ETS Environmental
Optical Test System

User Manual

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COMPLIANCE

FDA-CDRH Compliance

Under the US Food and Drug Administration (FDA) Center for Devices and Radiological Health (CDRH), the unit complies with the Code of Federal Regulations (CFR), Title 21, Subchapter J, which pertains to laser safety and labeling. See following link for more information:

- http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPartFrom=1000&CFRPartTo=1050

CSA / IEC Compliance

The system complies with certain standards of the Canadian Standards Association (CSA) and the International Electrotechnical Commission (IEC).

The system falls in the Installation Category (Overvoltage Category) II under IEC 664. IEC 664 relates to impulse voltage levels and insulation coordination. The category is defined as: local level, appliances, portable equipment, etc., with smaller transient overvoltages than Installation Category (Overvoltage Category) III.

The system falls in the Pollution Degree 2 category under IEC 1010-1 and CAN/CSA-C22.2 No. 1010.1. The IEC standard on Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use relates to insulation coordination. The CSA standard is on Safety Requirements for Electrical Equipment for Measurement Control, and Laboratory Use, Part I: General Requirements. The Pollution Degree 2 category is defined as follows: “Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.”

CE Compliance

Electronic test equipment is subject to the EMC Directive in the European Union. The EN61326 standard prescribes both emission and immunity requirements for laboratory, measurement, and control equipment. This system has undergone extensive testing according to the European Union Directive and Standards.

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GENERAL INFORMATION

ETS Environmental Optical Test System Overview

Built upon the same technology as the breakthrough RLM Automated Return Loss Meter and OSX Optical Switches, the ETS Environmental Optical Test System provides a fully integrated solution for long-term testing of optical components. With its capability to measure changes in Insertion Loss (IL) and mandrel-free Return Loss (RL) of up to 320 channels, the ETS is the perfect solution to perform compliance testing of components being stressed in environmental simulations.

Figure 1: ETS Environmental Optical Test System

Applications

- Patch cord and cable assembly certification
- Passive component design and validation
- Compliance testing

Key Features

- Mandrel-free RL testing
- Up to 4 built-in wavelengths:
  - SM: 1310, 1490, 1550, 1625 or 1650 nm
  - MM: 850, 1300 nm
- Bidirectional or unidirectional testing

Test & Measurement Standards

- Conforms to:
  - GR-326-CORE
  - GR-1435-CORE
  - GR-910-CORE
  - GR-1209-CORE
  - GR-2866-CORE
  - Verizon FOC
- Multimode IL launch conditions meet the IEC 61280-4-1 Encircled Flux standard

Included in the System

- 19” rackmount cabinet
- RLM Automated Return Loss Meter
- Dual OSX switches
- Computer and touchscreen monitor
- 1500 VA UPS
- ETS software

Optional Accessories

- NIST traceable ethernet thermometer

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SAFETY INFORMATION

To avoid situations that could result in serious injuries or death, always observe the following precautions.

The safety instructions must be observed whenever the system is operated, serviced, or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the user manual is in direct violation of the standards of design, manufacturing, and intended use of the system. Santec Inc. assumes no liability for the customer's failure to comply with any of these safety requirements.

Safety Markings on the Units

See Table 1 for symbols and messages that can be marked on the unit. Observe all safety instructions that are associated with a symbol.

Table 1: Safety symbols

	Laser radiation may be present. Refer to the user manual for instructions on handling and operating the unit safely. Avoid looking into any ports near which this symbol appears.
	Frame or chassis terminal for electrical grounding within the unit.
	Protective conductor terminal for electrical grounding to the earth.
WARNING	Procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.
CAUTION	Procedure can result in serious damage to or destruction of the unit if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.

Classification

The ETS consists of several instruments assembled in a rackmount cabinet. Each instrument consists of an exposed metal chassis that is connected directly to earth via a power cord and is therefore classified as a Class 1 instrument.

The laser (or lasers) contained in the RLM is (are) Class 1M laser(s) as specified under the international standard IEC 60825-1 Ed. 3.0 b:2014 and ANSI Z136.1-2014.

Important Safety Information

Laser Hazards

Warning

- Never look directly into the end of an optical cable connected to an optical output device that is operating. Laser radiation is invisible and direct exposure can severely injure the human eye.

Electrical Hazards

Warning

- Some of the circuits are powered whenever the units are connected to the AC power source (line power). To ensure that all circuits are powered off, disconnect the power cord from either the power inlet on the unit's rear panel or from the AC line-power source (receptacle). The power cord must always be accessible from one of these points. If the units are installed in a cabinet, the operator must be able to disconnect the units from the line power by the system's line-power switch.

- Use only the type of power cord supplied with the units. If you need to replace a lost or damaged cord, make sure to replace with a power cord of the same type.

- Connect the power cord only to a power outlet equipped with a protective earth contact. Never connect to an extension cord or any receptacle that is not equipped with this feature.

- If using a voltage-reducing autotransformer to power the units, ensure that the common terminal connects to the earthed pole of the power source.

- Do not interrupt the protective earth grounding. Such action can lead to a potential shock hazard that can result in serious personal injury. Do not operate the units if an interruption to the protective grounding is suspected.

- Do not operate the units when its cover or panels have been removed.

- To prevent potential fire or shock hazard, do not expose the units to any source of excessive moisture.

- Do not use the units outdoor.
- Operating the units in the presence of flammable gases or fumes is extremely hazardous.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Only technicians authorized by Santec Inc. should carry out repairs. In addition to voiding the warranty, opening the units (even when unplugged) can expose you to potential shock hazards.
- Some of the capacitors can be charged even when the units are not connected to the power source.
- Do not perform any operating or maintenance procedure that is not described in the user manual.

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GETTING STARTED

Caution

- To avoid injury or death, always observe the precautions listed in SAFETY INFORMATION on page 4.

This manual contains complete operating instructions for safe and effective operation of the ETS Environmental Optical Test System. It is recommended that users of the ETS familiarize themselves with contents of this manual before using the instrument.

The test report and a description of any customer-requested information may be found in the envelope included with the instrument.

Initial Inspection

Warning

- To avoid electrical shock, do not initialize or operate the system if it bears any sign of damage. Ensure that the system and any devices or cords connected to it are properly grounded.

✓ Inspect the package and contents for signs of damage.

✓ Ensure all contents are included.

✓ Read the user manual thoroughly and become familiar with all safety symbols and instructions to ensure that the system is operated and maintained safely.

✓ If the initial inspection reveals any damage or missing components, immediately notify Santec Inc. and if necessary, the carrier.

Operational Requirements

The operating environment must meet the conditions outlined in Table 2. It is highly recommended to have stable lab conditions such as those specified by Telcordia in the GR-326 standard (Table 3). The ETS published specifications are met under these conditions.

Table 2: Environmental requirements

Parameter	Specification
Altitude	Up to 2000m
Temperature	0 to 40°C
Humidity	Up to 80% RH (0 to 40°C)
Voltage	Main supply voltage fluctuations must not exceed ± 10% of the nominal voltage

Table 3: Telcordia GR-326 ambient laboratory conditions

Parameter	Specification
Temperature	23 ± 2 °C
Humidity	< 75 % RH

Important Recommendations

General Information

A good setup for long term testing has additional challenges compared to standard IL/RL measurements.

The two most critical aspects are:

- connector contamination
- microcracks and fiber management

Before connecting any jumper to the instruments, inspect both ends with a microscope. A bench top ferrule inspection scope such as Santec's EFI-100 (Figure 2) is recommended for inspecting jumpers and connectorized switch pigtails.

When connecting directly to an instrument bulkhead, a bulkhead inspection probe can facilitate the process.

Even dirt in the peripheral zones outside the core can affect long term IL stability. **Extra diligence is required.**

Figure 2: Santec's EFI-100-CM inspection scope

Fiber microcracks are difficult to detect and a slow IL drift over many hours or days is a common manifestation. If possible, replace any fibers that are suspected of having microcracks.

Microcracks are especially sensitive if the fiber is bending. It is recommended to have enough flat space to allow the fibers going from the instruments to the chamber to be as straight as possible. Avoid any crossed fibers.

Hanging fiber is another common source of drift. This is sometimes unavoidable between the bench and the environmental chamber but fiber should be supported as much as possible.

The lab conditions should be optimized for temperature and humidity control. For example, the Telcordia GR-326 standard defines ambient lab conditions for temperature = 23 ± 2 °C and RH < 75%.

The ETS software can apply external fiber drift corrections from reference channels. It is recommended to manage the fiber in such a way that the reference channel is within the bundle of channels it is correcting as much as possible outside the chamber.

Examples of Fiber Management

In this section, five examples of fiber management are shown with good and bad aspects highlighted. This is a critical optimization step to have a stable long-term test system.

