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# **Model 928-OMS 4-CH**

## **Optical Monitoring System**

### **User Manual**

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**ACRONYMS AND ABBREVIATIONS**

CWDM	Coarse Wavelength Division Multiplexing
DHCP	Dynamic Host Configuration Protocol
EDL	Electronic Data Logger
GbE	Gigabit Ethernet
GUI	Graphical User Interface
IP	Internet Protocol
LED	Light Emitting Diode
MAC	Media Access Control (Ethernet)
OEM	Original Equipment Manufacturer
OMS	Optical Monitoring System
OTDR	Optical Time-Domain Reflectometer
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
PLC	Programmable Logic Controller
ROV	Remotely Operated Vehicle
TCP	Transmission Control Protocol
uC	Microcontroller
WDM	Wavelength Division Multiplexer

## 1.0 Introduction

Focal's Model 928 Optical Monitoring System (OMS) offers industry leading, live and real-time performance monitoring of fiber-optic systems consisting of multiple fiber-optic rotary joints, tethers, and umbilical cables. The 928-OMS has been designed to seamlessly integrate with existing Focal multiplexer and slip ring diagnostics to provide the end user with the capability to determine, monitor and predict the overall health of electro-optic systems.

The 928-OMS provides key performance status of multiple active fiber-optic cables carrying live communications data and non-active spare cables. The status of all monitored systems is managed using Focal's advanced software and is accessible via an easy-to-use and intuitive graphical user interface (GUI), smart front panel LEDs and remote network connection. The 928-OMS is physically installed in-line with a user's existing communication electronics (multiplexers or media converters). The advanced software manages and optimizes the 928-OMS settings allowing for easy and accurate measurements.

The 4-channel version of the 928-OMS supports the monitoring of four (4) independent fiber optic links and has been designed to work with systems operating typically at 1310 nm and 1550 nm and with CWDM systems that avoid 1591 nm and 1611 nm wavelengths. This version of the OMS is composed of one 19" module which includes all electrical and optical components to be connected in-line with the user's multiplexer system. The 928-OMS design allows transparent integration with the end user's optical system without disrupting the existing fiber connections.

This document covers the details of the 928-OMS hardware and software. For basic configuration and operation refer to the 928-0601-02 Model 928-OMS Quick Start Guide (4CH).

## 1.1 Safety Precautions

The following safety precautions should be observed before using this product.



This product is intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possible injury. Do not make module connections unless qualified to do so.

Before connecting this product to the power source, verify that the output voltage is within the specifications of the product's power supply.

Do not attempt to modify or repair any circuit unless recommended by the manufacturer.



Protect the power cable from being walked on or pinched by items placed or against them.

Always unplug the power cable at the plug, do not pull on the cord itself.

Do not block any ventilation openings.



Do not look into the end of a fiber when it is plugged into a transceiver or active fiber, especially when using a magnifying instrument, such as a fiber microscope.

Handle optical fiber with extreme care. Glass fiber is subject to breakage if mishandled.

## 2.0 Specifications

**Table 2-1: Specifications**

Optical	
<b>Fiber Type</b>	Singlemode (9/125 μm)
<b>Monitoring Fibers</b>	4, in-line
<b>Operating Wavelength</b>	1625 nm (nominal)
<b>Distance Range</b>	0.5 – 20 km (typical)
<b>Output Power</b>	Class 1M, IEC 60825-1
<b>Insertion Loss</b>	1 dB (typical)
<b>Sampling Resolution</b>	1 – 10 m
<b>Distance Accuracy</b>	± 1.5 m
<b>Measurement Time</b>	10 – 30 seconds per fiber scan
<b>Measurements</b>	Fiber lengths, component optical losses, fault locations, reflections, alarms/warnings
<b>Options</b>	8 monitoring fibers 1611 nm operating wavelength
Mechanical	
<b>Dimensions</b>	1U 19" EIA rack enclosure
<b>Options</b>	Customization for OEM configurations
Power	
<b>Consumption</b>	10 W (max.)
<b>Voltage</b>	100 to 240 VAC, 50-60 Hz
<b>Current</b>	0.1 A (max.)
Connectors	
<b>Optical</b>	9 x ST/PC
<b>Power</b>	1 x IEC-320 C14 Jack
<b>Display</b>	1 x HDMI, 1 x VGA
<b>Serial Diagnostics</b>	1 x DB-9 for RS-232 (e.g. Model 903 diagnostics)
<b>Slip Ring Diagnostics</b>	1 x M12 For Model 923 access (RS-485 + 24 VDC)
<b>Ethernet Diagnostics</b>	2 x RJ-45 For Model 907 diagnostics and optional OMS remote diagnostics access
<b>PC Access</b>	4 x USB Type A For keyboard, mouse, and external storage
<b>Options</b>	Contact factory for other optical connectors
Environmental	
<b>Temperature</b>	0 °C to +40 °C (operation)
<b>Humidity</b>	5% to 85% RH, non-condensing
Software	
<b>Notifications</b>	User defined warning and alarm levels, historical statistics
<b>Configuration</b>	Presets of custom settings
<b>Logging</b>	OTDR traces and component measurements

## 3.0 Overview

The 928-OMS is a combination of hardware and software package that provides live monitoring of multiple fibers and detail diagnostics information of optical systems. It provides optical information from the near end, far end and intermediate optical components composing the optical system. The use of the 928-OMS enables prevention and prediction of system failures by monitoring and analyzing the optical system.

