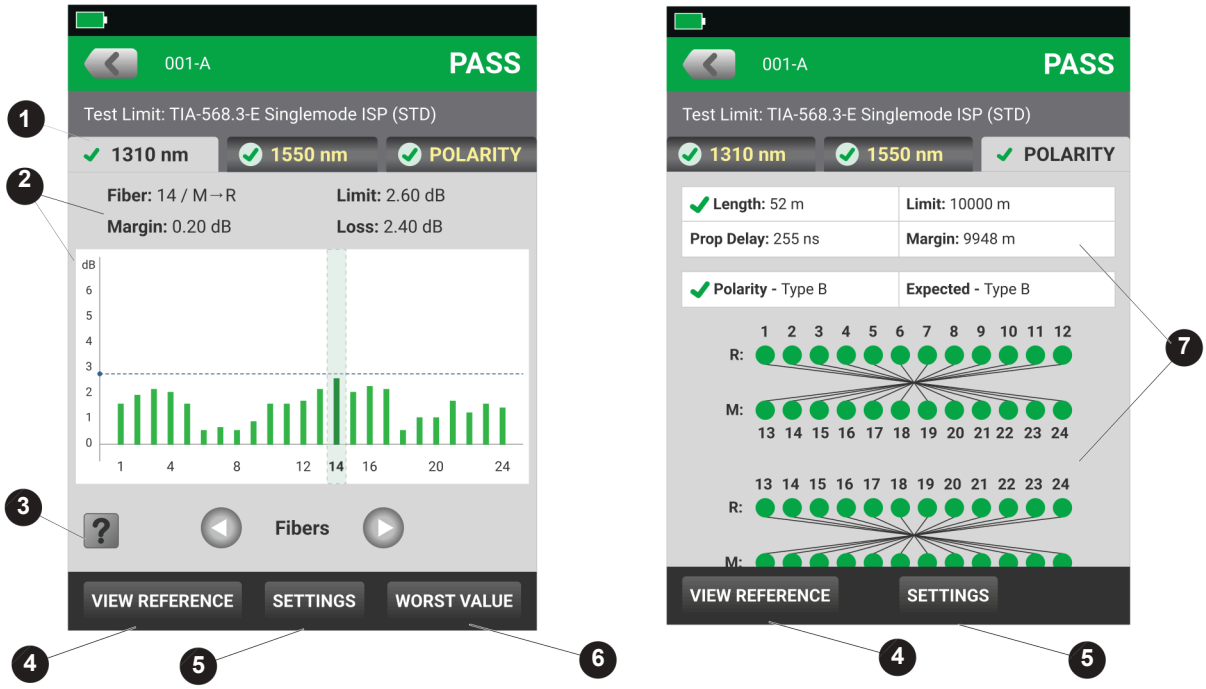
Table 12. Test Results



Item	Description
A	The test limit the tester used for the test.
B	The overall result for the test.
C	Test summary results show the worst loss, worst margin, length, and polarity. ✓ Indicates the tests that passed. ✗ Indicates the tests that failed. Tap to see the test details screen. See Table13.
D	Visual information about the test setup. Dashed lines indicate the connectors and fiber that are included in the test. Connector icon shows the number of fibers used in the test setup.
E	Tap **SAVE** to save the test results.

Table13 shows the details from the test results. Green indicates a PASS, Red indicates a FAIL.

Table 13. Test Result Details



Item	Description
A	Tap on each tab to see detailed information about 1310nm, 1550nm, or Polarity and length data. (Singlemode)
B	Shows the test details: □ **Fiber**: The selected fiber number is highlighted in the table. The test direction shows as M (Main end) and R (Remote end) for example, M →R is from Main to Remote. □ **Limit**: Shows the test limit. □ **Margin**: Shows the difference between the limit and the loss. □ **Loss**: Shows the loss value for that fiber. □ A graphic of the fiber measurement. □ □ Tap on a new fiber to see detailed information about that fiber, or tap / to change the highlighted fiber.
C	Tap to go to the Help screen
D	Tap to go to the View Reference screen

Table 13. Test Result Details (cont.)