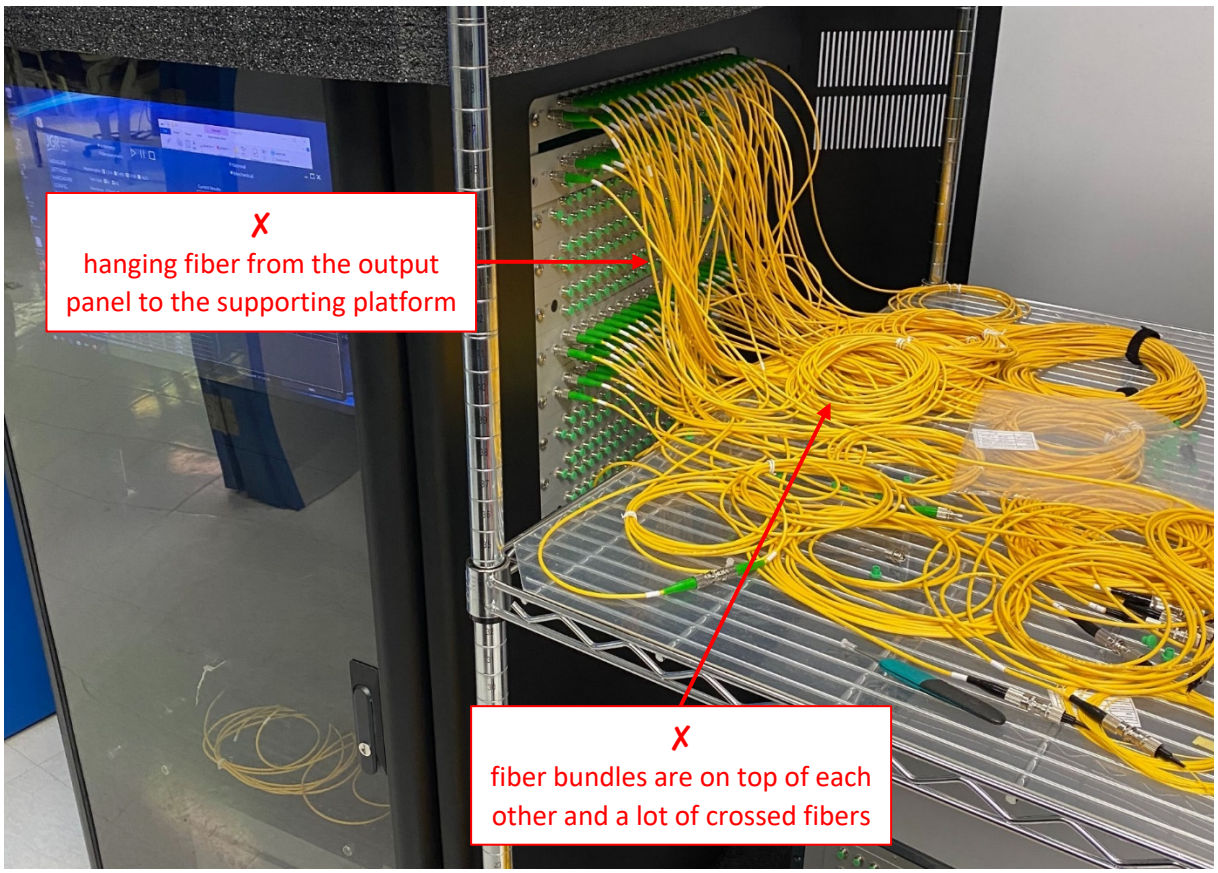


Figure 3: Fiber management example #1

Figure 4: Fiber management example #2

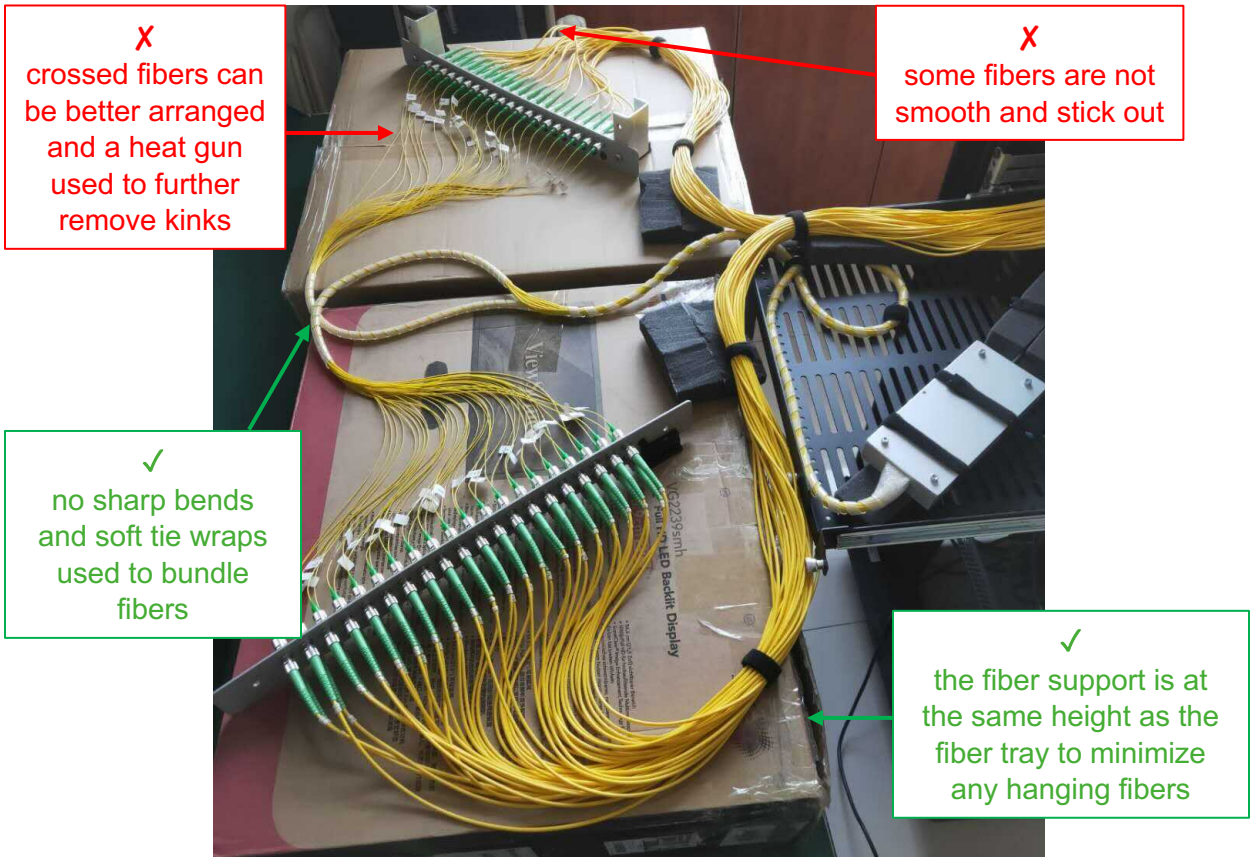


Figure 5: Fiber management example #3

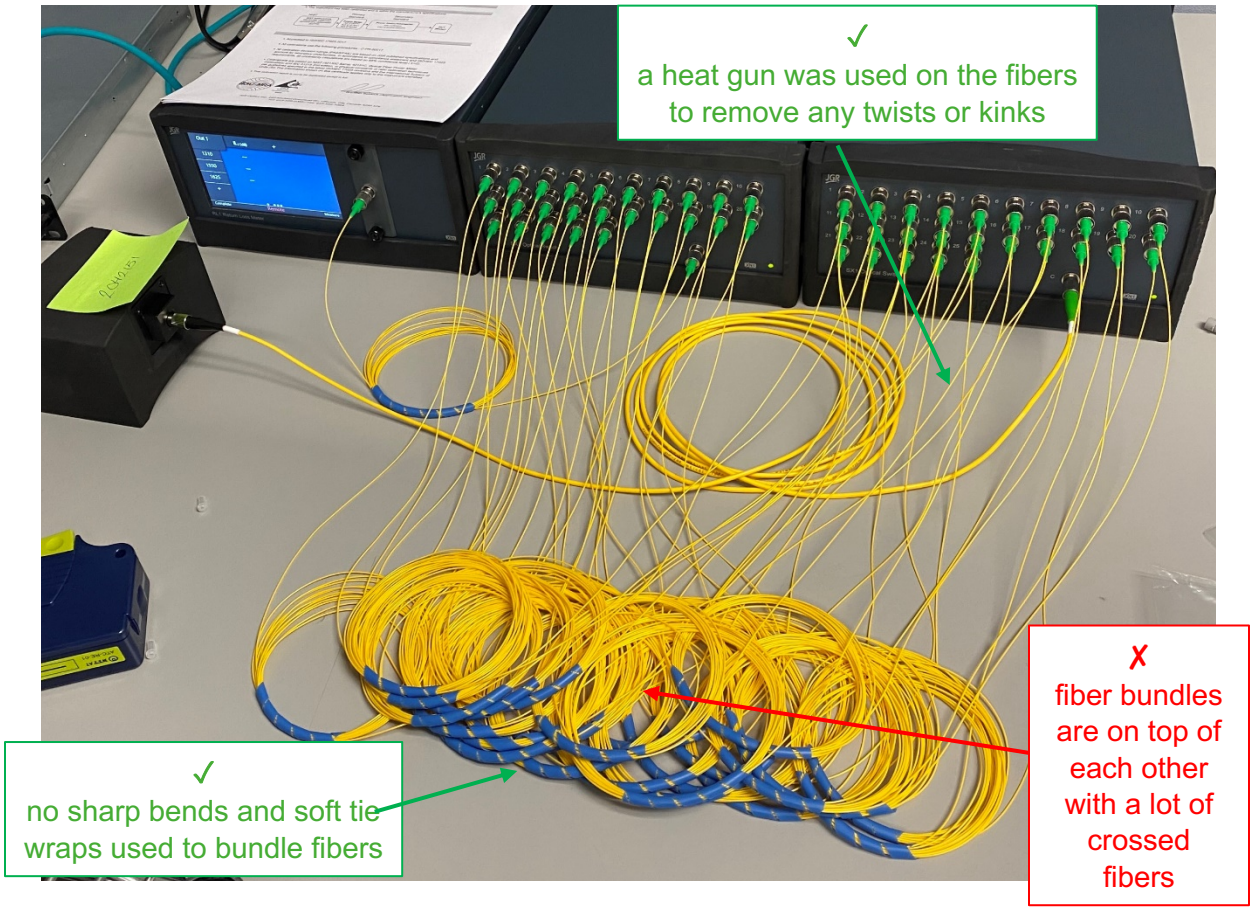


Figure 6: Fiber management example #4

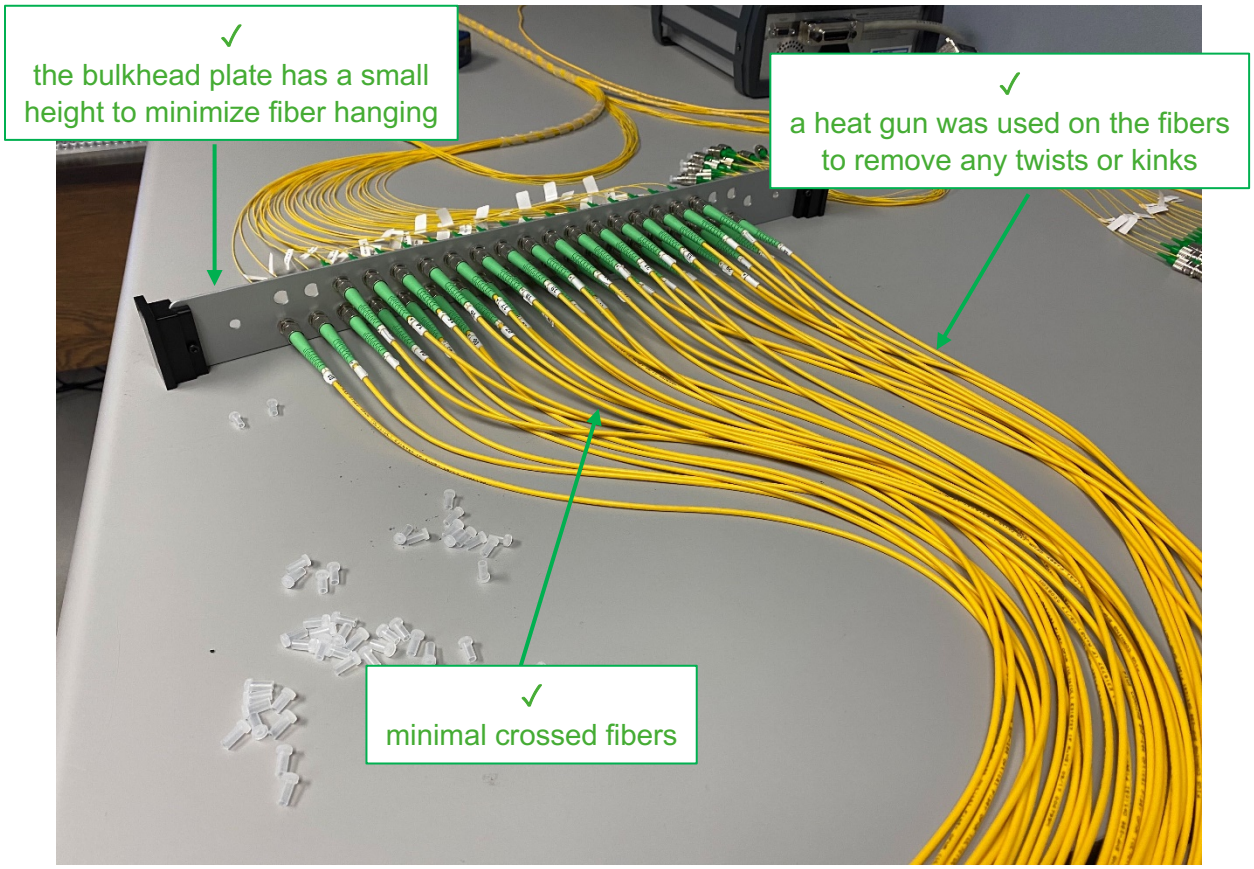


Figure 7: Fiber management example #5

Turning on the System

- Verify that each component (monitor, PC, RLM, OSX) is turned off. They should all be plugged into the provided UPS at the bottom of the rackmount cabinet.
- Verify that the UPS is turned off then connect it to a power source (line power) via the provided power cord.
- Turn on the UPS (press and hold the power button).
- Turn on each component.
- On the RLM front panel touchscreen, swipe to the *Detectors* page to verify that the RD-S is detected and paired, see Figure 8.

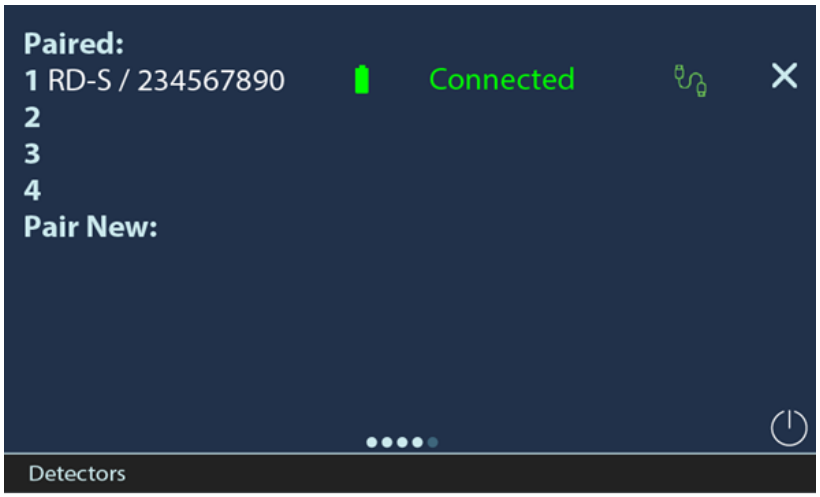


Figure 8: RLM successfully paired to a detector

Software Initial Setup

Hardware Communications

The RLM and OSX are connected to the PC via USB (Figure 9).

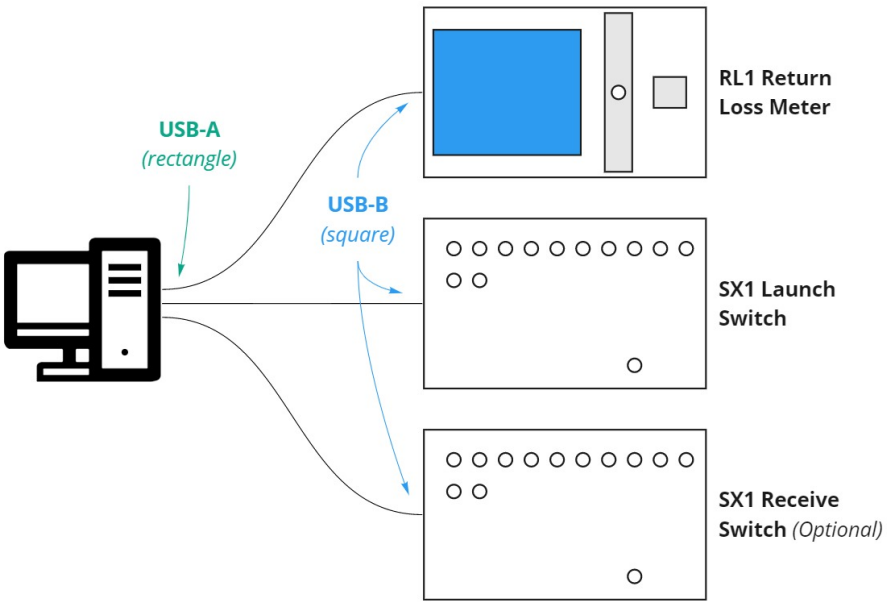


Figure 9: Hardware connections to PC

You can verify their connectivity in *Device Manager*. Each instrument will show up as a *USB Test and Measurement Device (IVI)* (see Figure 10).

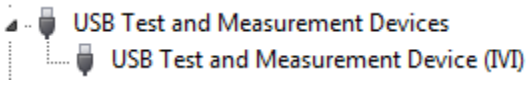


Figure 10: RLM/OSX connectivity in *Device Manager*

Open the ETS software and go to the *HARDWARE* tab (Figure 11) to confirm the switches have been assigned to their appropriate roles (input/output). Click and drag to move instruments on the *HARDWARE* tab.

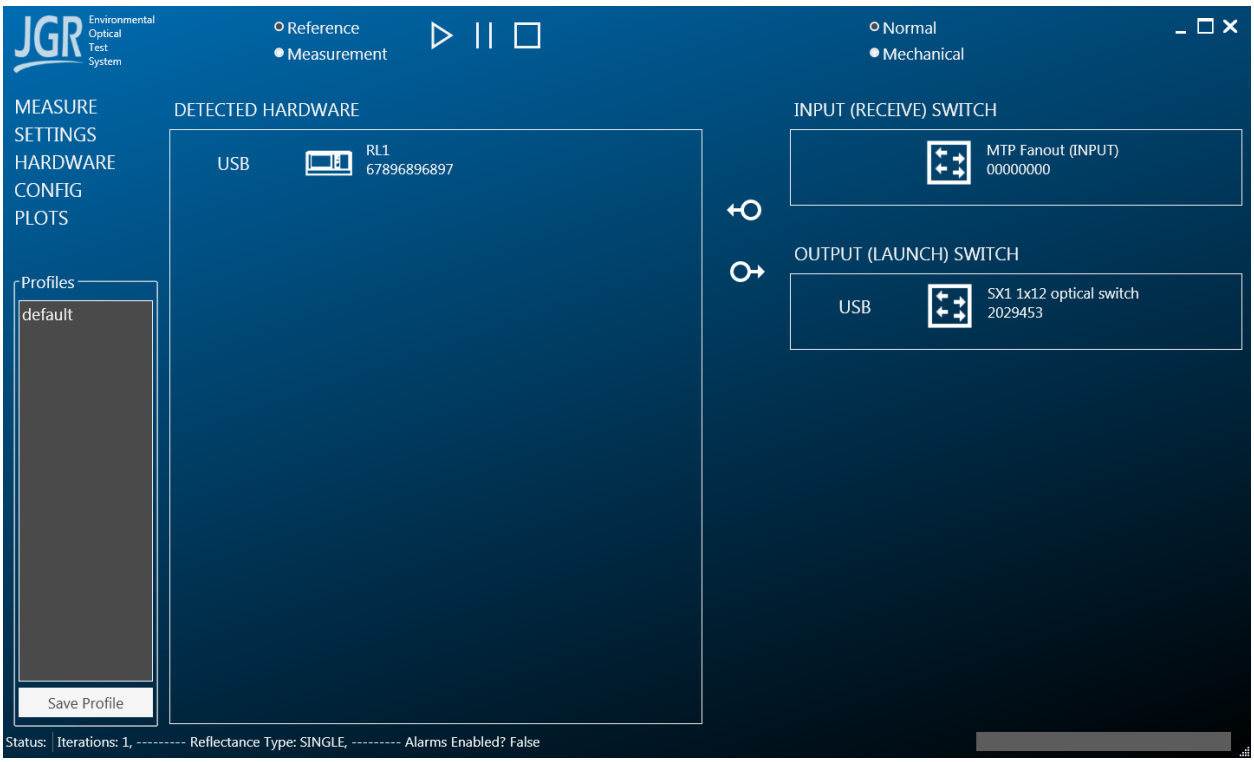


Figure 11: ETS software – *HARDWARE* tab

In the case of a single switch system, a virtual hardware will be created called *MTP Fanout (INPUT)*. Drag this item to *INPUT (RECEIVE) SWITCH* position.

