



Multi Channel Fiber Tester MT9100A

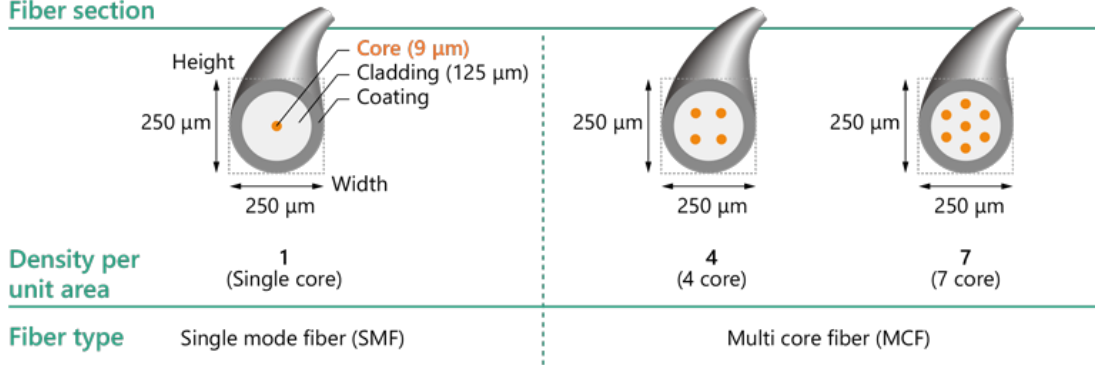


Recently, the advent of AI and other emerging technologies has led to a growing demand for optical communication, and there is a constant need for higher capacity. Space division multiplexing (SDM), designed to increase the capacity of optical fibers, is now attracting attention as a way to address this need. The **weakly coupled multicore fiber**, which is one of the SDM technologies, contains multiple cores within a single fiber cladding. It allows higher capacity to be achieved by increasing the number of cores. This optical fiber, however, is known to have drawbacks - **inter-core crosstalk***, which degrades the signal quality, and **high installation costs**.

The **Multi Channel Fiber Tester MT9100A** is a solution developed to overcome these drawbacks.

* Inter-core crosstalk is a phenomenon in which an optical signal leaks from one core to another.

Fiber section



Density per unit area

Fiber type

Single mode fiber (SMF)

Multi core fiber (MCF)



Weakly coupled multicore fiber

MT9100A

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The Multi Channel Fiber Tester MT9100A is the **industry's first* solution** that is capable of evaluating the distribution of inter-core crosstalk in a weakly coupled multicore fiber (MCF).

*As of November 2025,
based on our research

● Touch panel-based 9-inch display

Front view



● Portable chassis

- ✓ 257 (W) × 163 (H) × 185 (D) mm
- ✓ Built-in battery with a runtime of 6 hours

● 4 synchronized OTDR interfaces

Top view



● Remote control

- ✓ VNC-based GUI control from the PC
- ✓ Support for SCPI commands

■ Main features

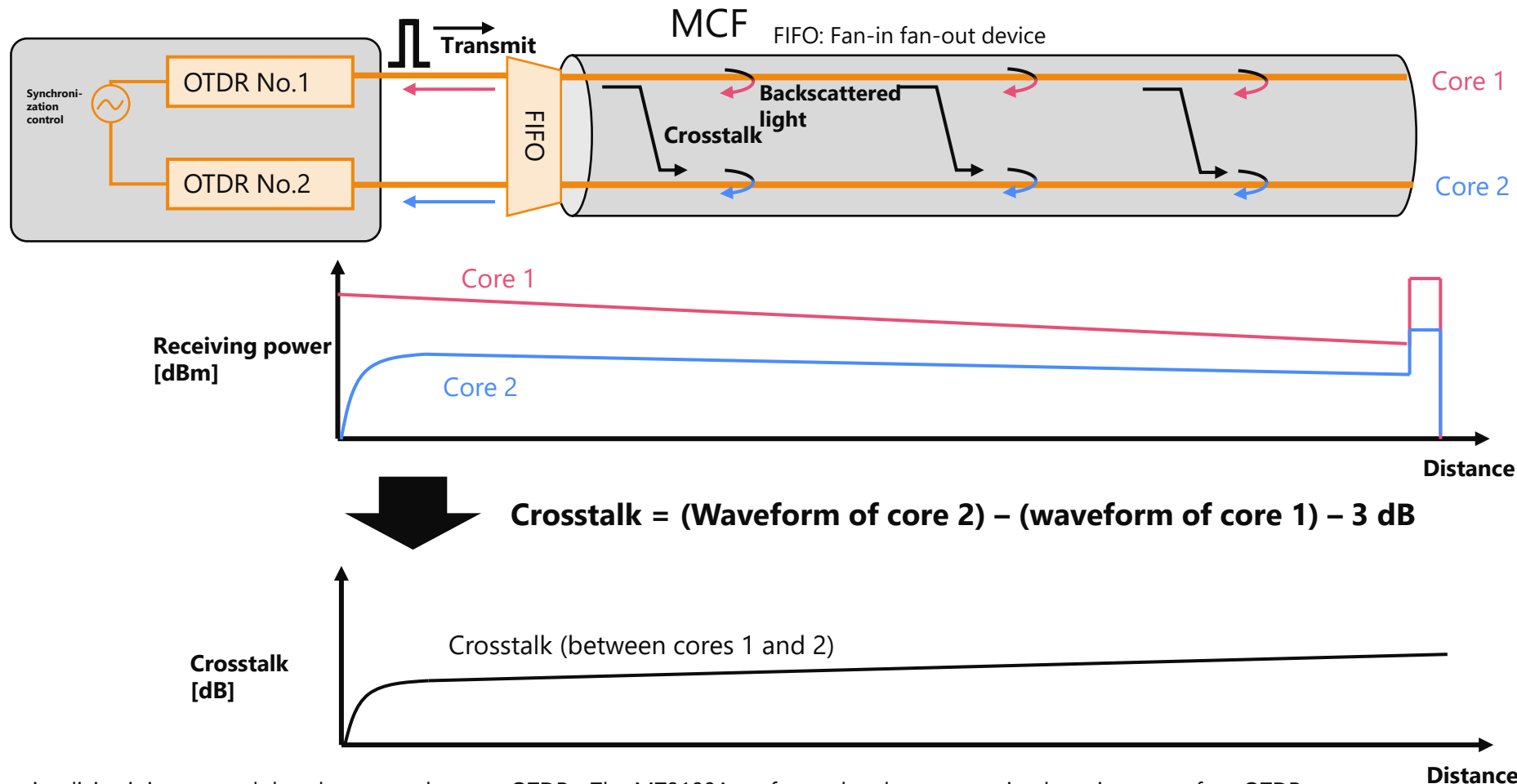
- ✓ **Industry's first multi-channel OTDR system supporting 4 channels**
- ✓ **Evaluation** of inter-core crosstalk **as the distribution**
- ✓ **Single-action** evaluation **without connection switching**

■ Use cases

- ✓ MCF research and development
- ✓ Field testing of MCF and MCF cables
- ✓ MCF and MCF cable manufacturing and inspection processes