The key features of the 928-OMS are all designed to reduce and prevent system downtime while providing an easy to use and effective tool to the end user. Some of the key features and benefits of the 928-OMS include:

### Real time performance monitoring on live fibers

- It saves operating costs by avoiding unscheduled downtime.
- It allows optical status of components in the optical system to be monitored while the communication system is in use without the need of disconnecting the system.

### Automatic or manual continuous monitoring of multiple fibers

- It allows monitoring up to 4 unique or redundant fiber optic systems. Backup inactive fiber links can be monitored to verify their performance thus enabling real-time reassurance of the reliability of the backup link.

### Software for configuring, monitoring, trending and logging

- It provides full system diagnostics such as optical power levels, fiber distances, optical insertion losses and point of fault identification.
- It allows increasing optical power margins of critical telemetry links.

### Simple setup and operation

- It reduces training and technical support costs.
- It saves significant time identifying and locating optical problems.

### Factory or user configured operating modes

- It reduces time to configure the tool and eliminates guess work when using factory tested configurations while also enabling flexibility for power users and tool customization for system-specific needs.

For information pertaining the basic start up and functionality of the 928-OMS refer to the 928-0601-02 Model 928-OMS Quick Start Guide (4CH).

### 3.1 Typical Application: Surface-Remote ROV System

A typical fiber system for a surface to remote ROV consists of several optical and electrical elements including a console multiplexer, a surface winch, TMS winch, remote multiplexer on board an ROV and fiber optic cable enabling communication between top side and the ROV. The system connects the console multiplexer to the surface winch with a deck cable on board the vessel. From the surface winch an umbilical cable connects to the TMS winch. From the TMS winch a tether cable connects to the remote multiplexer.

Focal's 928-OMS seamlessly integrates with the typical ROV system with the addition of the 928-OMS to the console unit. This addition will provide the user with full optical system diagnostics with minimal changes to existing fiber connections. A visual representation of the typical ROV system application with the integrated 928-OMS can be seen in the figure below.