Setting Reference Channels

See Figure 12.

- Click on the SETTINGS tab.
- To assign a reference channel, press ALT + S to go into supervisor mode then modify the cells. Pressing ALT + S again locks the reference channels.
- Exiting this page without an assigned save file will prompt an error message.

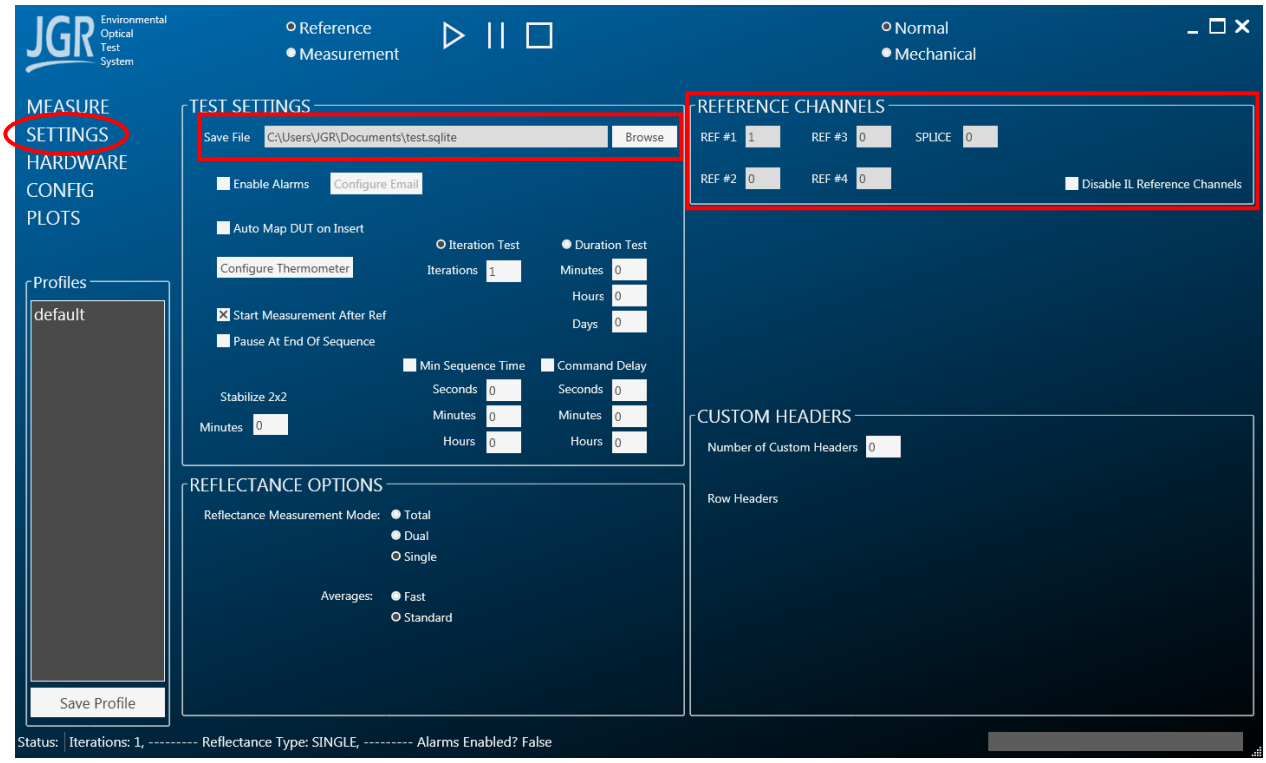


Figure 12: Setting the reference channels

The reference channels compensate for external fiber IL drift. It is suggested to bundle the fibers together as much as possible and include each reference channel within its corresponding group.

The reference channels are the physical channels on the switches. All other ETS channel numbering will be adjusted accordingly.

For example, a 100 channel ETS typically comes with 2 reference channels:

- each switch has 102 physical channels
- REF #1 is assigned to physical ch.1
- REF #2 is assigned to physical ch.52
- the displayed channels in the MEASURE, CONFIG and PLOTS are adjusted accordingly
    - ETS ch.1 = physical ch.2
    - ETS ch.2 = physical ch.3
    - ..
    - ETS ch.51 = physical ch.53
    - ..
- REF #1 compensates for ETS ch.1-50
- REF #2 compensates for ETS ch.51-100

Managing Reference Lengths and System IL

Click on the *CONFIG* tab to set the lengths of each switch and measure the system IL (see Figure 13).

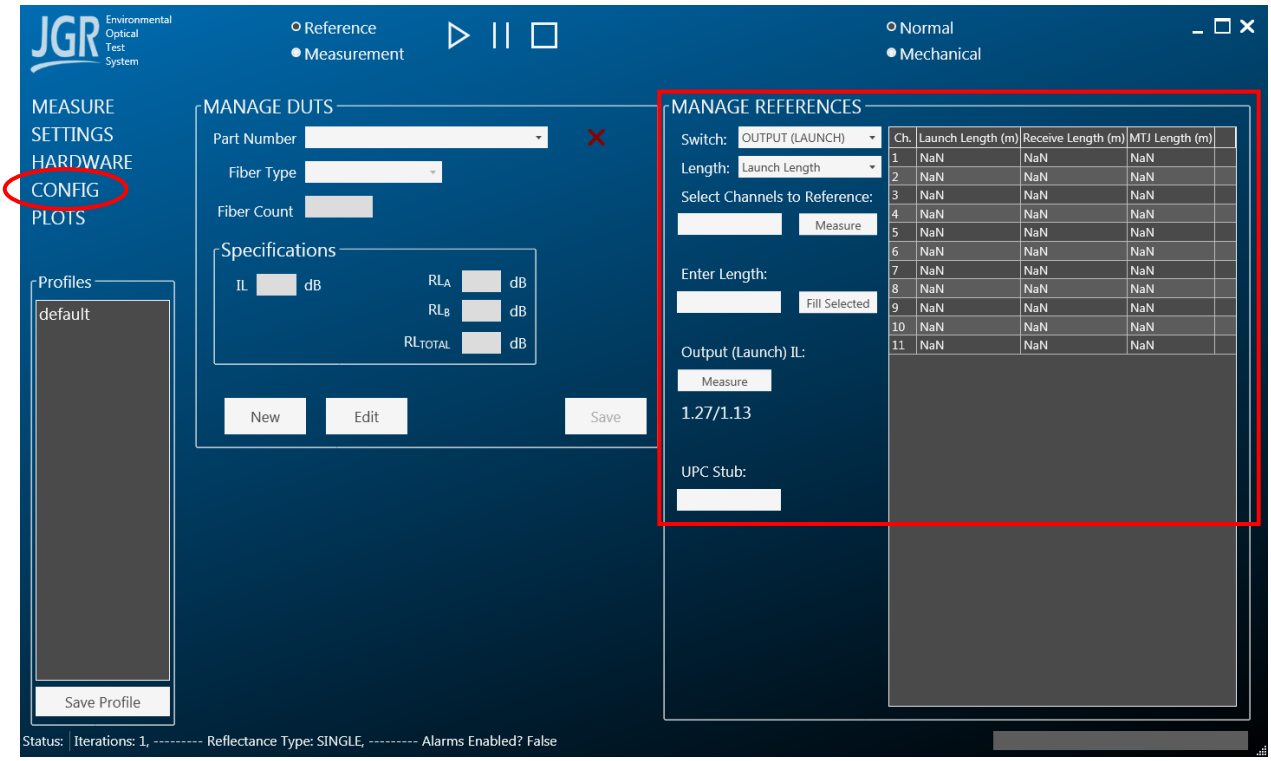


Figure 13: Managing reference lengths and system IL

- The definitions of the different lengths are shown in the following pages. They are the reference lengths for RL_A and RL_B.
- In the case of a bidirectional RLM (ex: RLM-**2X**-3050-S-09FA):
  - each switch must have defined launch and receive lengths
- In the case of a single output RLM (ex: RLM-**01**-3050-S-09FA):
  - the launch switch must have a defined launch length
  - the receive switch (or fanout) must have a defined receive length
- Each switch must have a defined MTJ length.

Length Definitions

The lengths are defined for pigtailed (Figure 14 and Figure 15) and side panel (Figure 16 and Figure 17) configurations.

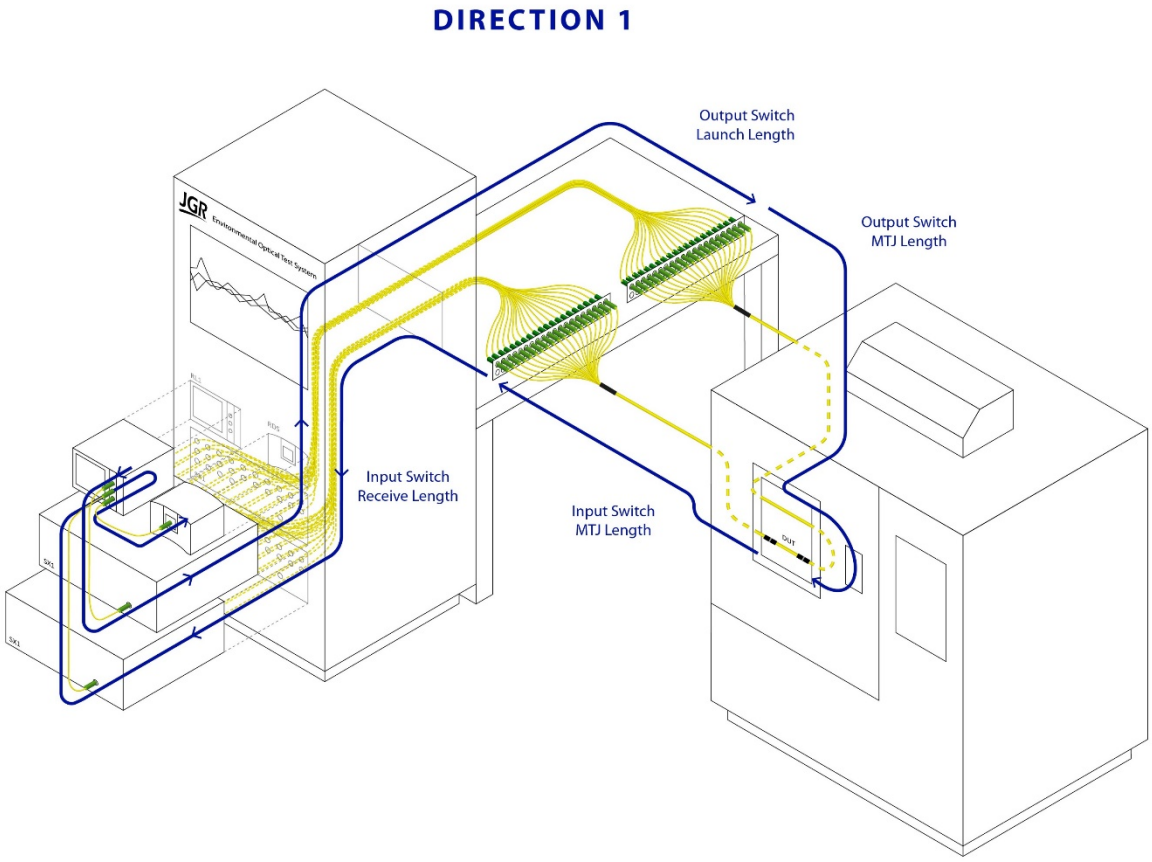


Figure 14: Length definition (pigtailed configuration, direction 1)

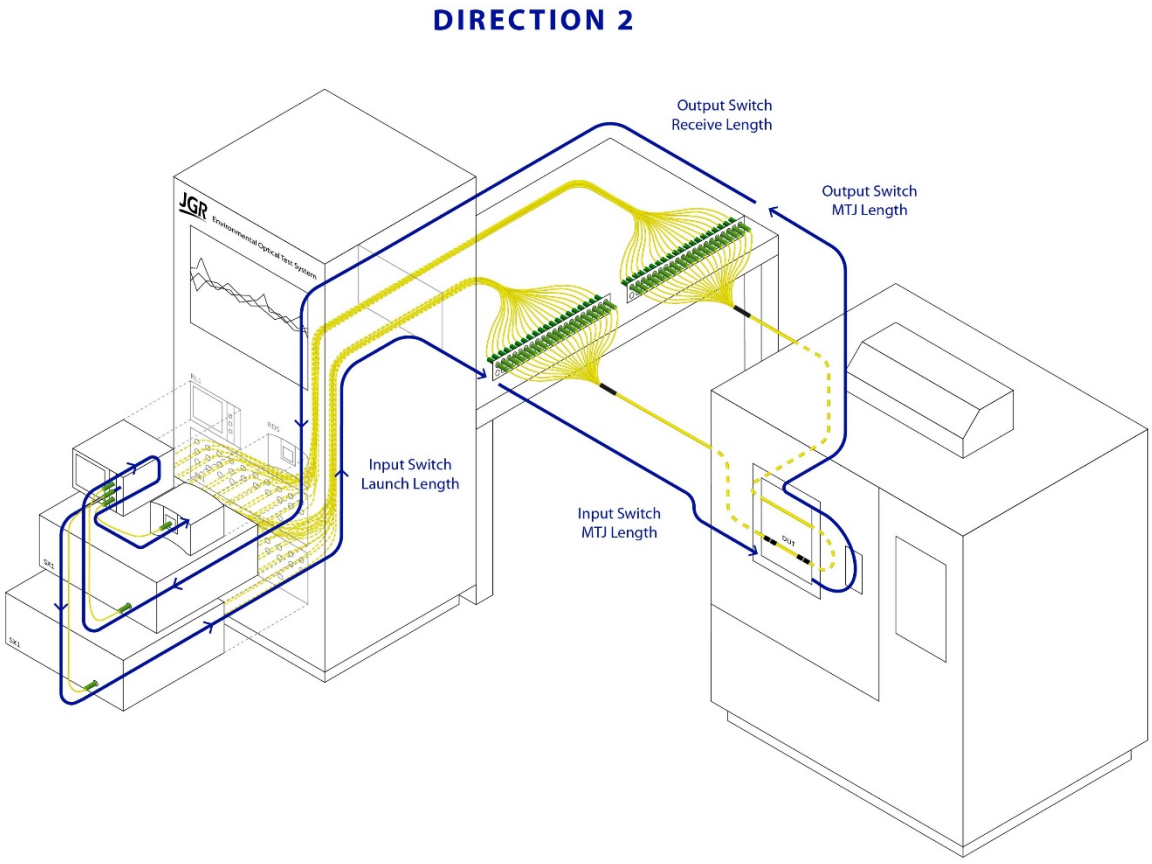


Figure 15: Length definition (pigtailed configuration, direction 2)