Product overview – Multi-channel OTDR system

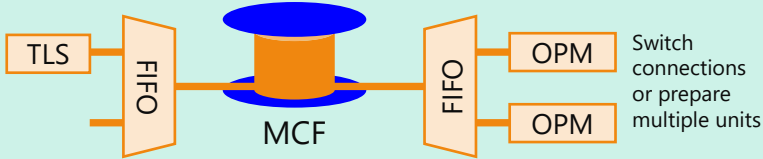
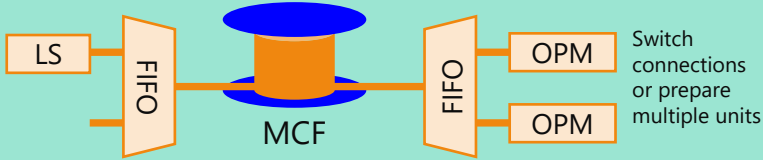
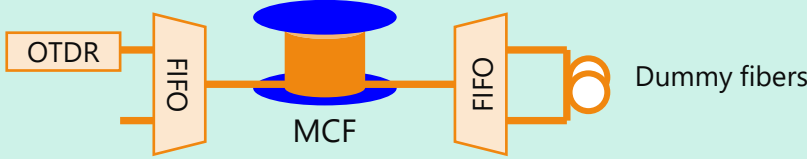
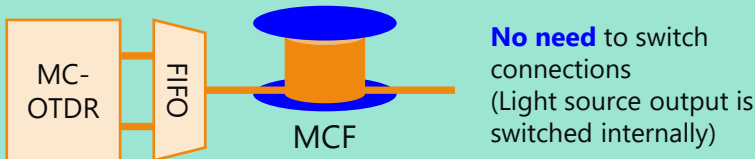
The multi-channel OTDR system adopted by the MT9100A has multiple built-in OTDRs, which are synchronized to conduct measurement. One OTDR transmits a probe pulse, and all the OTDRs receive the returned backscattered light. This allows the system to measure inter-core crosstalk as a distribution.



* For simplicity, it is assumed that the system has two OTDRs. The MT9100A performs the above operation by using up to four OTDRs.

Product overview – Comparison with other methods

Several methods are available to measure MCF crosstalk. The multi-channel OTDR (MC-OTDR) adopted by the MT9100A has a number of advantages.

Method	Measurement diagram	Evaluation speed	Distribution measurement	Portability	Other measurable items
TLS/OPM (wavelength sweep)		Low Connection switch required	Impossible	Low	None
LS/OPM (CW light source)		Low Connection switch required	Impossible	Low	None
Loopback		Medium	Impossible	High	- Attenuation loss - Return loss
MC-OTDR (MT9100A)		High	Possible	High	- Attenuation loss - Return loss

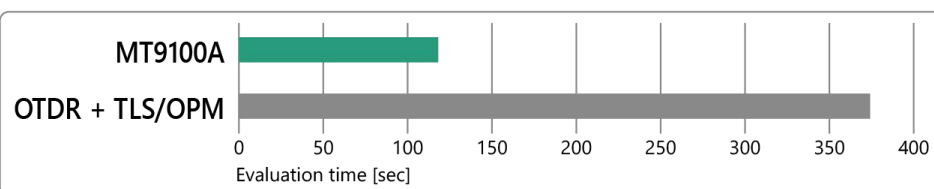
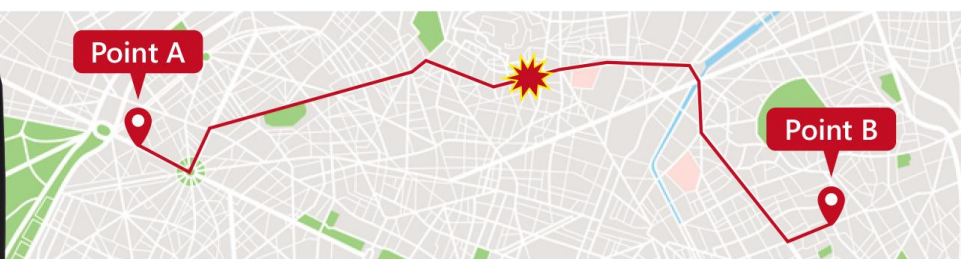
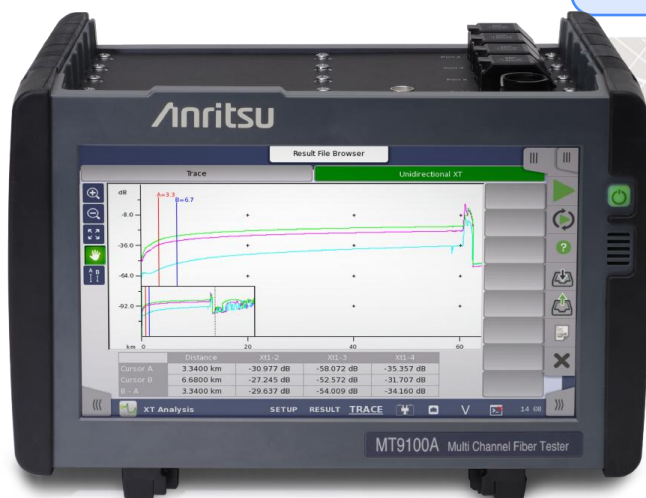
* LS means Light source, and also TLS means Tunable Light Source.

Product overview – Advantages for each use case

Taking advantage of its features, the MT9100A works effectively mainly in two use cases.

● R&D/installation test

- ✓ Identifying loss and points of failure due to crosstalk helps **establish cable installation requirements**.
- ✓ Since there is no need to have personnel and equipment on both ends, a **cost- and time-efficient evaluation can be provided**.
- ✓ The battery-powered tester can be used even in locations where a power source is unavailable.



● Fiber cable manufacturing process

- ✓ The MT9100A evaluates transmission loss, return loss, and crosstalk **more than three times as efficiently as the conventional methods**.
- ✓ There is no need to switch connections during the evaluation. This reduces incorrect inspections and error arising from connection mistakes, leading to **less rework due to human errors**.
- ✓ The option with a narrower central wavelength standard* (opt. 012/013) **can provide a margin of error for the crosstalk test specs**.

* For detailed specifications, see "Main specifications" and the relevant catalog.

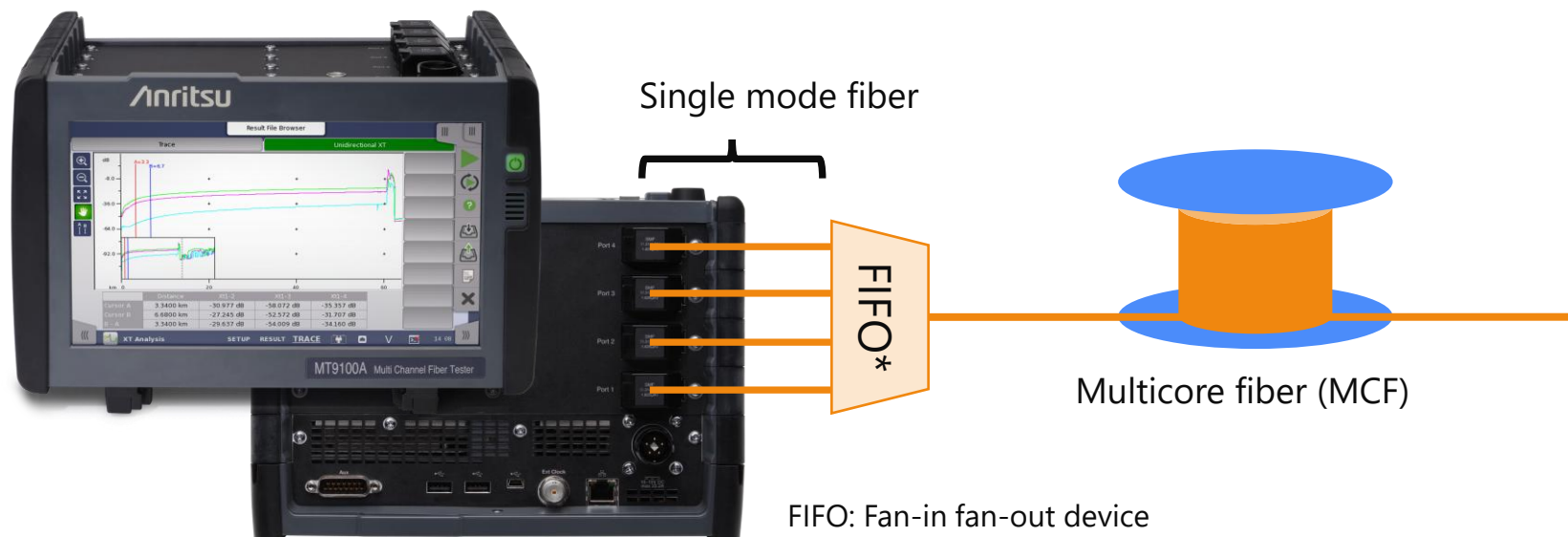
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Main functions – Connection setup