Item	Description
E	Tap to go to the configuration data for this test. Tap to
F	move the highlight to the fiber with the worst value. The
G	polarity detail tab shows: □ □ □ □ □ □ **Length**: Shows the measured length **Prop Delay**: Shows propagation delay **Limit**: Shows the test limits for length **Margin**: Shows the difference between the limit and the loss. **Polarity** and **Expected**: Shows the measured and expected polarity type. A graphic of the measured polarity. Where M is the Main end, and R is the Remote end.

Maintenance

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents. Dirt or moisture in the terminals can affect readings.

XW **Warning**

To prevent possible electrical shock, fire, or personal injury:

- **Have an approved technician repair the Product.**

Charging the Battery

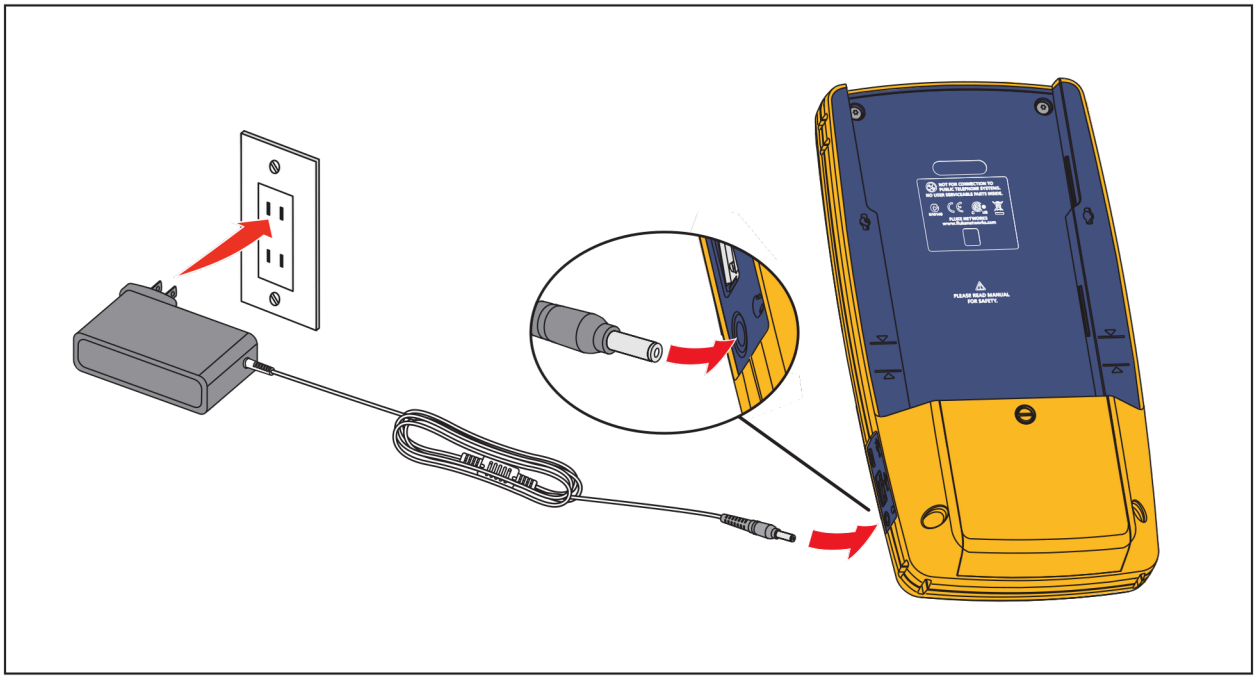
Before you use the battery for the first time, charge it for about 2 hours with the tester turned off. To charge the battery Connect the AC adapter to the 15V jack on the left side of the tester. See Figure5.

A fully-charged battery operates for approximately 8 hours of typical use. The battery takes approximately 4 hours to fully charge when the tester is turned off.

Note

You do not need to fully discharge the battery before you recharge it. The battery will not charge if its temperature is outside the range of 32 °F to 104 °F (0 °C to 40 °C). The LED is yellow if the battery will not charge.

Figure 5. Charging the Battery



Product Disposal

Dispose of the Product in a professional and environmentally sound manner:

- Delete personal data on the Product before disposal.
- Remove batteries that are not integrated into the electrical system before disposal and dispose of batteries separately.
- If this Product has an integral battery, put the entire Product in the electrical waste.