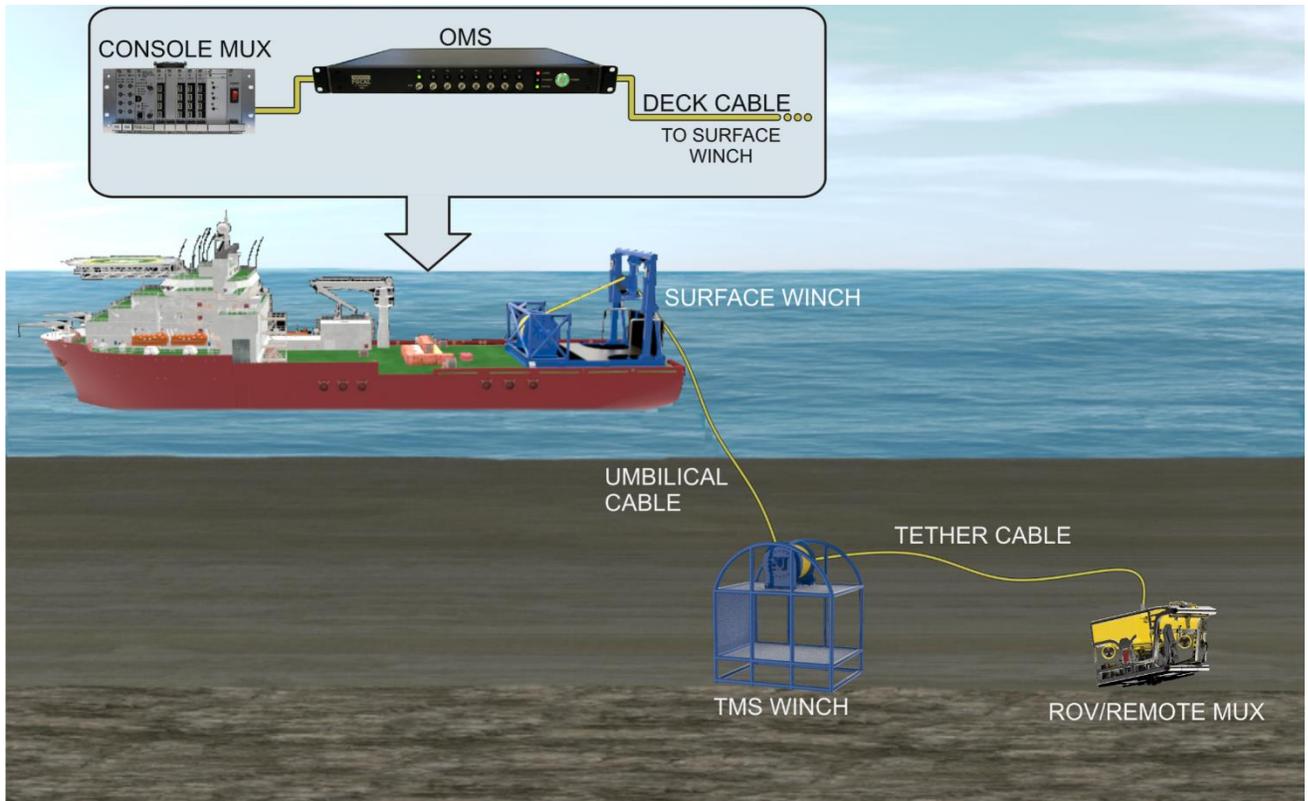


Figure 3-1: Typical ROV System with OMS Diagram

## 4.0 Hardware

The 928-OMS ordering part number is shown below. The standard version of the 928-OMS supports four channels in a single 19" 1U module suitable for mounting inside a standard 19" rack. The 4-CH OMS contains all the electro-optical components to integrate with an existing multiplexer system or to be used as a standalone tool.

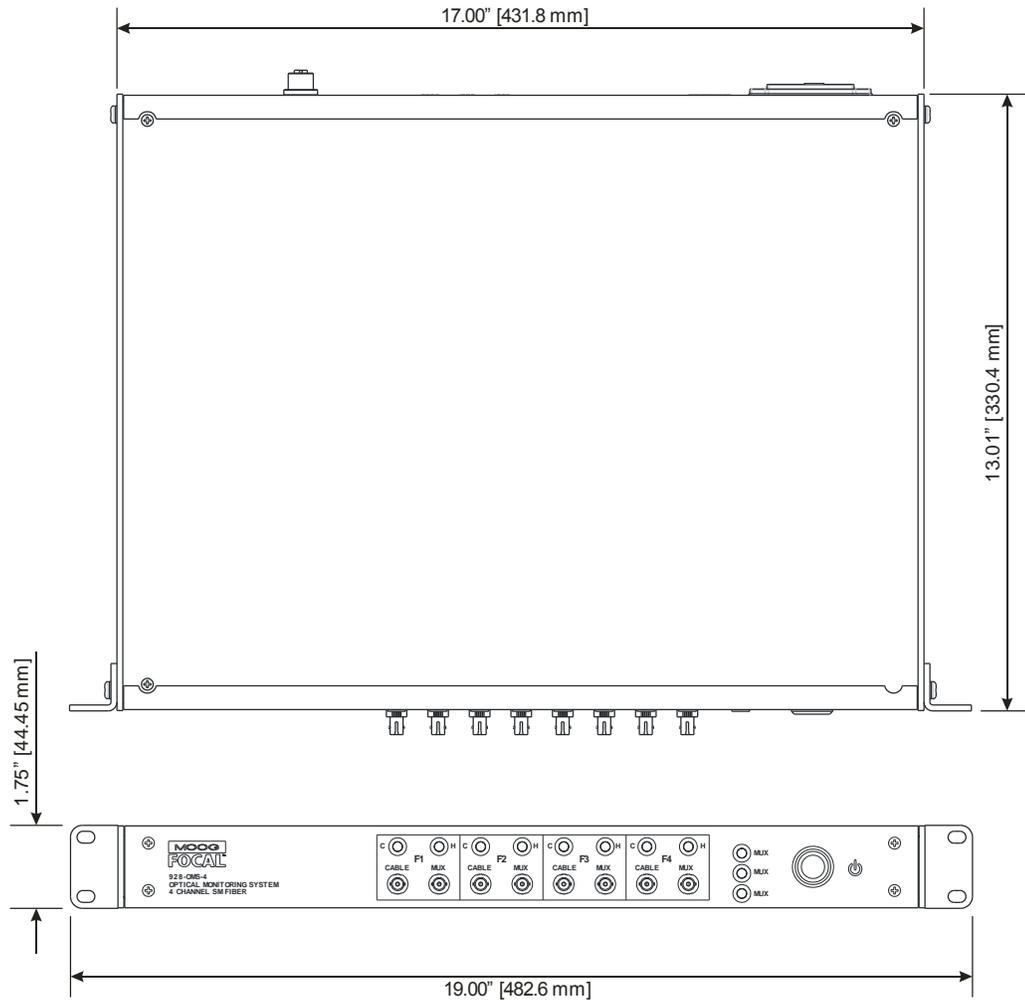
**Table 4-1: Ordering Part Number**

Ordering P/N	Description	Installation Drawing
928-8004-00	4 CH, Optical Monitoring System (OMS), 19", 1U Module	928-8004-00

**Note:** An 8-channel version of the OMS is also available and higher channel counts are possible. Please contact the factory for details or any specific requirements.

## 4.1 Dimensions

The overall nominal dimensions of the 928-OMS are shown below. For more details refer to the installation drawing 928-8004-00.



**Figure 4-1: OMS Overall Nominal Dimensions**

## 4.2 Front Panel Connections

For integration with an existing fiber multiplexer system, the 928-OMS should be connected as shown below. For standalone installations without an external multiplexer in-line simply leave the MUX port unconnected and connect the fiber under test into the CABLE port.



### IMPORTANT

Before making any fiber connections to the front panel of the unit, ensure the fibers being connected at the front are completely clean and free of any debris. Damage or errors can be caused by bad fiber cleaning or handling.