Unlike other measurement methods, the MT9100A can evaluate a fiber without switching connections during the measurement.

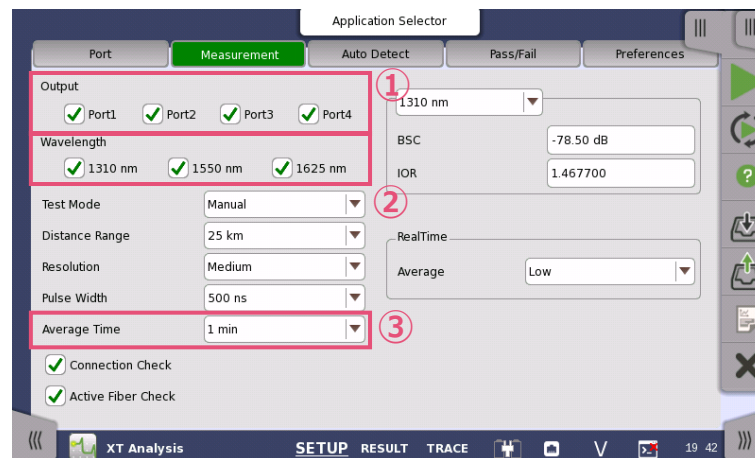
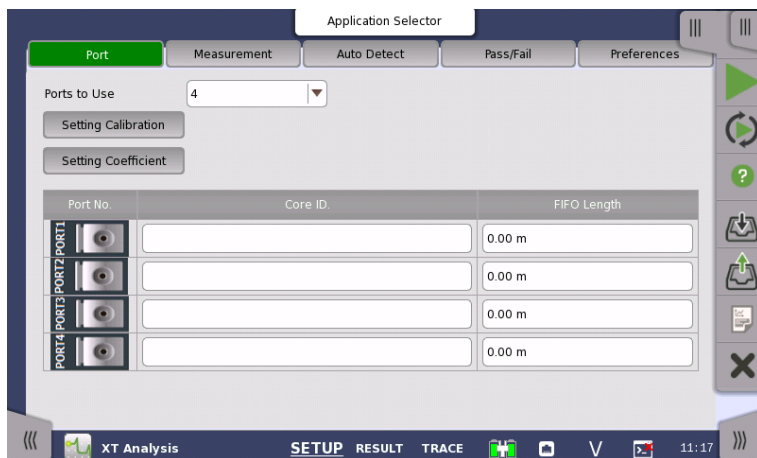
Also, since there is no need to connect a FIFO to the far end of the fiber to be evaluated, the tester can be set up with ease.



* Connecting an MCF requires a FIFO that supports breakout to single mode fibers.
To measure crosstalk in an MCF, use a FIFO whose crosstalk is sufficiently small.

Main functions – Measurement condition setting

The MT9100A can evaluate up to four MCF cores. When measuring some of the four-core MCF items or a two-core MCF, unnecessary measurements can be omitted.



The total measurement time is determined by the following three settings.

$$\text{Total Measurement Time} = \text{① Number of Output Ports} \times \text{② Number of Wavelengths} \times \text{③ Average Time}$$

When the wavelength is 1550 nm and the average time is 30 seconds, the total time it takes to measure all the characteristics of a four-core MCF is 120 seconds.

Main functions – Measurement condition setting

Shown below are three measurement examples, along with the number of ports used, the output port setting, and the data obtained.

When measuring only core 1 of a 4-core MCF

Number of ports used: 4

Output:

☒ Port1 ☐ Port2 ☐ Port3 ☐ Port4

Number of obtained waveforms: 4

When measuring a 2-core MCF

Number of ports used: 2

Output:

☒ Port1 ☒ Port2 ☐ Port3 ☐ Port4

Number of obtained waveforms: 4

When measuring all combinations of a 4-core MCF

Number of ports used: 4

Output:

☒ Port1 ☒ Port2 ☒ Port3 ☒ Port4

Number of obtained waveforms: 16

Per wavelength		Output port			
		No.1	No.2	No.3	No.4
Input port	No.1	Attenuation loss (No.1)	Crosstalk (No.2-1)	Crosstalk (No.3-1)	Crosstalk (No.4-1)
	No.2	Crosstalk (No.1-2)	Attenuation loss (No.2)	Crosstalk (No.3-2)	Crosstalk (No.4-2)
	No.3	Crosstalk (No.1-3)	Crosstalk (No.2-3)	Attenuation loss (No.3)	Crosstalk (No.4-3)
	No.4	Crosstalk (No.1-4)	Crosstalk (No.2-4)	Crosstalk (No.3-4)	Attenuation loss (No.4)

Main functions – Result summaries

Once all measurements are complete, the screen displays two types of summaries, including the data about crosstalk. These summaries let you see the pass/fail results of an MCF or a transmission path including an MCF at a glance.

This summary is useful when you want to view the list of **transmission loss, return loss, far-end crosstalk values, and all pass/fail results** during a manufacturing inspection or for a similar purpose.

No.	Wavelength	Test	Receive Core ID	Test State	OTDR	UXT
11	1625nm	XT3-1		Done	...	Pass:-30.997 dB
		XT3-2		Done	...	Pass:-17.343 dB
		OTDR		Done	Pass	...
		XT3-4		Done	...	Pass:-19.525 dB
12	1625nm	XT4-1		Done	...	Pass:-17.286 dB
		XT4-2		Done	...	Pass:-32.350 dB
		XT4-3		Done	...	Pass:-16.900 dB
		OTDR		Done	Pass	...

"OTDR" references the result of the transmission loss waveform event. "UXT" makes a pass/fail judgment based on whether the far-end crosstalk value exceeds the threshold. "Result" at the top indicates the overall pass/fail result. If there is any unacceptable item, **Fail** is shown for that item.