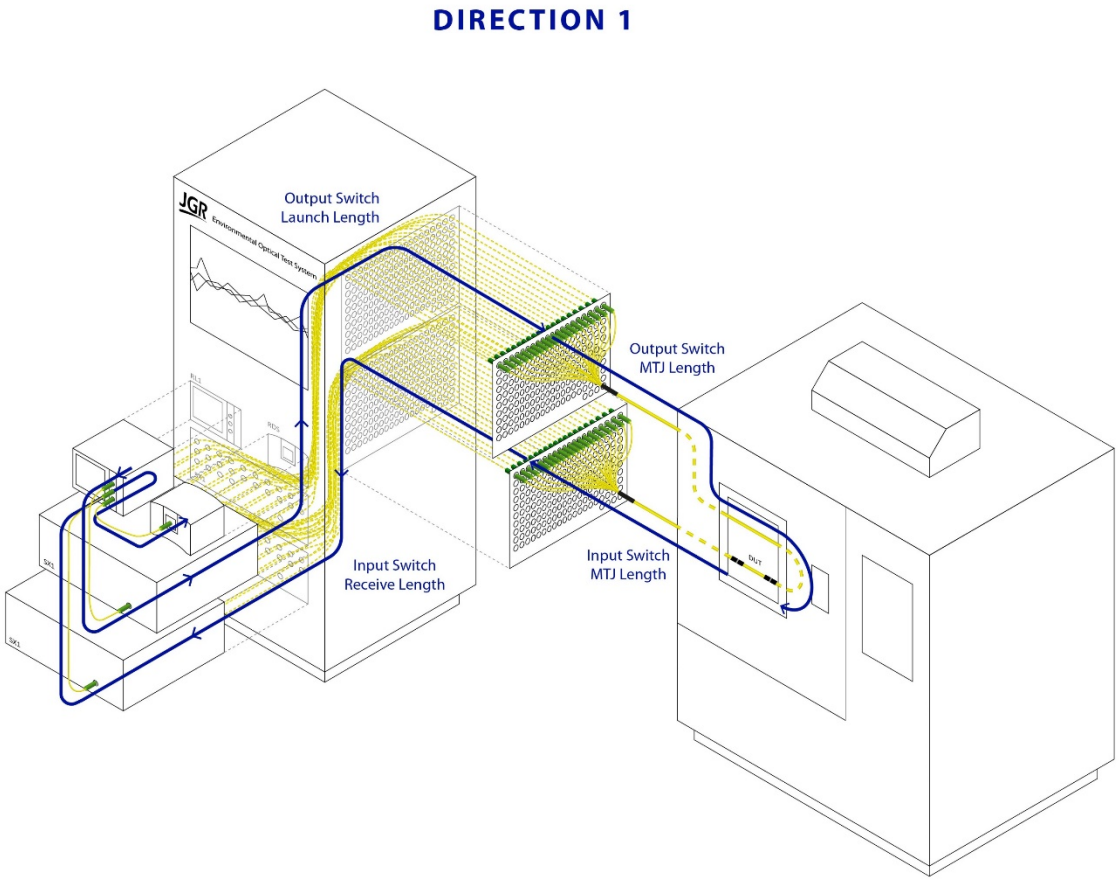


Figure 16: Length definition (side panel configuration, direction 1)

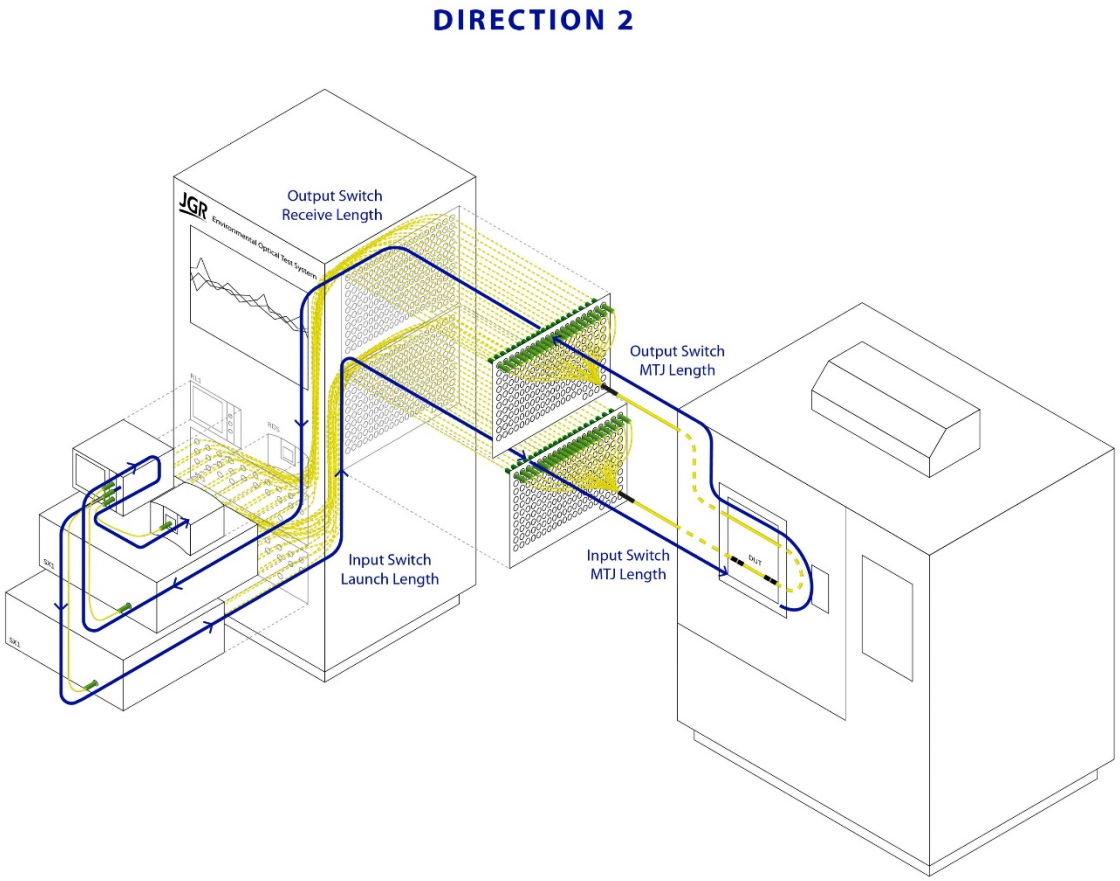


Figure 17: Length definition (side panel configuration, direction 2)

Direction 1 Length References and Output IL

It is recommended to use a 3m jumper with a flat polish (PC) connector for the length referencing.

Alternatively, an APC jumper can be used. Putting on a dust cap will increase the reflection and may help in cases where there is some uncertainty.

- Inspect and connect a 3m jumper (“UPC stub”) from launch channel 1 to the detector (Figure 18) and measure the *Output (Launch) IL* (Figure 19, typical values are < 2 dB).

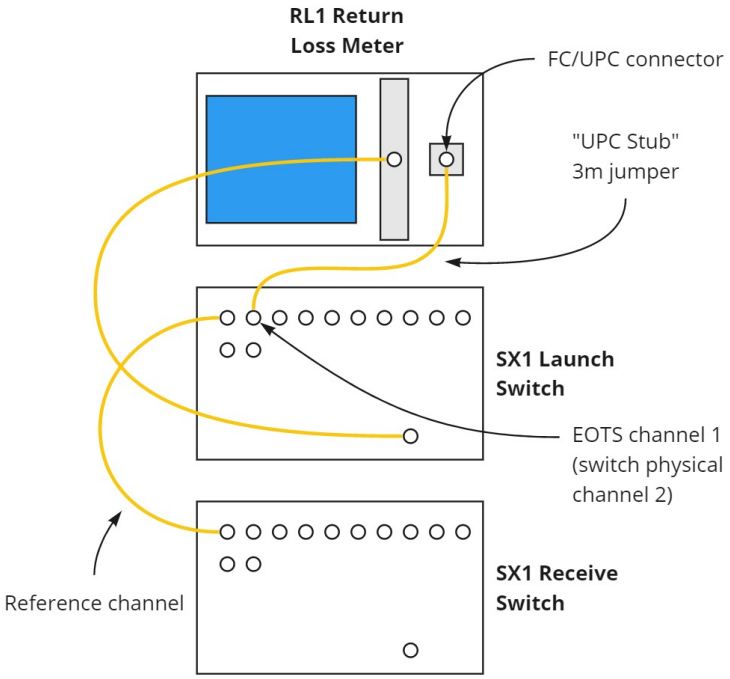


Figure 18: Direction 1 launch length reference and output IL connection diagram

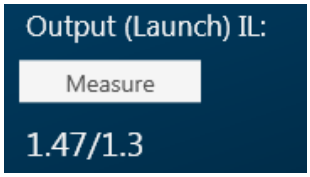


Figure 19: Measure direction 1 output IL

- Press ALT + S to unlock supervisor mode to have access to the launch/receive lengths.
- Without changing the optical connections, measure the launch length of the output switch on channel 1 (Figure 20).

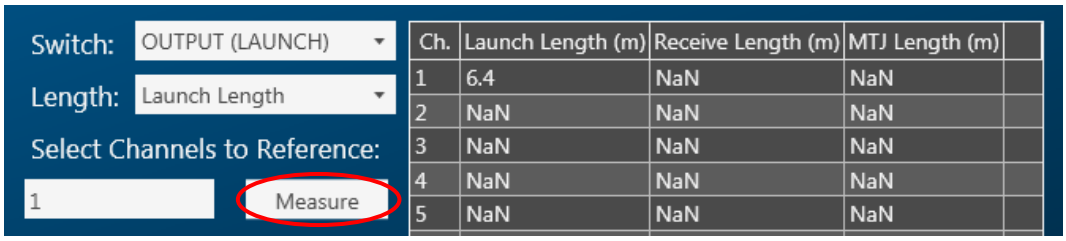
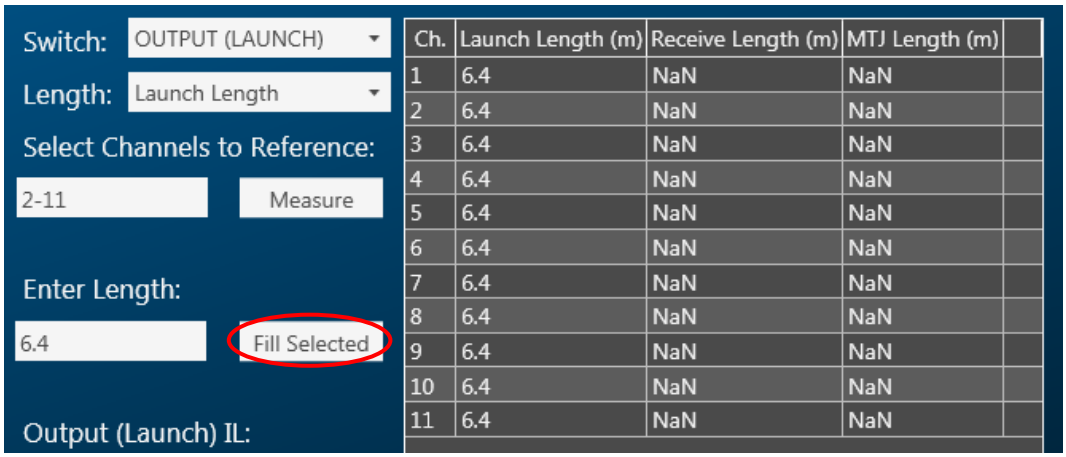


Figure 20: Measure launch length of the output switch

- Repeat the previous point for each channel or enter manually if the lengths are known (Figure 21).



Ch.	Launch Length (m)	Receive Length (m)	MTJ Length (m)
1	6.4	NaN	NaN
2	6.4	NaN	NaN
3	6.4	NaN	NaN
4	6.4	NaN	NaN
5	6.4	NaN	NaN
6	6.4	NaN	NaN
7	6.4	NaN	NaN
8	6.4	NaN	NaN
9	6.4	NaN	NaN
10	6.4	NaN	NaN
11	6.4	NaN	NaN

Figure 21: Fill launch length of the output switch

- If using a receive switch, inspect and connect two 3m jumpers between the launch switch channel 1 and receive switch channel 1 (Figure 22).

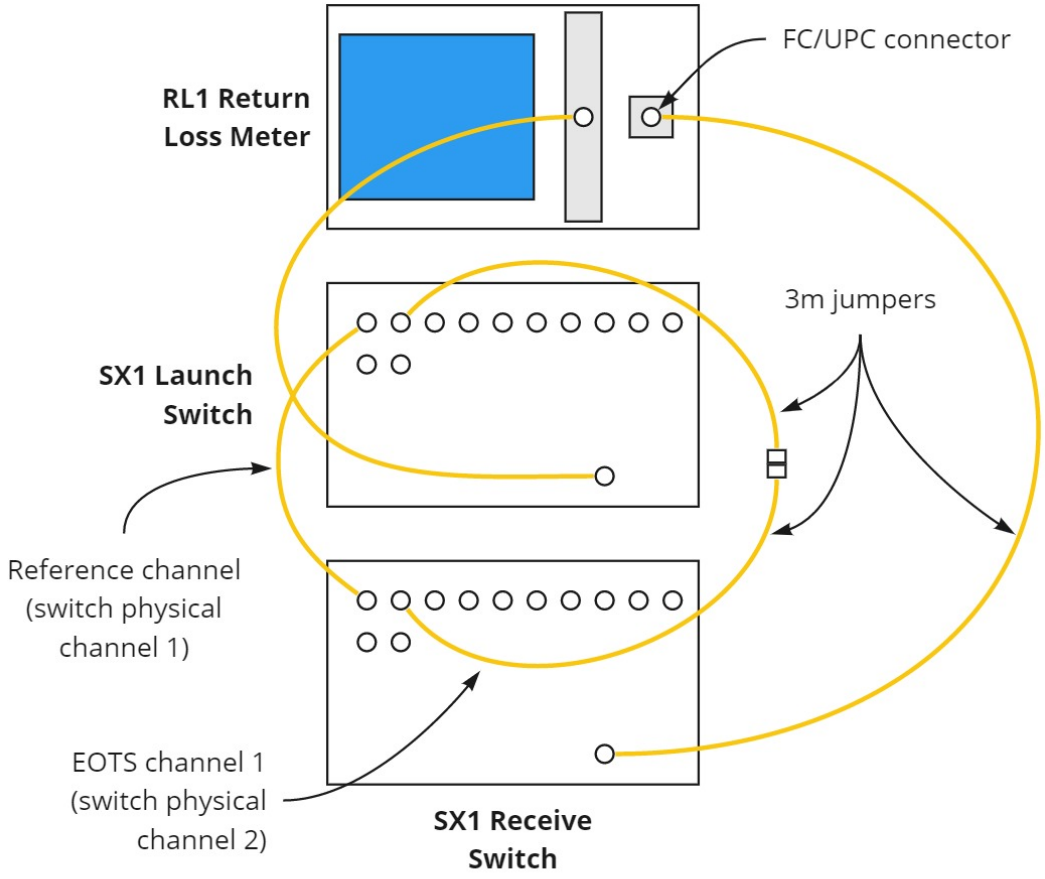


Figure 22: Direction 1 receive length connection diagram (single output RLM)

- Measure the receive length of the input switch on channel 1 (Figure 23).