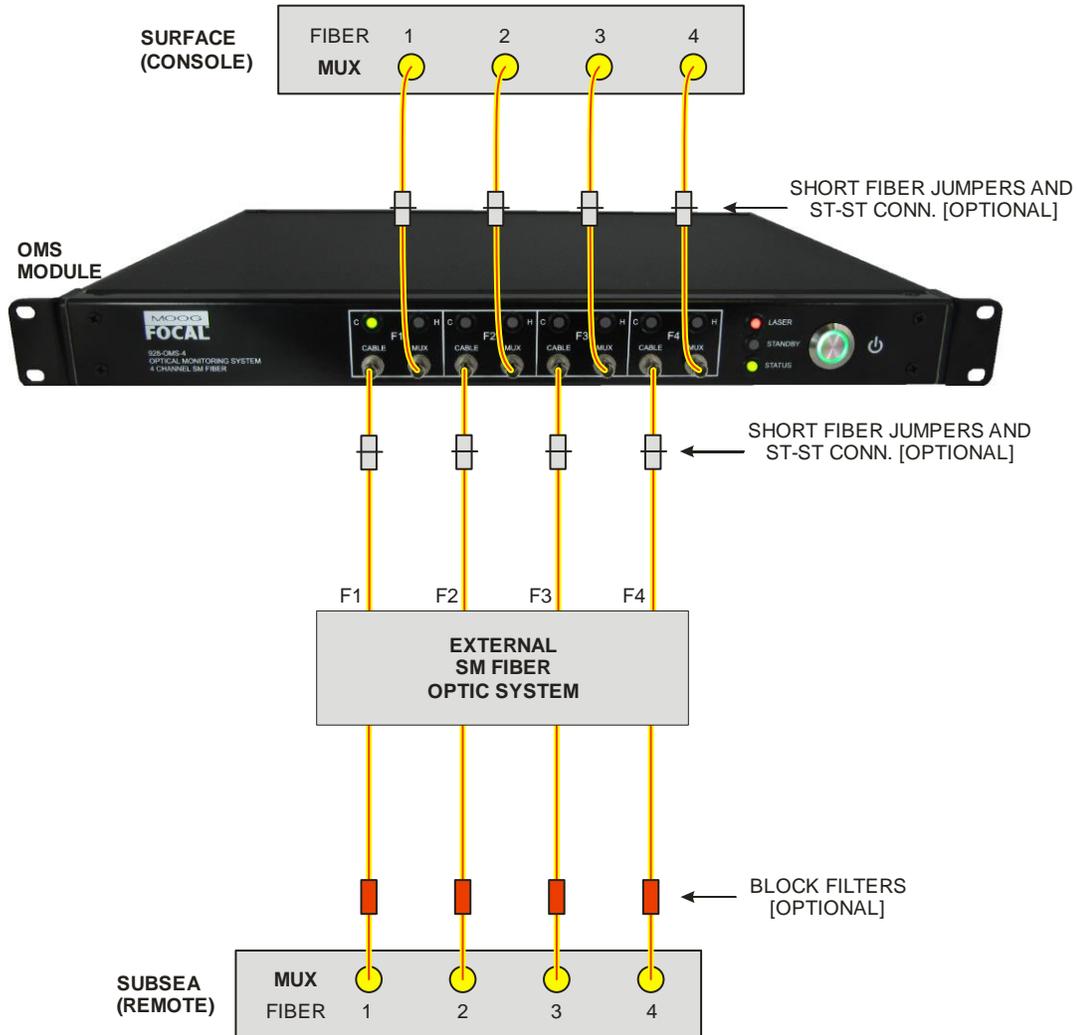


Figure 4-2: OMS Front Panel Connections

The figure above shows that the 928-OMS is placed at the surface (console) in-line with the fiber link to the subsea (remote) multiplexer. The insertion loss through the 928-OMS is typically < 1 dB. The optical path inside the module is entirely passive, so the multiplexer link will run even if the OMS control module is powered off.

### Notes:

1. The short fiber jumpers connected at the front panel of the 928-OMS are optional. However, it is highly recommended to use them to prevent damage or dirt entering the front panel ST connectors.
2. **The block filters at the remote end are required for live monitoring of non-CWDM multiplexer systems (e.g. 903 WDM-based systems).** These filters are only optional for Focal-type CWDM systems or CWDMs that have been pre-tested or approved by the factory.

### 4.3 Diagnostic LEDs

The front panel LEDs are used to indicate the status for each fiber on the 928-OMS. Both the **C (Current)** and **H (History)** LEDs can be cleared using the application software, by resetting the application software or performing a hardware reset. An LED initialization sequence is shown each time the software application is started.



Figure 4-3: OMS 4-CH Front Panel LEDs

#### Current (C) Status LEDs

The Current Status LEDs report the status for the last complete measurement on a fiber. The LED states are listed in the table below.