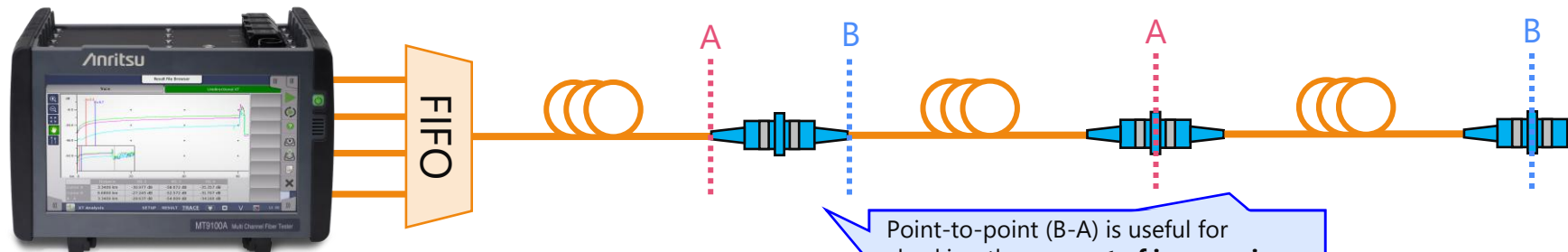
This summary is convenient when you want to check **all far-end crosstalk values at once**.

		port1	port2	port3	port4	total
Input	port1		-14.523 dB	-30.997 dB	-17.286 dB	-12.615 dB
	port2	-17.882 dB		-17.343 dB	-32.350 dB	-14.521 dB
	port3	-30.686 dB	-14.159 dB		-16.900 dB	-12.244 dB
	port4	-19.732 dB	-31.067 dB	-19.525 dB		-16.464 dB

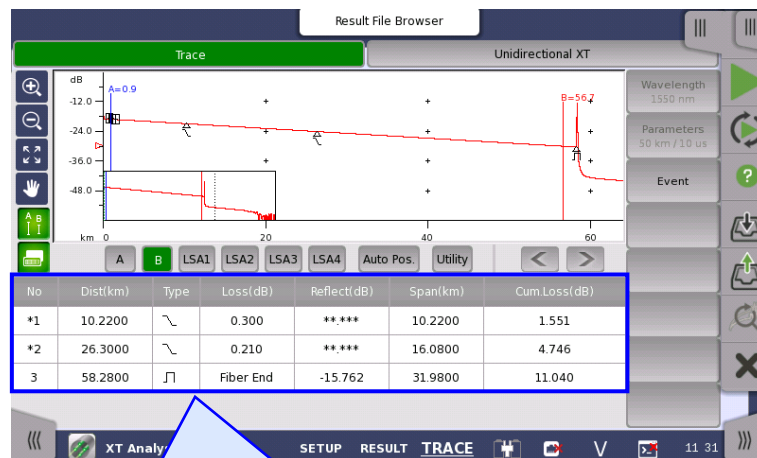
A two-dimensional table consisting of transmission and reception ports displays far-end crosstalk values. "Total" shows **the total amount of crosstalk that a core receives from all the other cores**. This represents the amount of crosstalk that an optical signal actually receives and can be used as an indicator in a transmission test.

Main functions – Measurement waveform

View both transmission loss and crosstalk directly from the waveform. Crosstalk values can be measured at any point, or compared as the difference between two points.



Point-to-point (B-A) is useful for checking the **amount of increase in crosstalk only at a connection point or only for a specific span.**



Regarding the transmission loss waveform, the loss and reflection present in the fiber not being measured are automatically detected as events, which are displayed as an event table. This is helpful when there are many events or when you want to avoid overlooking small events.

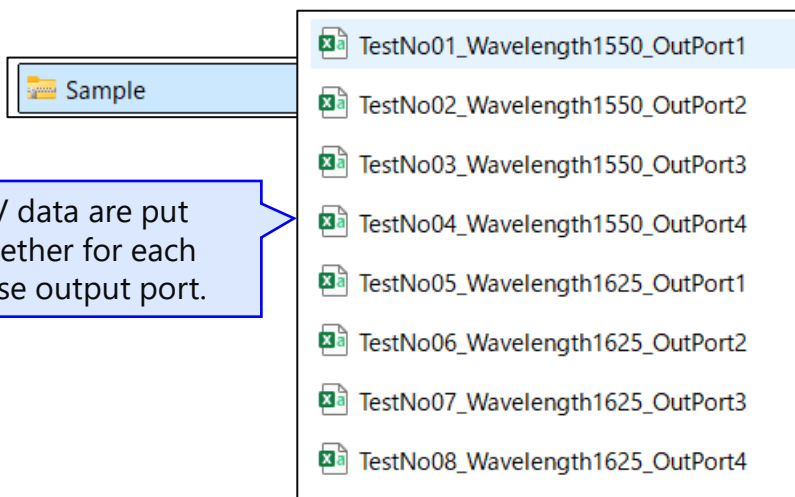
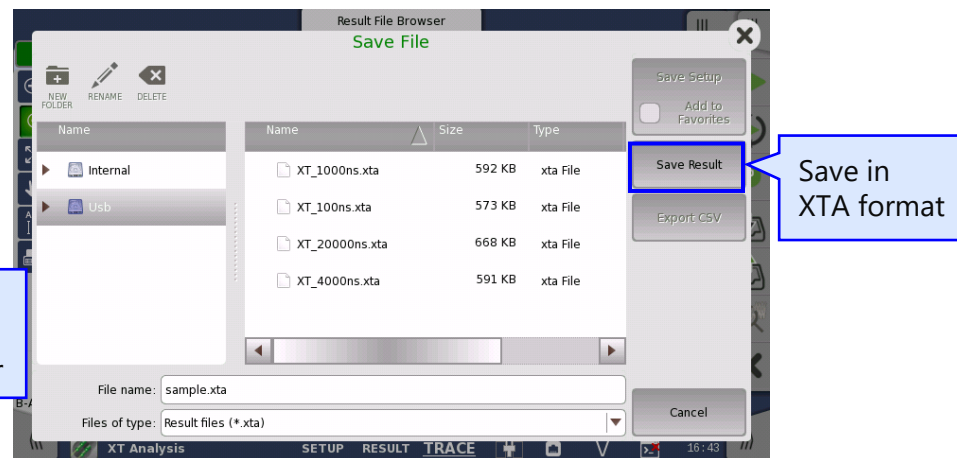
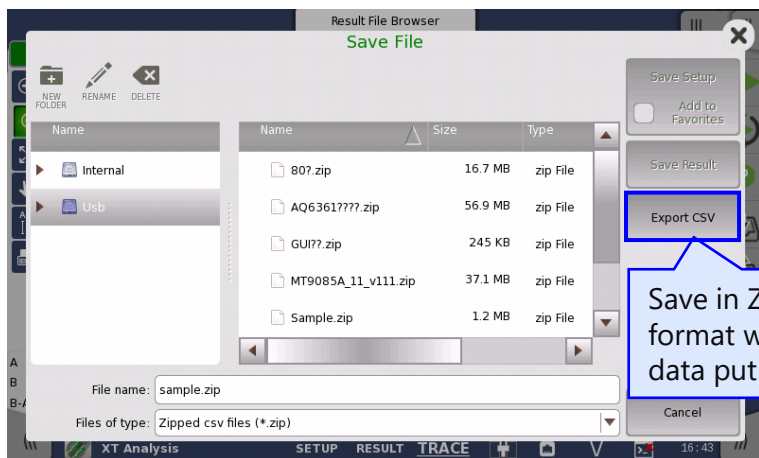
Switch between tabs



Up to three waveforms are simultaneously drawn for crosstalk. By specifying points with cursors A and B, you can display a table showing the crosstalk value at each of those points and the amount of increase in crosstalk between two points (B-A).