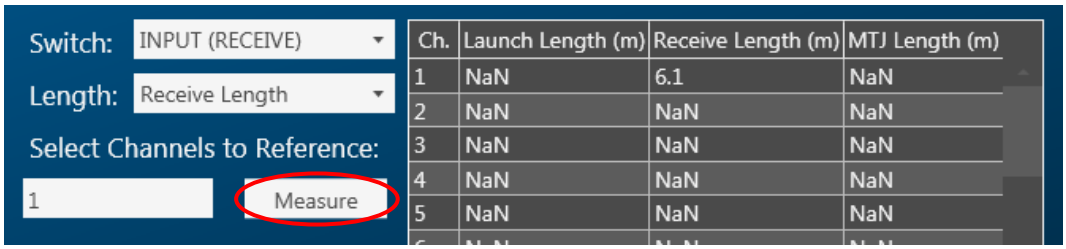


Figure 23: Measure receive length of the input switch

- Repeat for each channel or enter manually if the lengths are known (Figure 24).

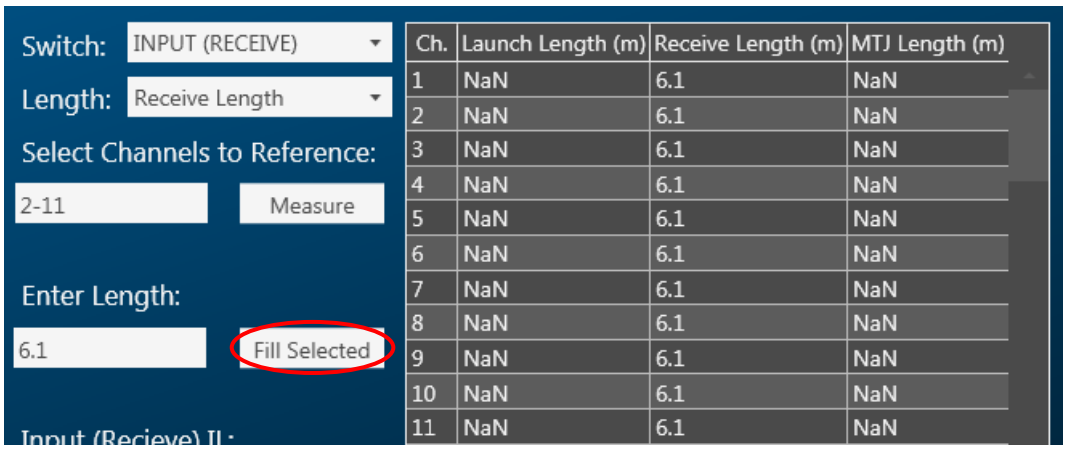


Figure 24: Fill receive length of the input switch

Direction 2 Length References and Input IL

Direction 2 is only applicable for a bidirectional (2X) RLM. For a single output RLM, skip this section and go to OPERATION.

- Inspect and connect the 3m UPC stub from receive channel 1 to the detector (Figure 25) and measure the *Input (Receive) IL* (Figure 26, typical values are < 2 dB).

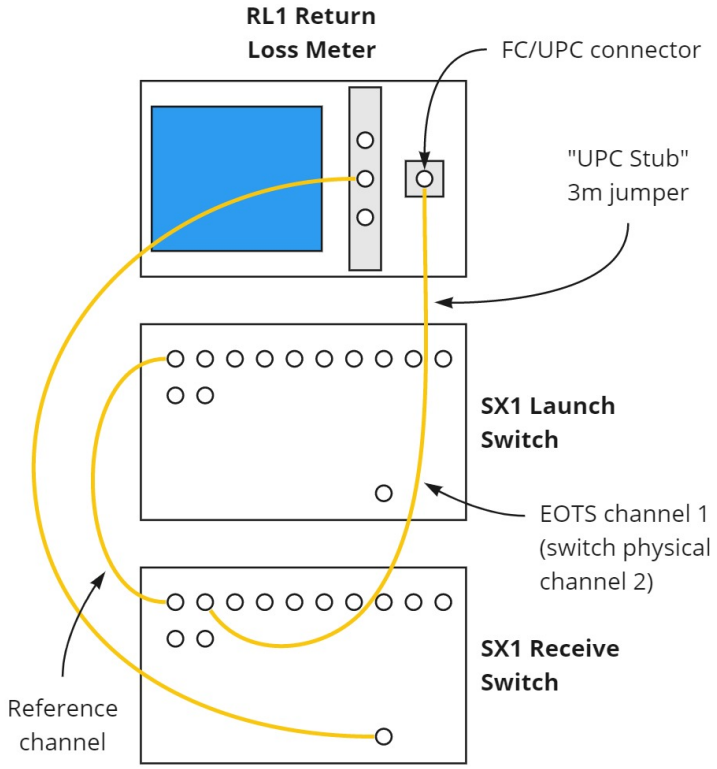


Figure 25: Direction 2 launch length reference and input IL connection diagram

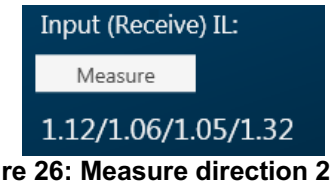


Figure 26: Measure direction 2 input IL

- Press ALT + S to unlock supervisor mode to have access to the launch/receive lengths.
- Without changing the optical connections, measure the launch length of the input switch on channel 1 (Figure 27).

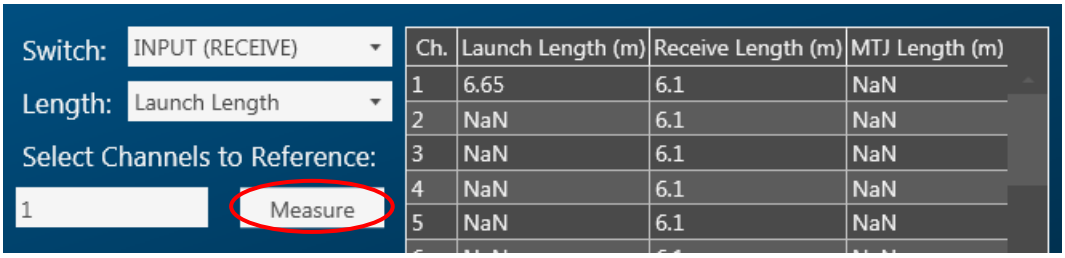
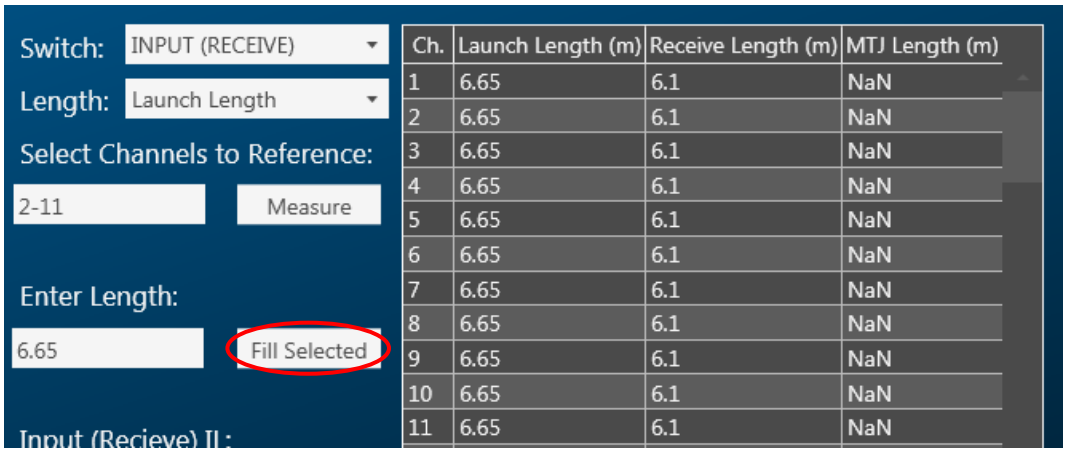


Figure 27: Measure launch length of the input switch

- Repeat the previous point for each channel or enter manually if the lengths are known (Figure 28).



Ch.	Launch Length (m)	Receive Length (m)	MTJ Length (m)
1	6.65	6.1	NaN
2	6.65	6.1	NaN
3	6.65	6.1	NaN
4	6.65	6.1	NaN
5	6.65	6.1	NaN
6	6.65	6.1	NaN
7	6.65	6.1	NaN
8	6.65	6.1	NaN
9	6.65	6.1	NaN
10	6.65	6.1	NaN
11	6.65	6.1	NaN

Figure 28: Fill launch length of the input switch

- Inspect and connect two 3m jumpers between the launch switch channel 1 and receive switch channel 1 (Figure 29).

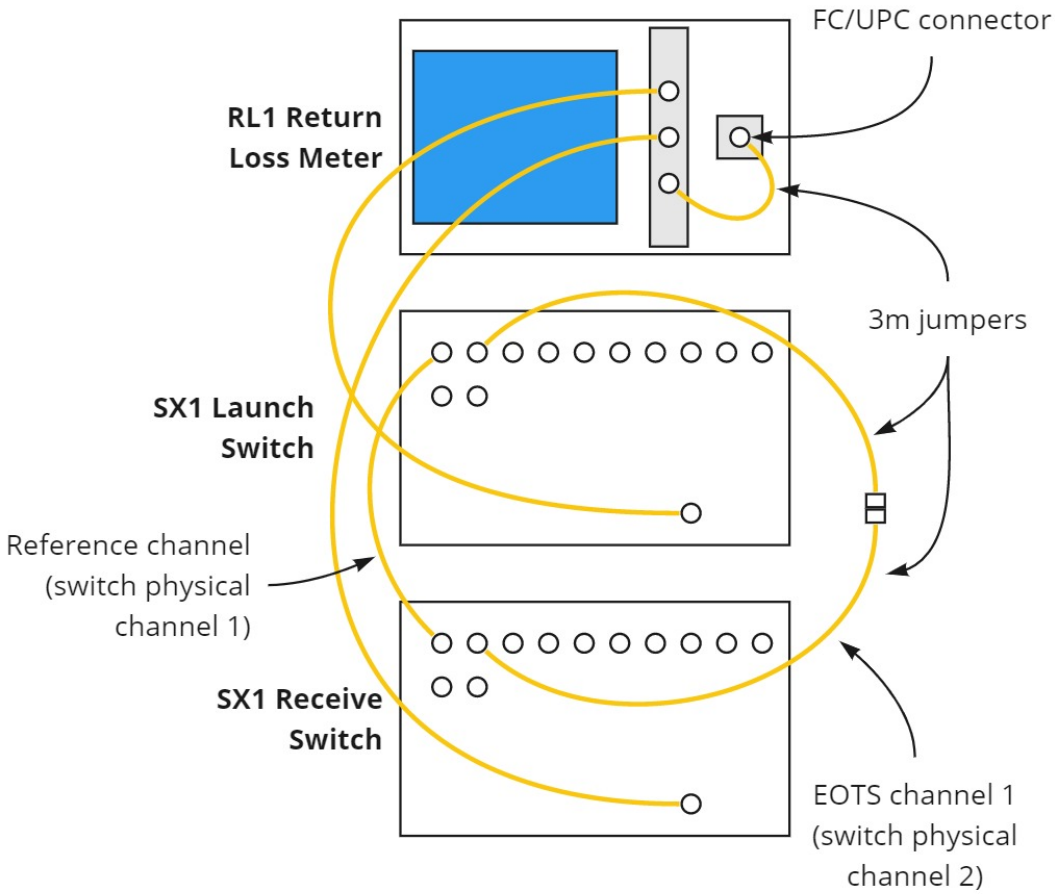


Figure 29: Direction 2 receive length connection diagram

- Measure the receive length of the output switch on channel 1 (Figure 30).

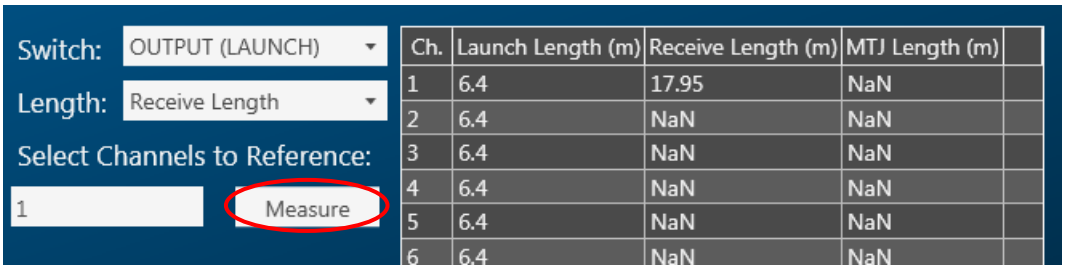


Figure 30: Measure receive length of the output switch

- Repeat for each channel or enter manually if the lengths are known (Figure 31).

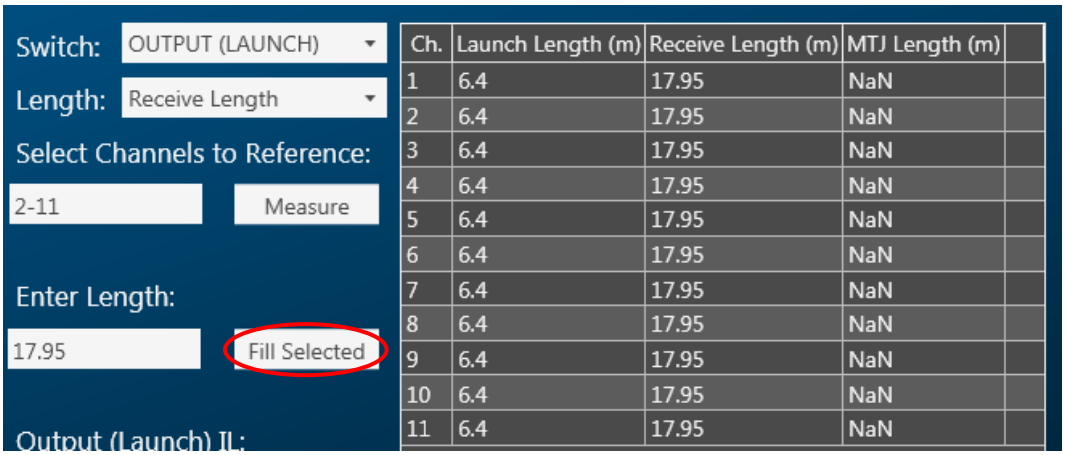


Figure 31: Fill receive length of the output switch

- Press ALT + S to exit supervisor mode and lock the launch and receive lengths. These lengths should be fixed unless hardware is changed.

5

OPERATION

Setting Up a Test

MTJ Length References

The MTJ lengths can be easily adjusted by one of the following methods. This is typically done if the reference cables leading to the environmental chamber are changed. See Figure 32.