Table 4-2: Current (C) Status LED States

LED State	Description
OFF	No measurement has been completed on the fiber.
FLASHING GREEN	A <b>measurement is in progress</b> on the indicated fiber where the last measurement indicated <b>no alarm or warning</b> states.
SOLID GREEN	A measurement was completed on the indicated fiber and <b>no alarms or warnings</b> were detected.
FLASHING YELLOW	A measurement is in progress on the indicated fiber where the last measurement indicated <b>warning</b> states.
SOLID YELLOW	A measurement was completed on the indicated fiber and <b>warnings were detected</b> .
FLASHING RED	A measurement is in progress on the indicated fiber where the last measurement indicated <b>alarm</b> states.
SOLID RED	A measurement was completed on the indicated fiber and alarms were detected.

#### History (H) Status LEDs

**SOLID RED:** An **alarm** has occurred on at least one full previous measurements for the indicated fiber. The history status LED is latching and will not clear until manually triggered by the user or a software reset occurs.  
**OFF:** No history status or the unit is off.

#### Laser LED

**SOLID RED:** The laser is on and the OMS is actively measuring.  
**OFF:** The OMS is not actively measuring.

#### Standby LED

**YELLOW:** The OMS unit is powered but the PC is turned off.

**Note:** Normally, when the OMS GUI shutdown button is used to turn off the unit, all the other front panel LEDs will be turned off and the standby LED will turn on yellow. If the user uses the front panel power button to turn off the unit then all the other front panel LEDs will keep the last known state and the standby LED will turn yellow. It is recommended to use the GUI shutdown button to power off the unit.

#### Status LED

**SOLID GREEN:** The unit is on and the OMS software is running.  
**OFF:** The unit is off or the OMS software has not been initialized.

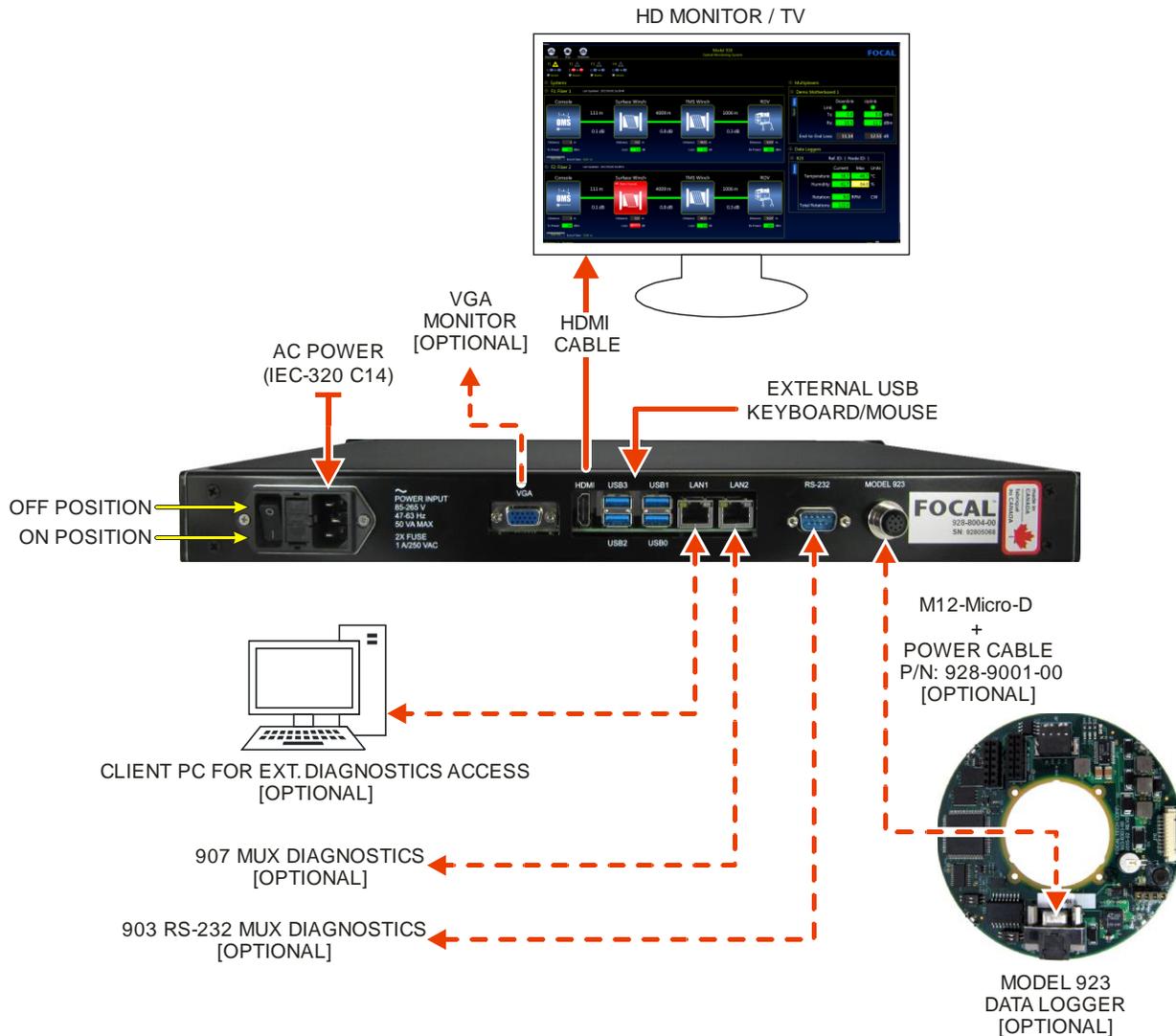
#### Power Indicator

The 928-OMS power button ring LED will lit green when the internal PC is powered. The ring will not be illuminated when the PC is off.