Main functions – Saving waveforms

The measured data is saved in XTA format, which can be read by the MT9100A. To retrieve the waveforms from the MT9100A and check them, use CSV output.

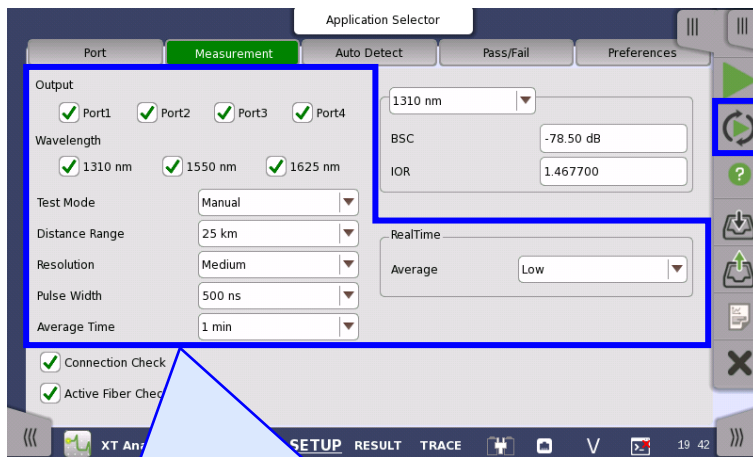
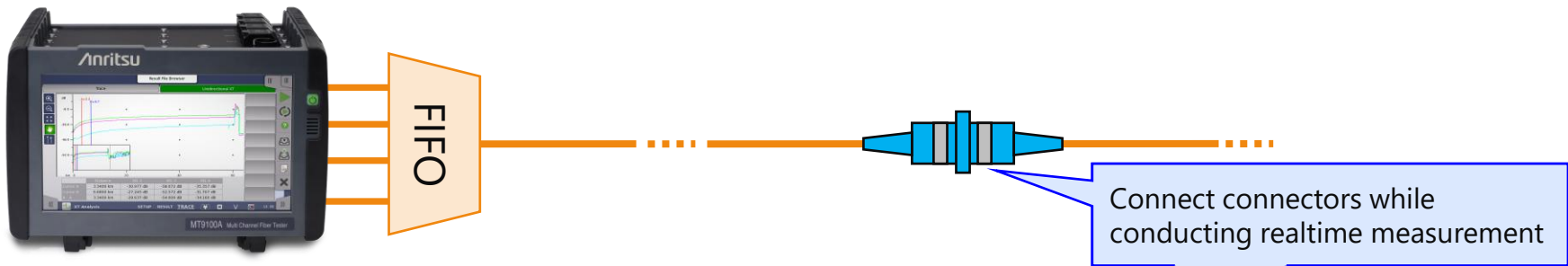


Measurement data of each port Crosstalk Crosstalk (linear)

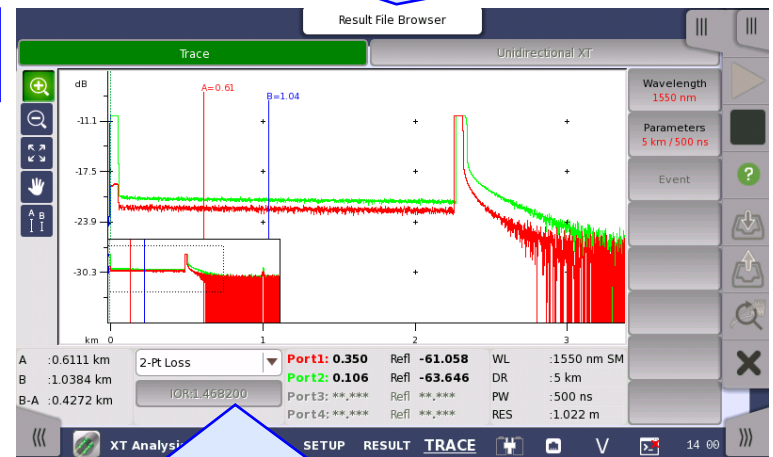
Distance[cm]	Trace(Port1)	Trace(Port2)	Trace(Port3)	Trace(Port4)	UXT(Port1)	UXT(Port2)	UXT(Port3)	UXT(Port4)	UXT_linear(Port1)	UXT_linear(Port2)	UXT_linear(Port3)	UXT_linear(Port4)
-2000	-16.124	-41.981	-50.572	-60	-52.445	-70.094	-91.103		5.69513e-06	5.78672e-08	7.75717e-10	
0	-13.806	-36.098	-45.823	-36.727	-45.315	-65.232	-49.193		2.94106e-05	2.99804e-07	1.20421e-05	
2000	-13.408	-35.545	-45.511	-35.802	-45.005	-65.404	-48.139		1.51867e-05	2.88162e-07	1.53498e-05	
4000	-13.081	-35.271	-45.199	-35.36	-45.111	-65.434	-47.909		3.08251e-05	2.86178e-07	1.61847e-05	
6000	-12.783	-35.271	-45.051	-35.36	-45.707	-65.734	-48.505		2.68722e-05	2.67077e-07	1.41092e-05	
8000	-12.561	-35.271	-44.658	-35.36	-46.151	-65.392	-48.949		2.42607e-05	2.88959e-07	1.27381e-05	
10000	-12.353	-35.271	-44.446	-35.36	-46.567	-65.384	-49.365		2.20447e-05	2.89492e-07	1.15745e-05	
12000	-12.135	-35.271	-43.932	-35.36	-47.003	-64.792	-49.801		1.9939e-05	3.3177e-07	1.04689e-05	
14000	-11.94	-35.151	-43.538	-35.36	-47.153	-64.394	-50.191		1.92621e-05	3.63611e-07	9.5698e-06	
16000	-11.775	-35.017	-43.188	-35.36	-47.215	-64.024	-50.521		1.89891e-05	3.95947e-07	8.86959e-06	
18000	-11.611	-34.853	-42.855	-35.154	-47.215	-63.686	-50.437		1.89891e-05	4.27993e-07	9.04281e-06	
20000	-11.468	-34.57	-42.511	-34.929	-46.935	-63.284	-50.273		2.02536e-05	4.69501e-07	9.3908e-06	
22000	-11.314	-34.282	-41.687	-34.688	-46.667	-61.944	-50.099		2.15429e-05	5.392e-07	9.77469e-06	
24000	-11.176	-34.044	-41.142	-34.434	-46.467	-61.13	-49.867		2.25818e-05	7.70968e-07	1.03111e-05	
26000	-11.063	-33.868	-40.983	-34.248	-46.341	-61.038	-49.721		2.32222e-05	7.87475e-07	1.06636e-05	
28000	-10.938	-33.73	-40.913	-34.084	-46.315	-61.148	-49.643		2.33617e-05	7.6778e-07	1.08568e-05	
30000	-10.826	-33.548	-40.914	-33.931	-46.175	-61.374	-49.561		2.41272e-05	7.28848e-07	1.10638e-05	
32000	-10.72	-33.256	-40.694	-33.704	-45.803	-61.146	-49.319		2.62847e-05	7.68134e-07	1.16978e-05	
34000	-10.615	-32.842	-40.699	-33.494	-45.185	-61.366	-49.109		3.03043e-05	7.30192e-07	1.22773e-05	
36000	-10.525	-32.513	-40.544	-33.282	-44.707	-61.236	-48.865		3.38301e-05	7.5238e-07	1.29888e-05	
38000	-10.437	-32.205	-40.454	-33.016	-44.267	-61.232	-48.509		3.74372e-05	7.53072e-07	1.40962e-05	
40000	-10.347	-31.9	-40.473	-32.729	-43.837	-61.45	-48.115		4.13336e-05	7.16204e-07	1.54349e-05	
42000	-10.272	-31.533	-40.455	-32.455	-43.253	-61.564	-47.717		4.78282e-05	6.97649e-07	1.69162e-05	
44000	-10.192	-31.243	-40.51	-32.232	-42.833	-61.834	-47.431		5.20839e-05	6.55597e-07	1.80677e-05	
46000	-10.12	-31	-40.283	-31.998	-42.491	-61.524	-47.107		5.63512e-05	7.04103e-07	1.94672e-05	

Main functions – Realtime measurement function

When connecting an MCF by connectors or fusion splicing, it is necessary to check whether all the cores are appropriately connected. The realtime measurement function outputs pulses from all the ports used for the measurement, thereby checking the connection status of up to four cores simultaneously.