1. Enter length manually if the MTJ lengths are known
2. connect the reference cable and leave open to air then measure with the RLM
3. connect a UPC stub of known length and leave open to air then measure with the RLM in cases of uncertainty

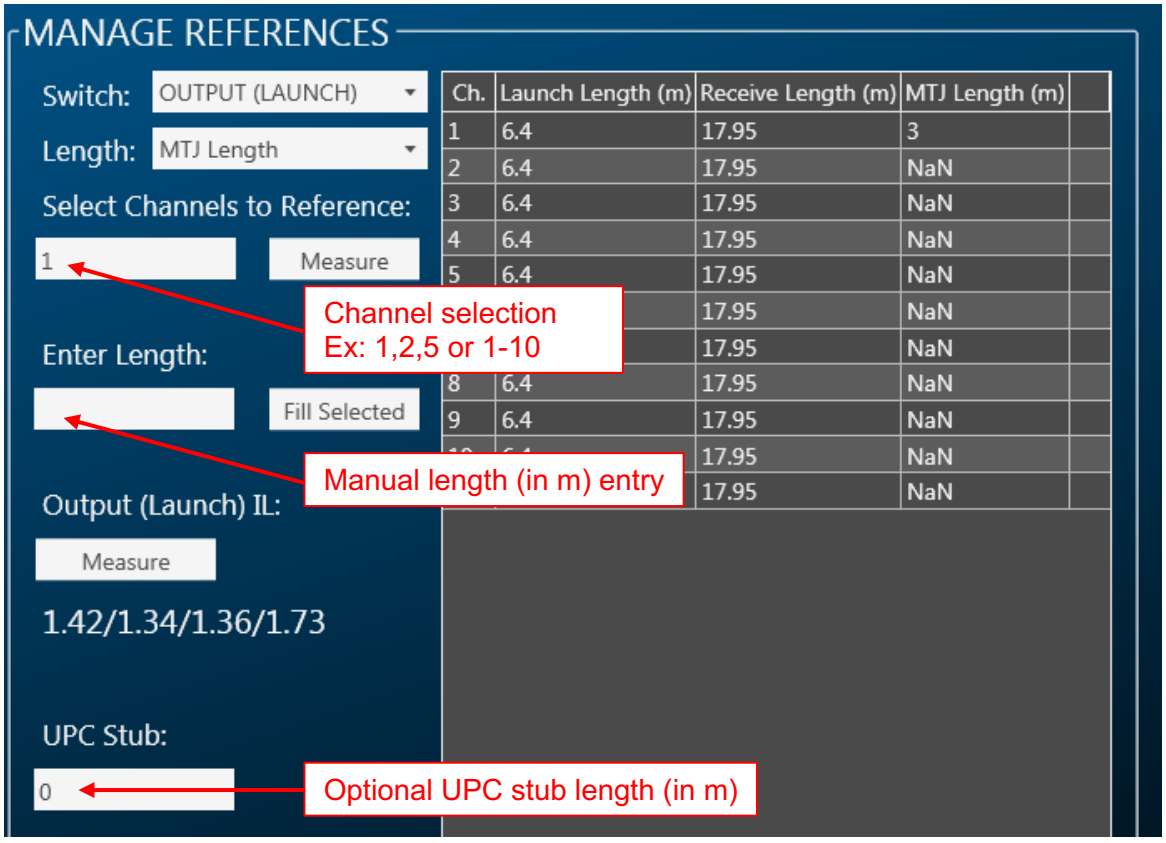


Figure 32: MTJ length references

Create a DUT

Click *New* and fill in the DUT parameters then click *Save.* Specifications can be left blank. See Figure 33.

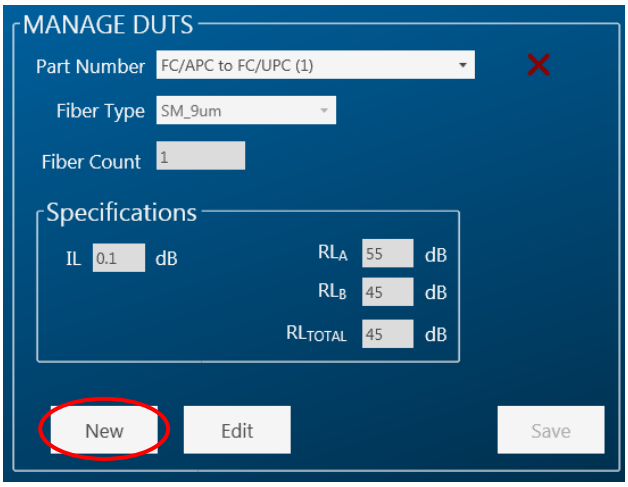


Figure 33: Create a new DUT

Review Settings

Click on the *SETTINGS* tab and review or change your measurement settings (Figure 34).

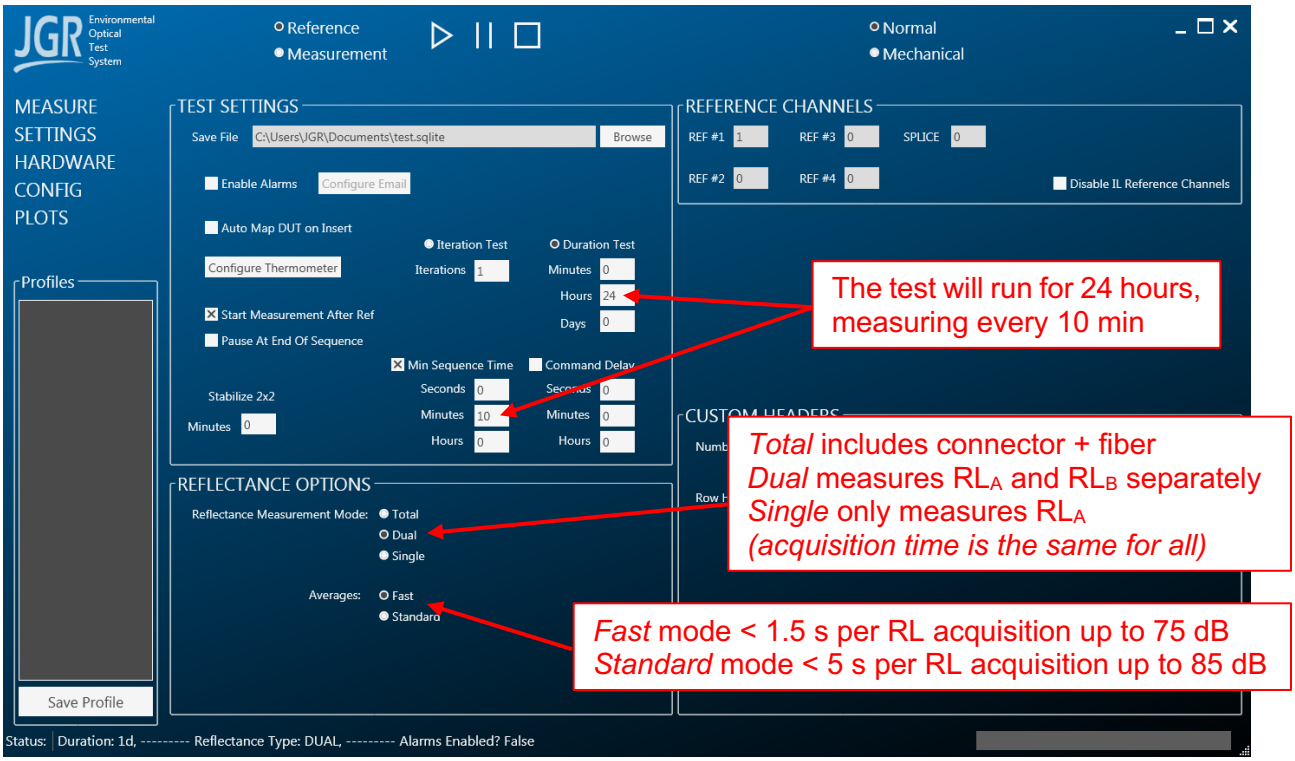


Figure 34: Measurement settings

Create a Test Sequence

- Click on the *MEASURE* tab and select test parameters then click *Insert* (Figure 35).

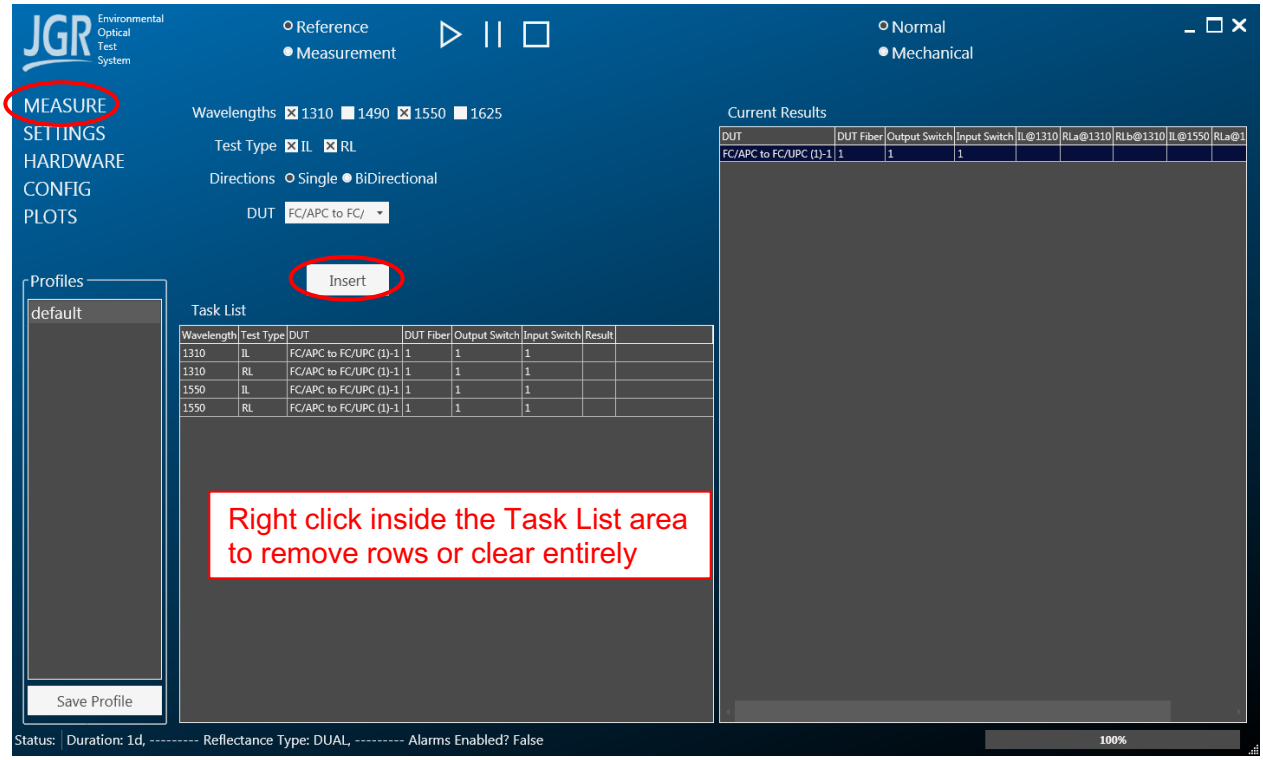


Figure 35: Create a test sequence

- Multiple DUTs can be entered in the sequence (Figure 36).

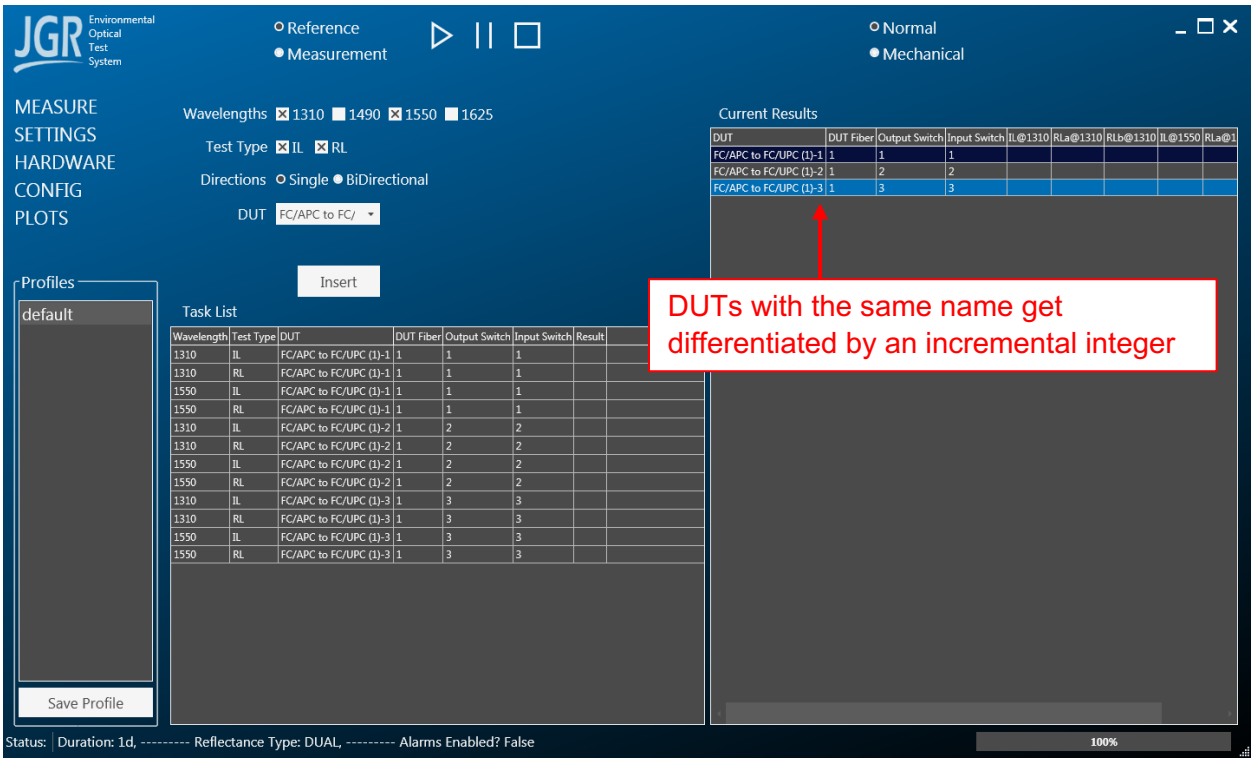


Figure 36: Enter multiple DUTs in a test sequence

Start a Test

- Connect the DUT fully then click ▷
- For the test sequence of Figure 36 (with REF #1 = 1), the optical connections are seen in Figure 37.

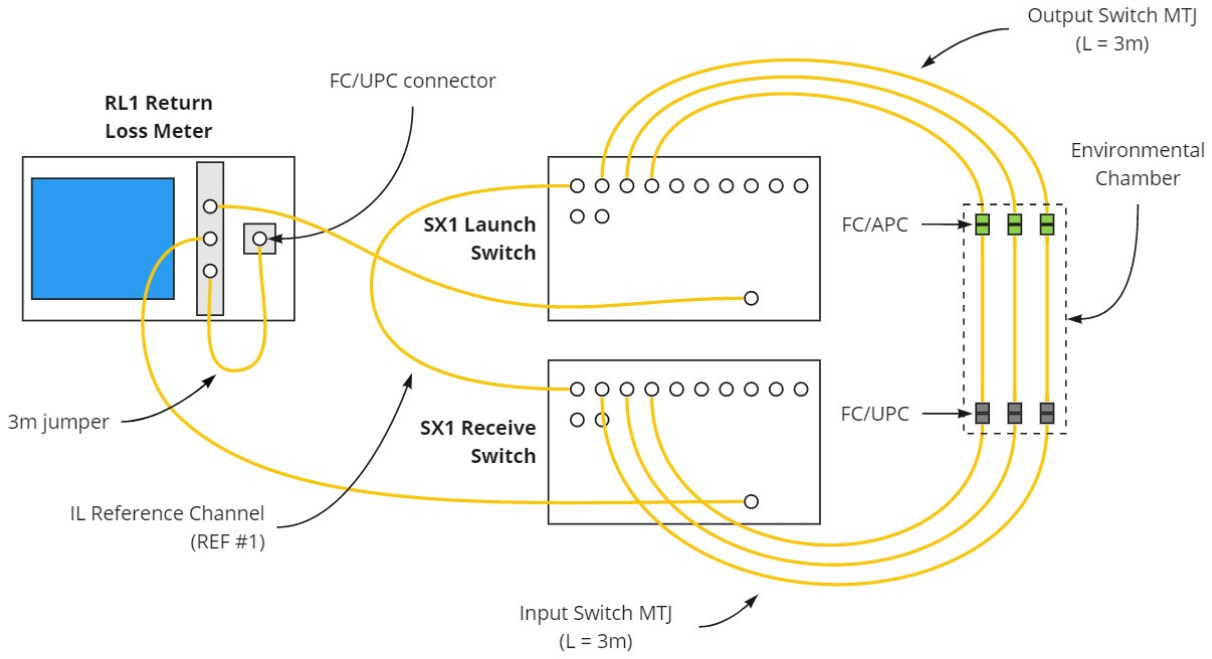


Figure 37: Optical connections example

Monitor Results in Real-time

- Click on *PLOTS* to view real-time graphs of the results (Figure 38).