**Note:** AC power should only be removed or turned off when the power indicator is also off.

## 4.4 Back Panel Connections

Rear panel connections from the 928-OMS are as shown below. Only an external monitor (HDMI or VGA), keyboard/mouse and AC power are required to start using the 928-OMS.



**Figure 4-4: OMS Back Panel Connections**

In addition to the built-in optical monitoring capabilities of the 928-OMS module, this tool can also be used as a central hub to collect key real-time diagnostics information from other Focal (and 3<sup>rd</sup> party) equipment. These additional equipment can be attached to the back of the 928-OMS via 2x Ethernet ports, 1x M12 Micro-D connector and 1x DB9 RS-232 port. The external equipment includes (but not limited):

- External PC for remote access to the 928-OMS (via 10/100/1000 Ethernet Port LAN1).
- Model 907-DIAG-E diagnostics card (via Ethernet Port LAN2).
  - Typical diagnostics information extracted/displayed: Critical optical transmit and receive optical power levels from 907 multiplexer motherboards that support diagnostics.
- Model 923 electronic data logger and external environment monitoring board (via M12 Micro-D).
  - Typical information extracted/displayed: External temperature (relative to board location), humidity and rotations.
- Model 903 FMB-X 2.5 (via RS-232 port)

**Note:** Older revisions on the 928-OMS hardware may not include the back panel RS-232 port.

## 4.5 Connector Pinouts

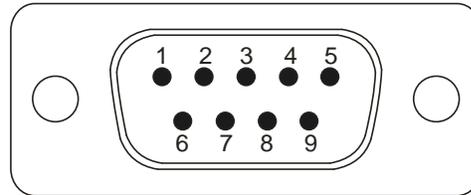
The sections below outline the pinout for the various connectors on the 928-OMS.

### 4.5.1 RS-232 – DB9M

The DB9 connector on the back of the 928-OMS uses a standard RS-232 pinout intended for receiving 903 serial diagnostics and also for support of future devices requiring an RS-232 interface. Note that this port is non-isolated. This serial port is listed as COM4 in the device PC. The pinout for this connector is shown below.

**Table 4-3: RS-232 DB9M Pinout**

Pin	Signal
1	Reserved*
2	RX DATA
3	TX DATA
4	Reserved*
5	GND
6	Reserved*
7	Reserved*
8	Reserved*
9	Reserved*



**Figure 4-5: RS-232 DB9 Male Connector (Front View)**

\*Reserved pins are internally connected and have a standard RS-232 pinout intended for future use.

**Table 4-4: RS-232 Port Mating Part Numbers**

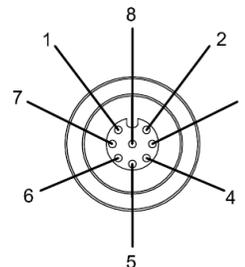
P/N	Manufacturer	Description
903-9059-00	Focal	3.5 mm Plug to DB9 Female RS-232 Cable Assembly for 903 FMB-X-2.5
928-9002-00	Focal	RS-232 Sniffer Cable Assembly (903 to OMS to External PC)
45-308	GC Electronics	RS-232 DB9M to DB9F Cable Assembly

### 4.5.2 Model 923 – M12

The M12 connector on the back of the 928-OMS labelled Model 923 is used for interfacing with an external Model 923 data logger. This port is capable of providing power to one (1) 923 board and also provides the RS-485 interface required for diagnostics communication. This port is isolated. The M12 connector is listed as COM2 in the device PC. The pinout for this connector is shown below.

**Table 4-5: Model 923 - M12 Pinout**

Pin	Signal
1	24 VOUT-
2	24 VOUT+
3	RS-485+
4	RS-485-
5	RS-485 GND
6	NC.
7	NC.
8	NC.



**Figure 4-6: Model 923 - M12 Connector (Front View)**

**Table 4-6: RS-232 Port Mating Part Numbers**

P/N	Manufacturer	Description
928-9001-00	Focal	M12 to 923 Power & RS-485 Cable Assembly

## 5.0 Software

The 928-OMS software is a .NET graphical user interface (GUI) that runs on a Microsoft Windows operating system. The OMS software is already pre-installed on the internal PC prior to shipping the device. The software executable is found under C:\FOCAL\_SOFTWARE\928-0401-00\_OMS\_GUI and must remain in that location for proper software auto-start operation.

On power-up the OMS unit will automatically login and auto-start the software so the user does not have to enter any credentials. The PC is configured with an account named **User** and the password is **user**.

### 5.1 Application Layout

The figure below highlights the main functional areas of the 928-OMS software.