The realtime measurement reflects the values set in the measurement condition tab. If multiple wavelengths are set, the measurement starts with the one having the smallest number.



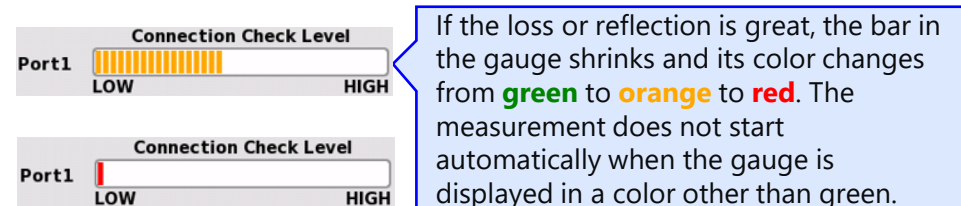
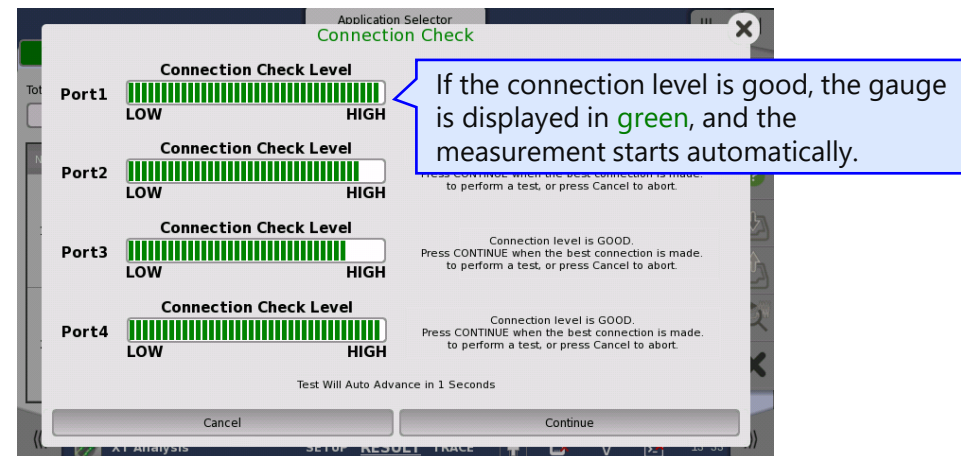
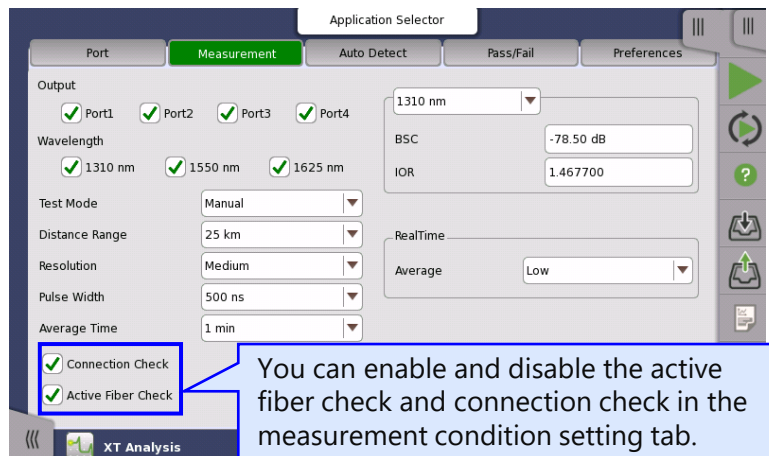
* The realtime measurement function does not calculate crosstalk.

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If an optical signal is detected in the fiber to be measured before the start of a measurement, the active fiber check suspends the measurement. This prevents an OTDR measurement from being conducted inadvertently during a transmission test, which keeps the MT9100A and transmission device from breaking down.

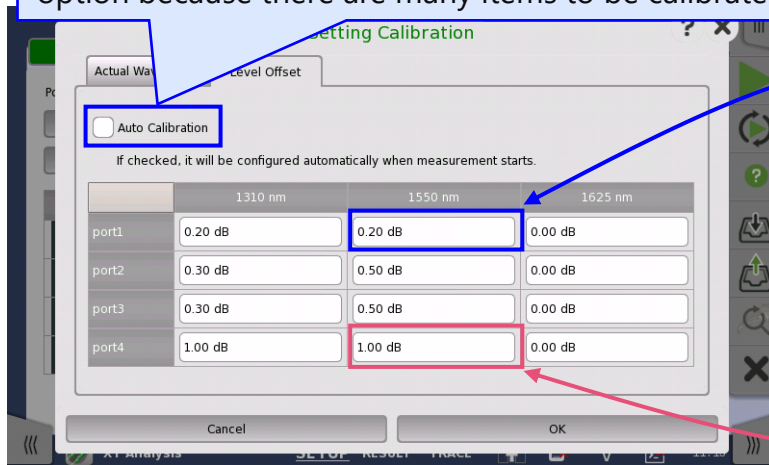
The connection check examines all the ports to be used before the start of a measurement to judge whether their ends near the device are appropriately connected. This can be used as an advance check before conducting a proper test.



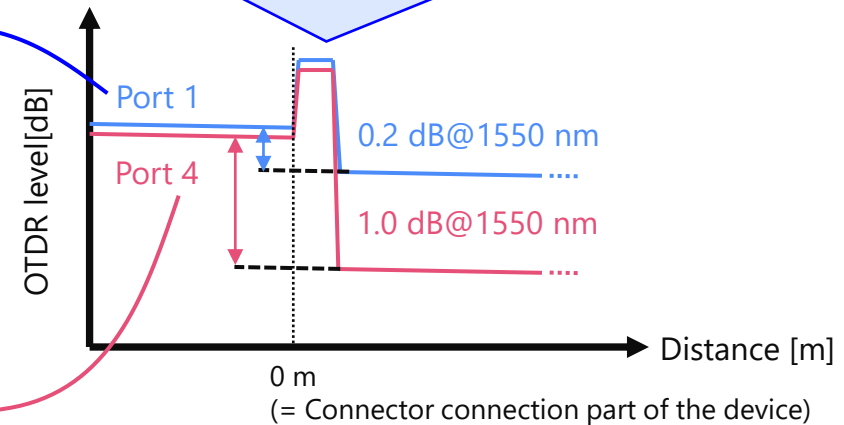
* If the loss of each individual port is greatly different, an error in the crosstalk values arises. It is recommended to conduct the test in good condition.