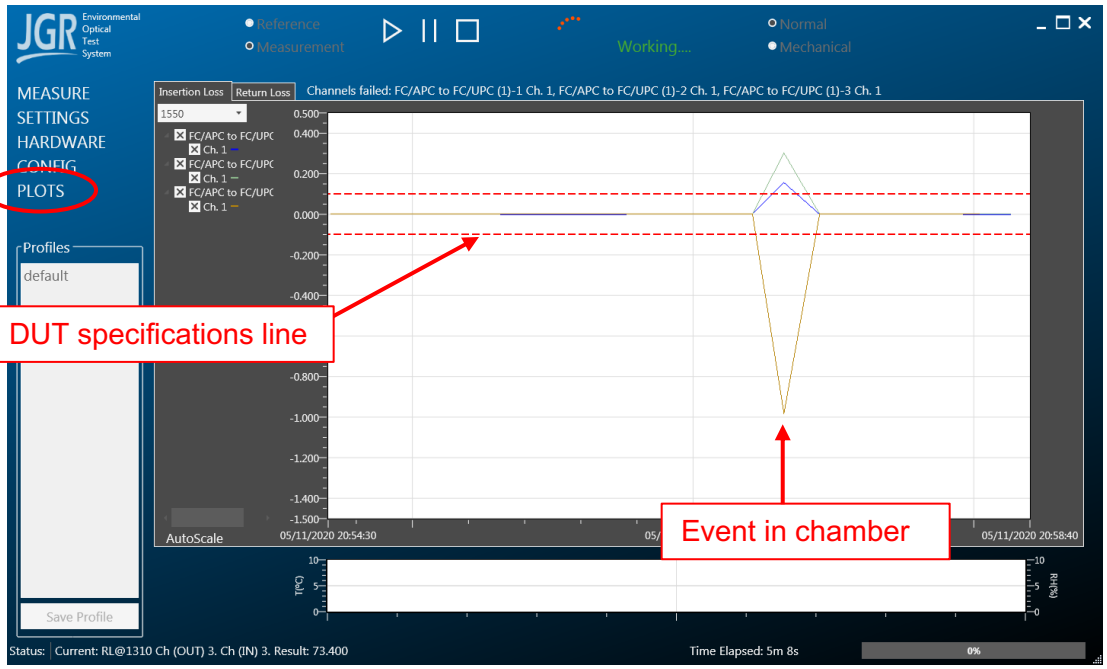


Figure 38: Real-time plots of data

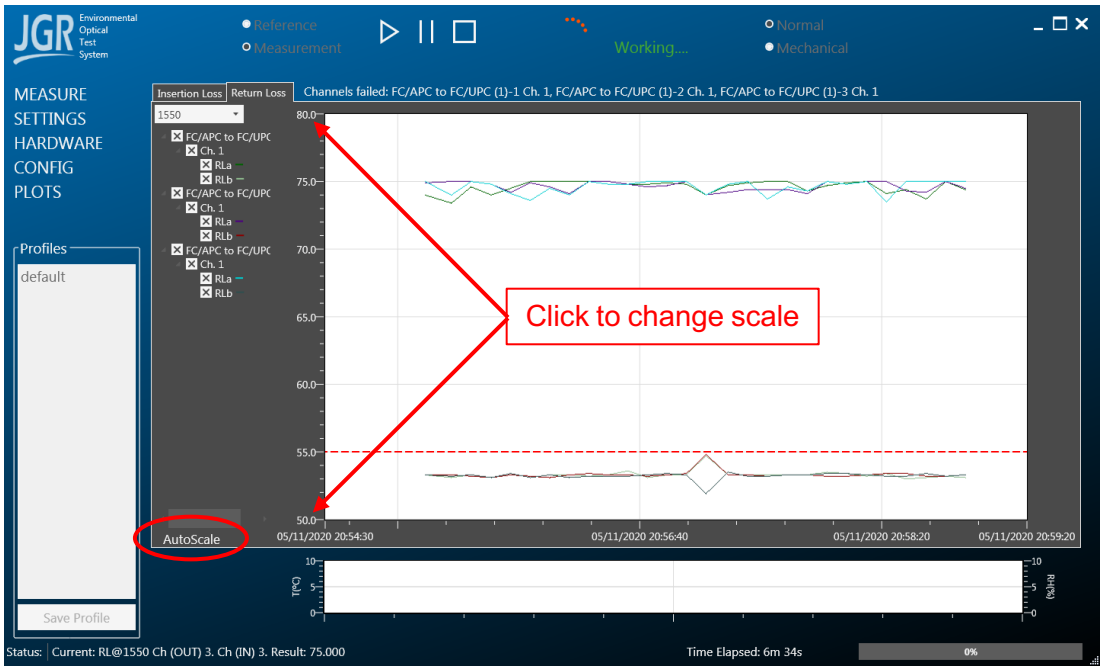


Figure 39: Changing scale in the *PLOTS* tab

Data Post-processing

Data Tools

- Open JGR Data Tools then click on the icon below (Figure 40) to load an .sqlite database file.

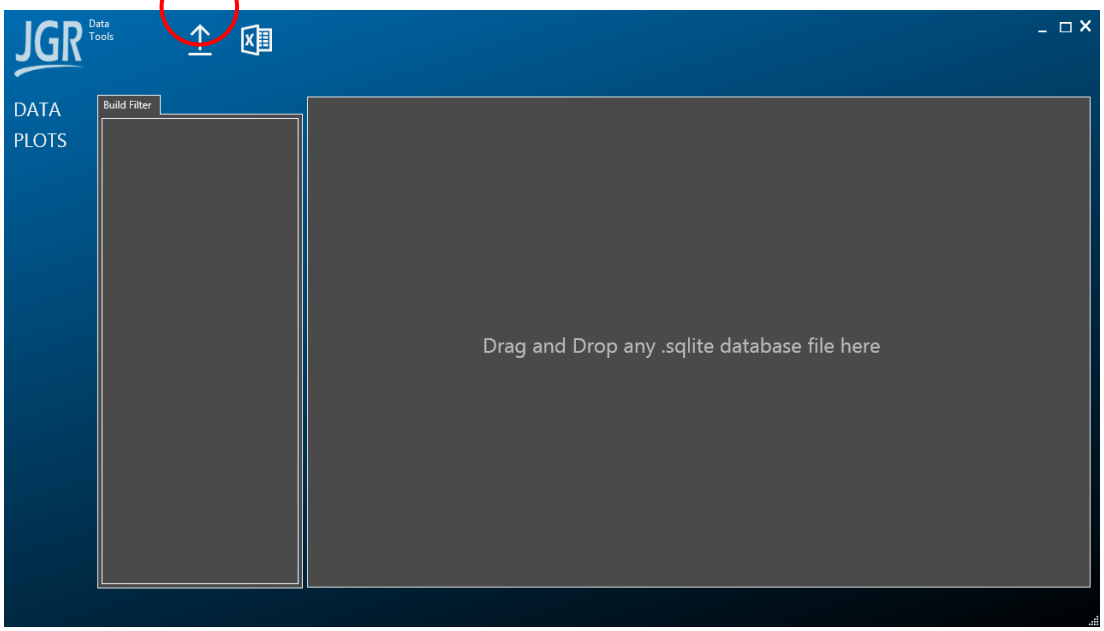


Figure 40: Data Tools – load an .sqlite database file

- Results can be viewed in table form (Figure 41).

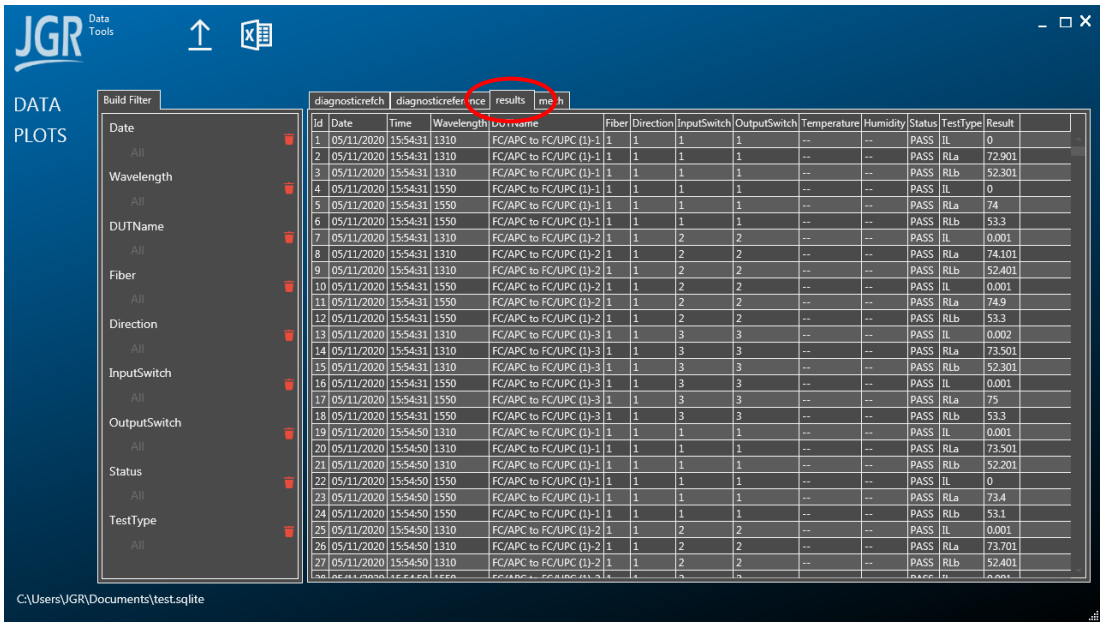


Figure 41: Data Tools – raw data in table form

- Go to the PLOTS tab and click on the icon below (Figure 42) to create data plots.

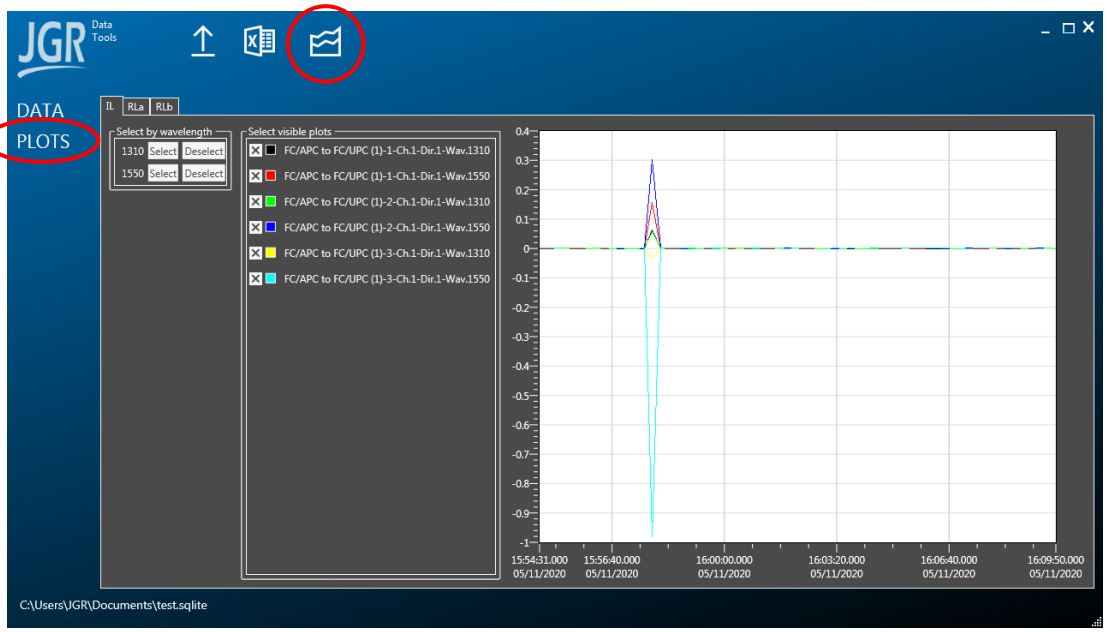
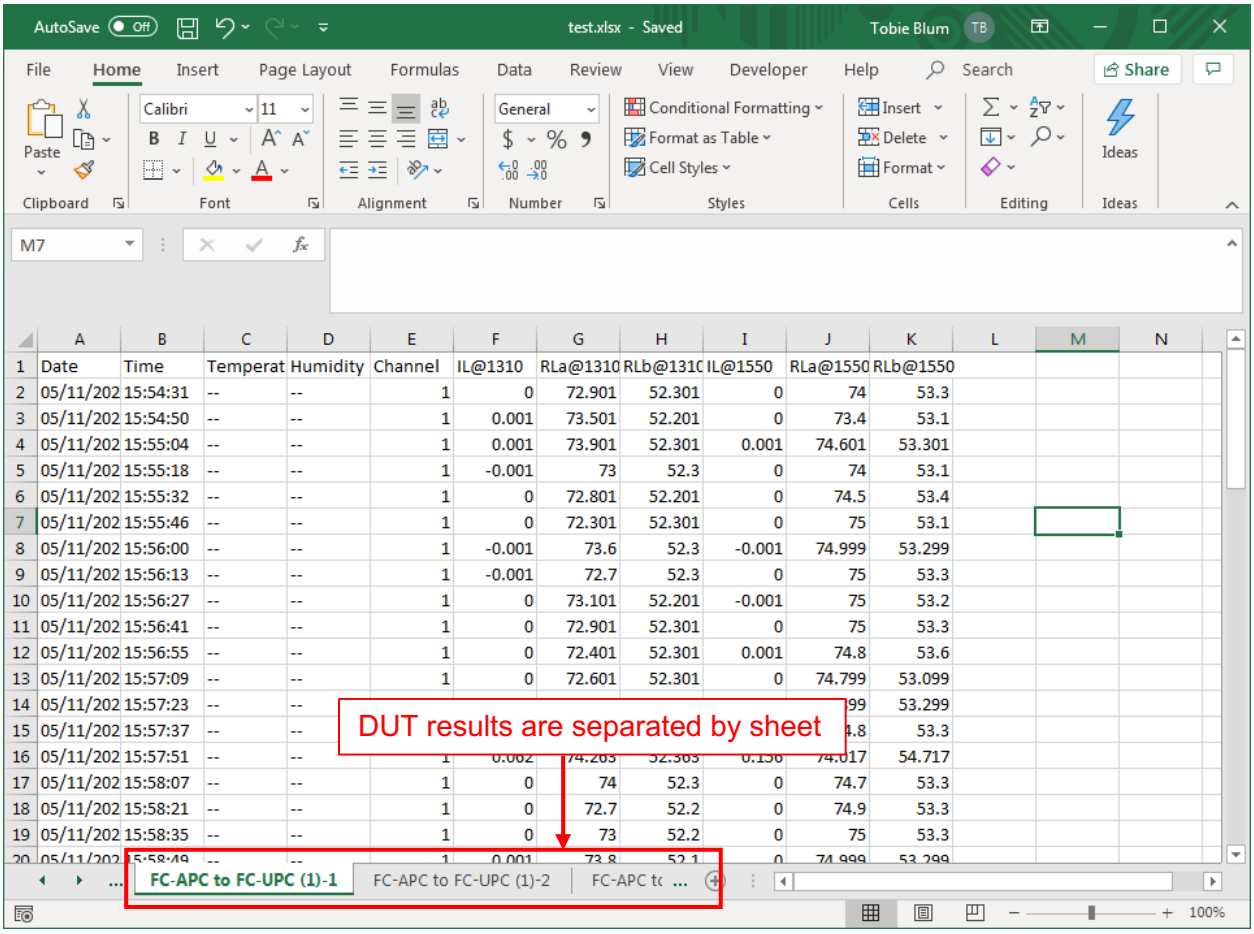


Figure 42: Data Tools – plots

Microsoft Excel

- Click on  to export data to Excel (Figure 43).
- A sort macro is available upon request, please email *support@jgroptics.com*.