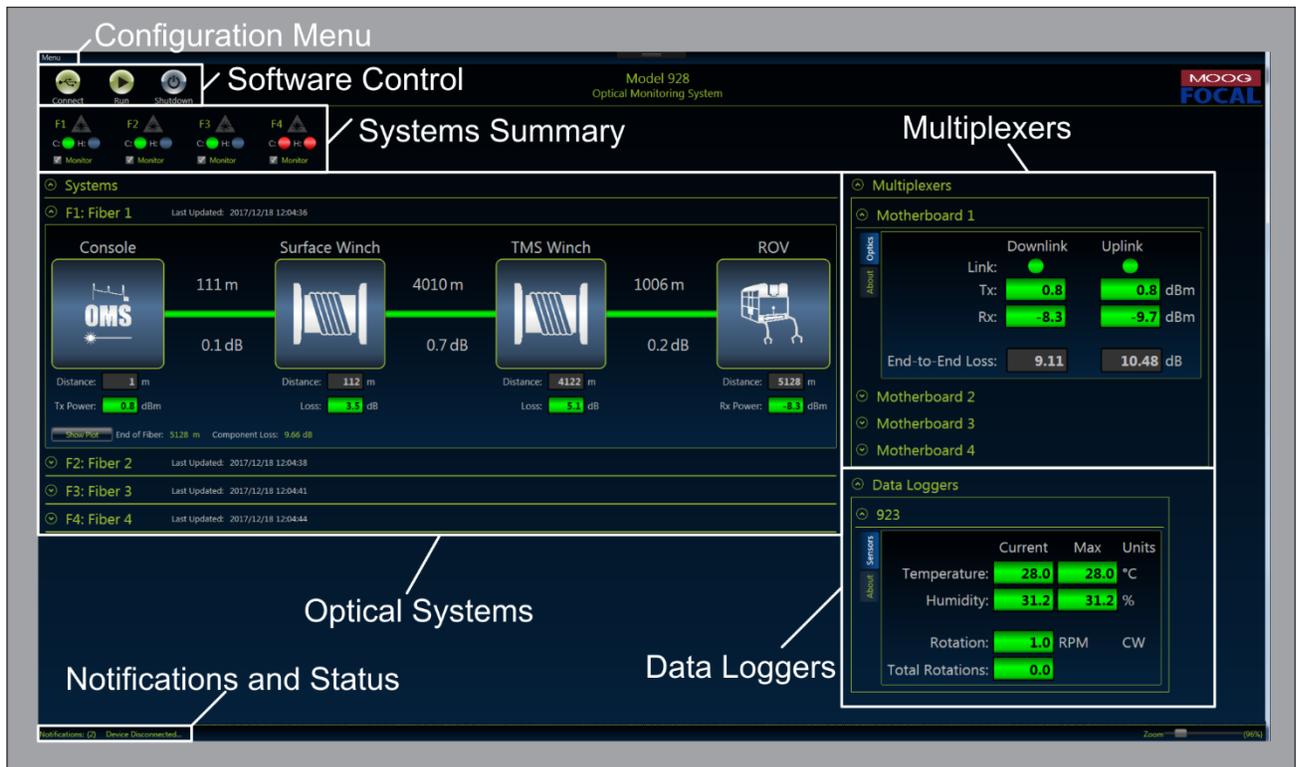


Figure 5-1: Software Layout

## 5.2 Software Control Buttons

The main title bar of the 928-OMS software displays three control buttons, **Connect/Disconnect**, **Run/Stop** and **Shutdown**. The buttons will automatically change function depending on the state of the 928-OMS device.

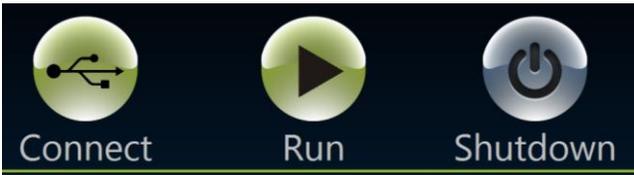


Figure 5-2: Default Software Control Buttons

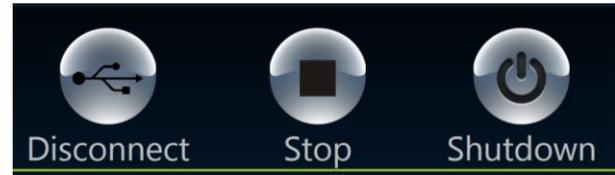


Figure 5-3: Alternative Software Control Buttons

### 5.2.1 Connect/Disconnect

The **Connect/Disconnect** button is used to initialize the measurement device. When the **Connect** button is pressed the measurement settings are read and the OMS is configured to begin system monitoring. The connection process takes approximately 5 seconds.

When the **Disconnect** button is pressed the measurement device is disconnected and live monitoring is no longer available. Note that certain measurement setting adjustments and importing system configurations can only be completed when the device is disconnected.

### 5.2.2 Run/Stop

The **Run/Stop** button is used to start and stop the monitoring process. When the **Run** button is pressed the device checks which fibers are enabled for monitoring. The measurement settings for the next active fiber are configured and the measurement process begins.

Pressing the **Stop** button will stop the monitoring process once the current measurement has finished. By pressing the **Start** button again the system will resume where it left off.

### 5.2.3 Shutdown

The GUI **Shutdown** button is used to safely turn off the 928-OMS. Pressing this button will begin the shutdown process for the device. Using the **Shutdown** button in the software ensures the front panel LEDs will all be cleared.