A difference in loss among the core ends near the device (core-dependent loss) produces a crosstalk result with an **error equivalent to the loss difference [dB] multiplied by 2**. The level offset function can be used in such a case. Entering the connection loss of each port corrects the vertical axis of the crosstalk waveform, allowing you to obtain correct values.

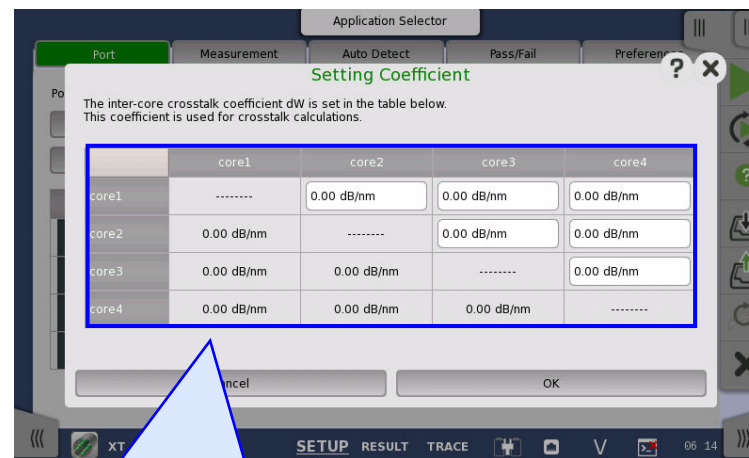
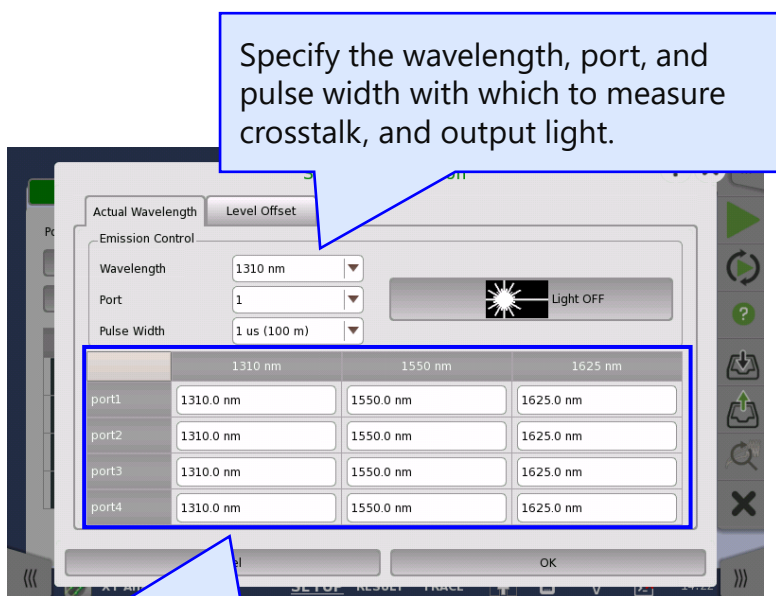
When Auto Calibration is selected, the calibrated values are automatically calculated before the start of a measurement. It is recommended to use this option because there are many items to be calibrated.



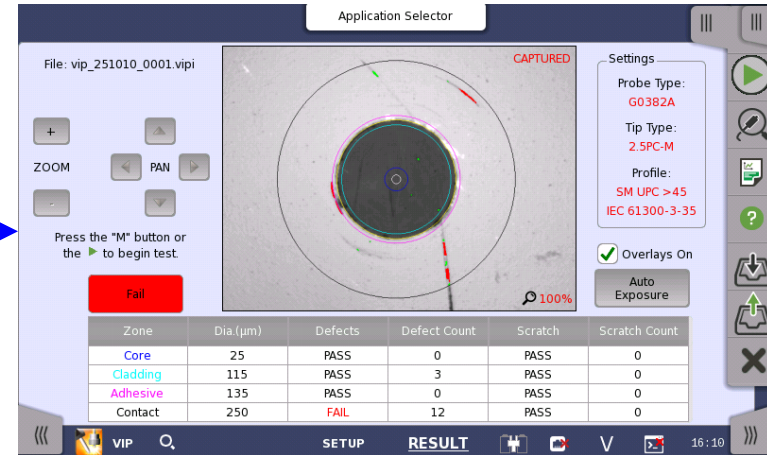
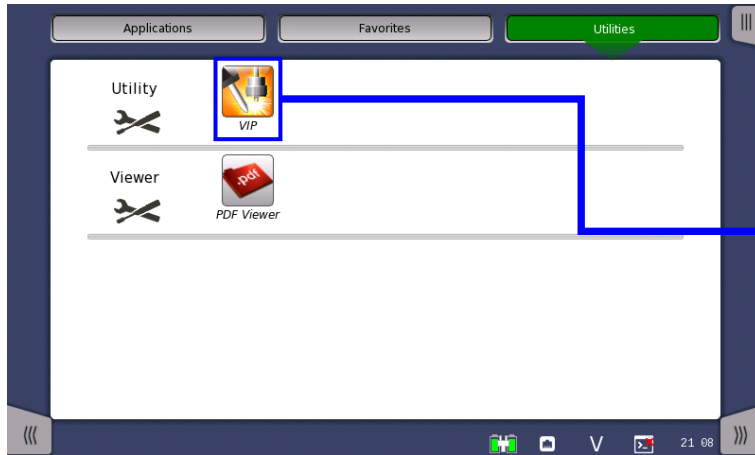
In the example below, there is an error of up to 1.6 dB unless the crosstalk values are calibrated. The calibrated values are the loss values seen from 0 m (connector connection part of the device).



The central wavelength of the OTDR light source of each port is shifted from the displayed value (1310 nm/1550 nm/1625 nm), and the obtained crosstalk value is based on the actual wavelength. If you enter the actual wavelength and the wavelength coefficient of the measured MCF, the MT9100A performs calibration so that the crosstalk value matches that to be obtained when the measurement is conducted using the displayed value.

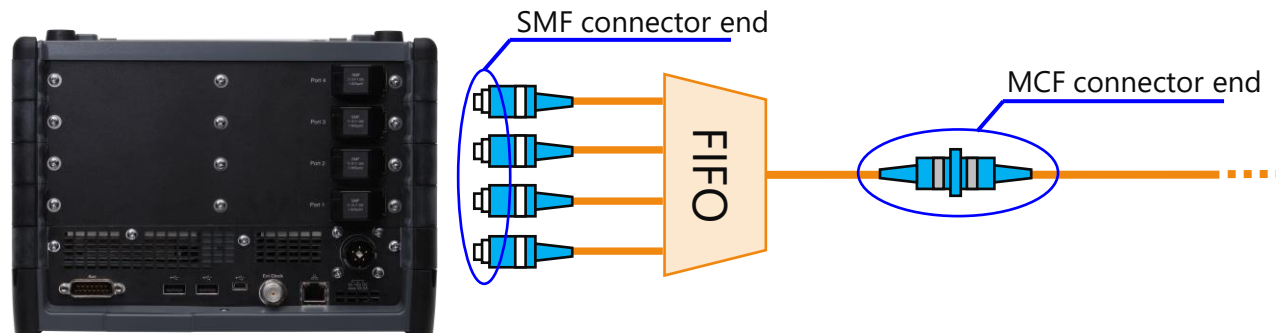


If you purchase a fiberscope, you can perform optical connector end face analysis. With a FIFO single-mode fiber (SMF) end and a single-core connector, you can make a pass/fail judgment according to an international standard.