	A	B	C	D	E	F	G	H	I	J	K
1	Date	Time	Temperat	Humidity	Channel	IL@1310	RLa@1310	RLb@1310	IL@1550	RLa@1550	RLb@1550
2	05/11/202	15:54:31	--	--	1	0	72.901	52.301	0	74	53.3
3	05/11/202	15:54:50	--	--	1	0.001	73.501	52.201	0	73.4	53.1
4	05/11/202	15:55:04	--	--	1	0.001	73.901	52.301	0.001	74.601	53.301
5	05/11/202	15:55:18	--	--	1	-0.001	73	52.3	0	74	53.1
6	05/11/202	15:55:32	--	--	1	0	72.801	52.201	0	74.5	53.4
7	05/11/202	15:55:46	--	--	1	0	72.301	52.301	0	75	53.1
8	05/11/202	15:56:00	--	--	1	-0.001	73.6	52.3	-0.001	74.999	53.299
9	05/11/202	15:56:13	--	--	1	-0.001	72.7	52.3	0	75	53.3
10	05/11/202	15:56:27	--	--	1	0	73.101	52.201	-0.001	75	53.2
11	05/11/202	15:56:41	--	--	1	0	72.901	52.301	0	75	53.3
12	05/11/202	15:56:55	--	--	1	0	72.401	52.301	0.001	74.8	53.6
13	05/11/202	15:57:09	--	--	1	0	72.601	52.301	0	74.799	53.099
14	05/11/202	15:57:23	--	--						99	53.299
15	05/11/202	15:57:37	--	--						4.8	53.3
16	05/11/202	15:57:51	--	--	1	0.002	74.263	52.363	0.156	74.017	54.717
17	05/11/202	15:58:07	--	--	1	0	74	52.3	0	74.7	53.3
18	05/11/202	15:58:21	--	--	1	0	72.7	52.2	0	74.9	53.3
19	05/11/202	15:58:35	--	--	1	0	73	52.2	0	75	53.3
20	05/11/202	15:58:49	--	--	1	0.001	73.8	52.1	0	74.999	53.299

Figure 43: Results exported to Excel

6

MAINTENANCE

Warning

- Devices with malfunctioning lasers must be returned to the manufacturer for repair.

Cleaning the Unit

Applicable to the RLM meter or OSX switches. If mounted in a rack cabinet, remove before proceeding with the steps below.

1. Unplug the unit from the line power.
2. Clean the enclosure with a damp cloth.
3. Do not plug the unit back in until it is completely dry.

Cleaning the RLM Output(s)

Warning

- Connecting contaminated or damaged connectors to the RLM can damage the unit and affect its performance.
- Damaging the output fiber during maintenance can affect the performance of the unit.

1. Inspect all connectors before each mating and if needed, clean with a lint-free wipe and/or IPA. Figure 44 shows a dirty connector requiring cleaning. Figure 45 shows a clean connector ready to be mated.
2. Loosen the front panel thumbscrews.
3. Gently remove the output panel. Ensure a clear line of sight to the fiber to prevent any stress on the output fiber.
4. Remove the connectors from the mating sleeves. For multiple output RLM's, a marking is visible on the fiber to distinguish which fiber is used for which output.
5. Clean the connectors and mating sleeves in accordance with the section Cleaning Jumper Connectors on page 39.
6. Reinstall the connectors into the mating sleeves.
7. Reinstall the output panel with the thumbscrews. To avoid damaging the fibers, keep a clear line of sight to the fiber as it spools back inside the unit. It should lay flat and spool

back in without resistance or twisting. Figure 46 shows an exposed view of good output fiber management. Figure 47 shows poor fiber management.

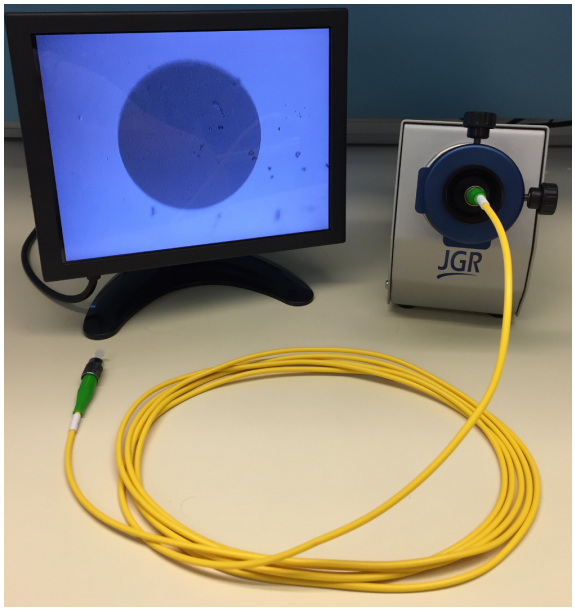


Figure 44: Dirty connector end-face inspection using Santec's EFI-100

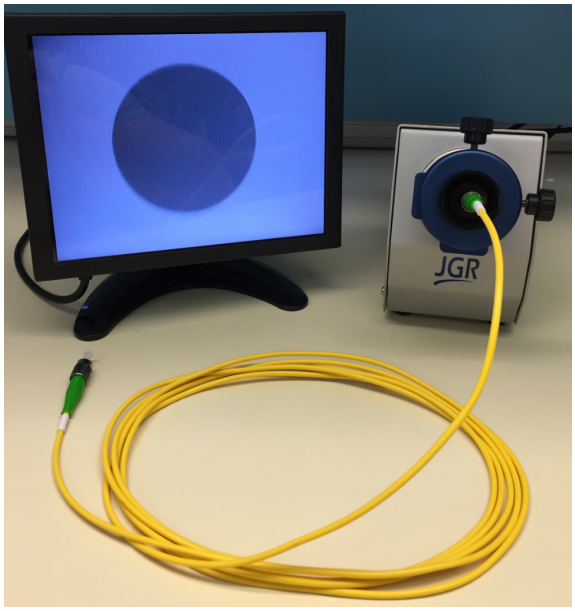


Figure 45: Clean connector end-face inspection using Santec's EFI-100

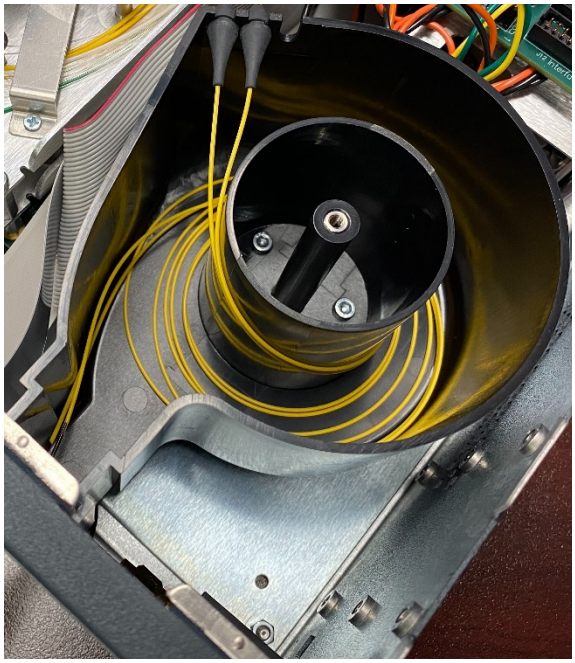


Figure 46: Exposed view of good output fiber management

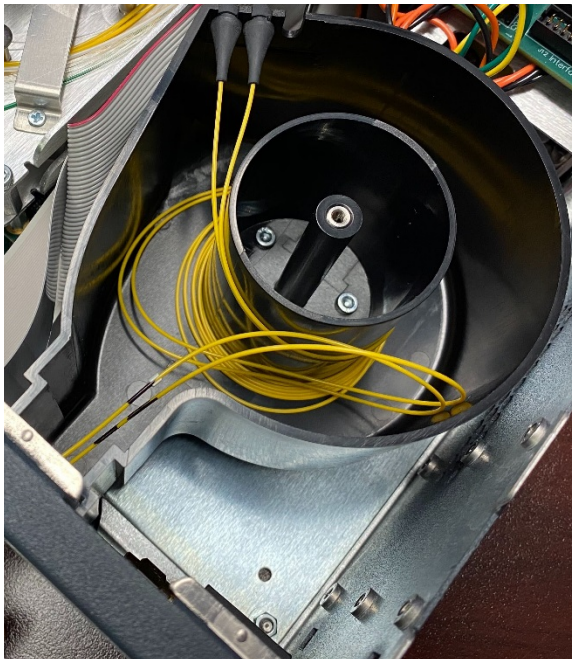


Figure 47: Exposed view of poor output fiber management

Note: the exposed views are only for instructional purposes. **The RLM chassis should not be opened during normal maintenance.**

Cleaning Jumper Connectors

Warning

- Using contaminated or damaged jumpers can affect the performance of the unit.
- Never force an optical connector mating. Some connectors have a ceramic ferrule that can be easily broken.

Optical cable ends need to be inspected before each mating to ensure they are free of contamination or damage. An inspection scope such as Santec's EFI-100 is required.

If they are contaminated, they must be cleaned. The following items are required.

- Filtered compressed air or dusting gas
- Lint-free swabs and lint-free wipes
- Optical grade isopropyl alcohol (IPA) or optical grade 200° ethanol (**do not use rubbing alcohol** which can contain up to 30% water)

To clean the connectors:

1. Blow the sleeve with compressed air.
2. Apply the alcohol to a small area of the lint-free wipe and rub the end of the ferrule over the wet area.
3. Wipe the ferrule on a dry area of the lint-free wipe.
4. Blow the end of the ferrule with compressed air.
5. Apply the alcohol to a lint-free swab to clean the remaining parts of the connector.
6. With the other end of the swab, dry the areas cleaned.
7. Blow the areas cleaned with compressed air.

7

STORAGE AND SHIPPING

Damage can occur from improper handling. Make sure to maintain the unit within the specified temperature range during storage or shipping. Please follow the recommendations below to minimize the possibility of damage:

- If possible, pack the unit in its original packing material when shipping.
- Avoid high humidity or large temperature fluctuations that could generate condensation within the unit.
- Avoid unnecessary shocks and vibrations.

Returning Instruments to Santec

As indicated above, please ship the returned material in the original shipping box or crate and packing material. If these are not available, follow the guidelines below:

1. Contact Santec to obtain an RMA number.
2. Cover the front panel with foam to prevent damage.
3. Wrap the unit in anti-static packaging. Use anti-static connector covers.
4. Pack the unit in a strong enough shipping box considering the unit's weight.
5. Use enough shock-absorbing material (10 to 15 cm) to cushion the unit and prevent it from moving inside the box. Pink poly anti-static foam is recommended.
6. Seal the shipping box securely.
7. Clearly mark FRAGILE on at least 3 of the 4 sides of the box.
8. Always provide the model and serial number of the unit and, if applicable, the RMA number on any accompanying documentation. If possible, indicate the RMA number on the box itself to facilitate identification.

Contact Information

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Ottawa, Ontario, Canada
K2M 1P6

Phone: +1-613-599-1000
Fax: +1-613-599-1099
Email: info@jgroptics.com
Website : www.jgroptics.com

8

SPECIFICATIONS

Table 4: ETS optical and electrical specifications sheet

Parameter	Specification	
	Single-mode	Multimode
Fiber Type (µm)	9/125	50/125 and/or 62.5/125
Encircled Flux Standard	N/A	IEC 61280-4-1
Operating Wavelengths (nm)	1310 / 1490 / 1550 / 1625 /1650	850 / 1300
Maximum Number of Channels	320 Input / 320 Output	
Insertion Loss Repeatability (dB)[1]	± 0.04	
Return Loss Dynamic Range (dB)	30 to 80	10 to 50
Return Loss Repeatability (dB)[1]	± 0.1 (< 65) ± 0.25 (65 to 70) ± 0.5 (> 70)	± 0.5 (< 40) ± 2.0 (> 40)
Power Consumption (VA)	400	
Power Backup[2]	5 hours	
Computer Recommended		
CPU	3.0 GHz or faster, 4-core	
RAM	8 GB	
Operating System	Windows 10 (64-bit)	

Notes:
[1] in a controlled lab environment as defined by GR-326: 23 ± 2 °C, RH < 75%
[2] with included Tripplite 1500VA Uninterruptible Power Supply

Table 5: ETS mechanical and environmental specifications sheet

Parameter	Specification
Mechanical Configuration	All equipment is installed in a single bay 28U 19” rack with removable covers and doors. Cabinet includes casters and levelers, front & rear doors to access instruments. Rear panel pigtails.
Cabinet Dimensions W x H x D (cm)	61 x 177 x 84
Shipping Crate Dimensions W x H x D (cm)	75 x 192 x 105
System Weight (kg)	180
Total Shipment Weight (kg)	250
Operating Temperature (°C)	0 to 40
Storage Temperature (°C)	-40 to 60
Humidity (Non-condensing)	Maximum 80% RH from 0 to 40°C

WARNING!

In the event of any trouble with this product, turn the unit off in accordance with the procedures to shut off the power described in this operation manual, disconnect the power source cord, make sure the product name and serial number described on the name plate of the product, and then contact our dealer at your place or directly contact us at Santec Photonics Laboratories. Our telephone number and facsimile number are shown below. However, we are not responsible for any trouble arising from your own repair or modification on this product.

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