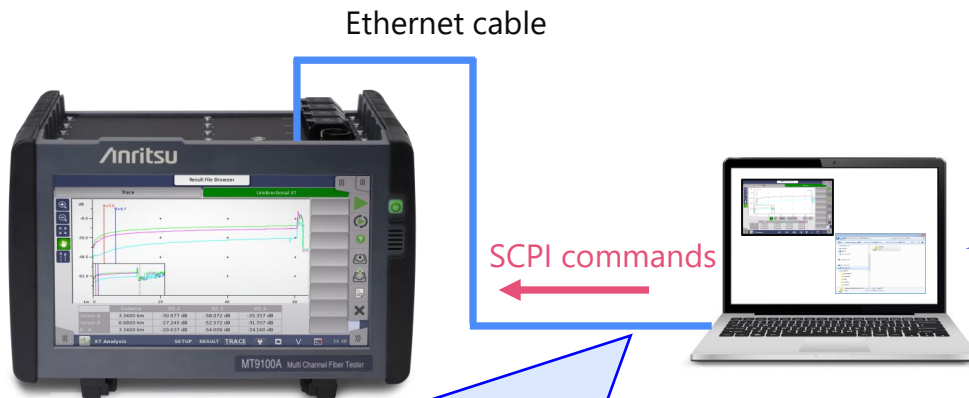
* When you check the end face of a certain type of SC-APC-F or FC-APC-F, the edges of the window may be displayed in black, making it impossible to check the end face correctly.

* In the case of a multicore fiber, you may not be able to see the cores of the connector end face. Since no international standard exists, you cannot analyze multicore fibers.



Other useful functions – Remote control

The MT9100A can be controlled remotely via an Ethernet interface. This is useful when you want to control the tester from a remote location or when you want to automate the manufacturing inspection process using SCPI commands and have the obtained data transferred to a PC.



● SCPI control/SCPI commands

The MT9100A supports SCPI commands. By creating an appropriate script, you can automate the whole process from setting measurement conditions to saving obtained data.

```
*RST
INST:STAR OTDR-XTA
SYST:WAIT:IDLE
INST:CONN:ALL

XTA:SOUR:USEP 4
XTA:SOUR:OUTP:PORT 1,0,1,0
XTA:SOUR:WAV 0,1,1
XTA:SOUR:TES AUTO
XTA:SENS:CONC 1

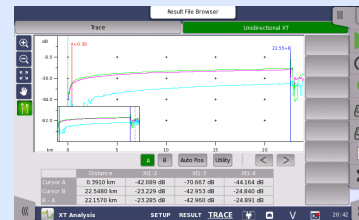
MEAS:STAR
*OPC?
# 1

XTA:SENSE:TRACe:READY?
MMEM:STOR:DATA "Usb/my-xta-trace.xta"

SYST:ERR?
# 0,"No error"
INST:TERM
```

● VNC function

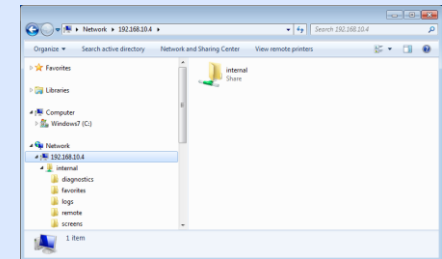
You can display a GUI on a PC and control the MT9100A from the PC.



* The PC displays what is displayed on the screen of the MT9100A.

● File sharing

The built-in memory of the MT9100A can be used as a shared folder on the PC. This is useful when you retrieve the data obtained with SCPI commands.



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Main specifications

Dimensions/weight	257.5±4 (W) × 163±4 (H) × 185.3±4 (D) mm or less; not including protrusions ≤5.9 kg, including the battery
Display	WVGA resolution (800 × 480 pixels), 9 inch
Supported languages	English and Japanese
USB interface	2 ports (USB 2.0 Type A) 1 port (USB 2.0 Type Mini-B)
Ethernet interface	Ethernet 10M/100M/1000M, RJ45 connector: 1 port
Storage capacity	7 Gbytes of built-in memory
Battery	Dedicated 10.80 V rechargeable smart lithium ion battery 18440 mAh Continuous operation time: 6 hours (typical value) Telcordia GR-196-CORE Issue2, September 2010, 25°C, battery fully charged Charging time: 9 hours (at 25°C, typical value), Battery level indication: %
AC adapter	Input: 100 to 240 VAC, 50 Hz/60 Hz Output: Rated 18 or 19 VDC, 13.2 A (maximum) Power consumption: 250 W or less
IOR setting	1.300000 to 1.700000 (in steps of 0.000001)
Distance indication unit	km, m, kft, ft, mi
Number of sampling points	Max. 30,001 points
Sampling resolution	0.05 m to 40 m

*For details, see the relevant catalog.

Main specifications

Wavelength	Option 010/011	1310/1550/1625 nm ± 25 nm
	Option 012/013	1310 nm ± 25 nm, 1550/1625 nm ± 10 nm
Distance measurement accuracy	± 1 m $\pm 3 \times$ measurement distance $\times 10^{-5} \pm$ cursor resolution (Excluding the uncertainty due to the refractive index)	
Distance range	0.5, 1.0, 2.5, 5, 10, 25, 50, 100, 200, 300 km	
Dynamic range	1310 nm: 46 dB, 1550 nm: 46 dB, 1625 nm: 44 dB	
Dead zone (Fresnel)	≤ 1.0 m	
Dead zone (Backscatter)	1310 nm: ≤ 3.8 m, 1550 nm: ≤ 4.3 m, 1625 nm: ≤ 4.8 m	
Return loss measurement accuracy	± 2 dB	
Crosstalk dynamic range	1310 nm: ≥ 84 dB, 1550 nm: ≥ 84 dB, 1625 nm: ≥ 81 dB	
Repeatability of crosstalk measurement	≤ 0.33 dB	

*For details, see the relevant catalog.

Contents

- Product overview
- Main functions
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- **Ordering information**

① Main unit specification

Model/Order No.	Name
MT9100A	Multi Channel Fiber Tester
G0418A	-Standard accessories- AC adapter: 1 pc
G0423A	POWER CORD: 1 pc
Z1746A	Two LiION Batteries: 1 pc
Z2195A	Stylus: 1 pc
MJB-1ET250002	MT9100A Operation Manual CD: 1 pc
	Attached documentation on laws and regulations: 1 pc

② Port option selection

Model/Order No.	Name
MT9100A-010	Standard wavelength accuracy / UPC Polish
MT9100A-011	Standard wavelength accuracy / APC Polish
MT9100A-012	High wavelength accuracy / UPC Polish
MT9100A-013	High wavelength accuracy / APC Polish

④ Software

Model/Order No.	Name
MX910000A*	MCF XT Characterization

*This software is installed as standard in the main unit.

③ Optical connector selection

Model/Order No.	Name
MT9100A-037	-To be applied to the option 010/012 UPC polish- UPC-FC Connector
MT9100A-040	UPC-SC Connector
MT9100A-025	-To be applied to the option 011/013 APC polish- APC-FC Connector
MT9100A-026	APC-SC Connector

**For details, see the relevant catalog.