#### **WARNING**

Do not use the AC power switch on the back of the unit to turn off the system until the internal computer is turned off using the 'Shutdown' button at the top of the GUI. The internal PC is off when the green ring on the power button is no longer illuminated.

### 5.3 Configuration Menu

The configuration menu provides access to the device boot settings, fiber measurement settings, optical system configurations, data logging setup, device network information, and the restart application feature.

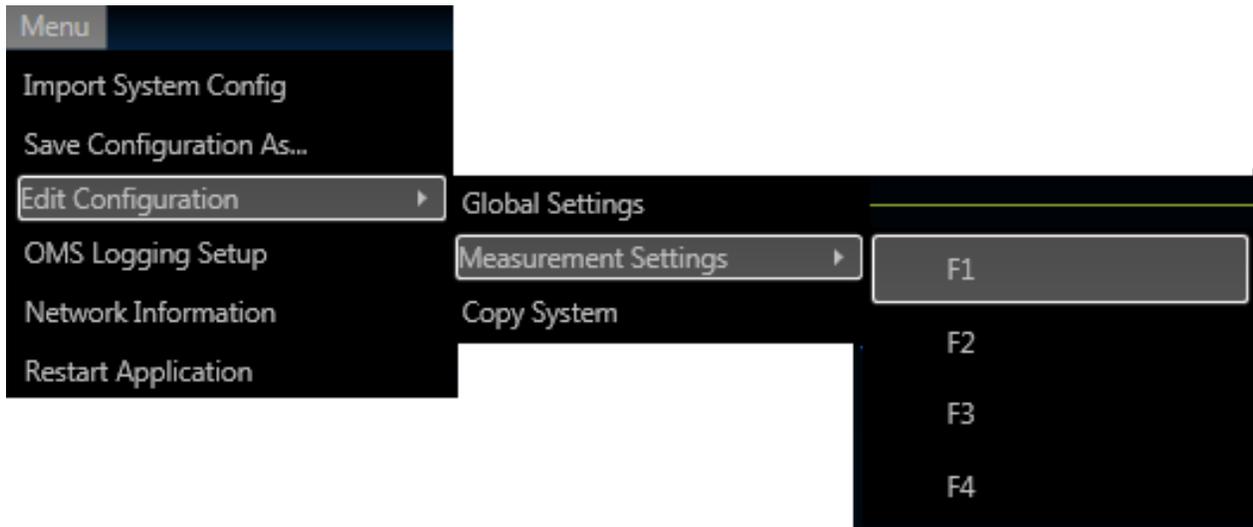


Figure 5-4: Configuration Menu

#### 5.3.1 Import System Config

The **Import System Config** option in the configuration menu is used to import previously created system configurations into the 928-OMS software. To use the **Import System Config** function the user must first click the **Stop** button and then the **Disconnect** button.

	<p>Importing a new system configuration will overwrite the current SystemConfiguration.xml file. Ensure any desired changes have been saved before importing a new configuration.</p>
---	---

The **Import System Configuration** window allows the user to select a configuration file from the drop down box or browse for an existing file. The files in the drop down box are populated from the Configurations folder in the application release folder. Once a configuration file is selected it can be loaded into the 928-OMS software by pressing the **Load New System Configuration** button.

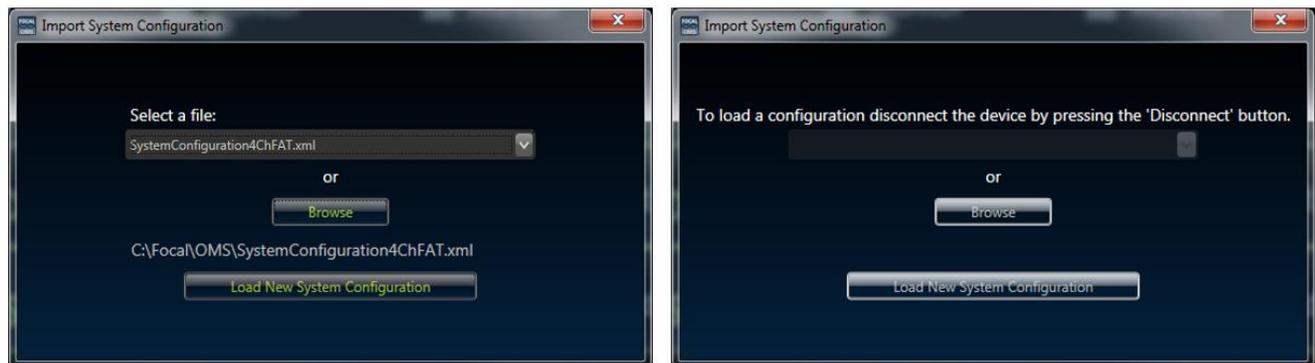


Figure 5-5: Import System Configuration Windows

#### 5.3.2 Save Configuration As...

The **Save Configuration As...** option in the configuration menu is used to save the current 928-OMS settings to a specified XML file. To save the current configuration as the default start-up settings overwrite the SystemConfiguration.xml file in the software release folder.

### 5.3.3 Edit Configuration

The **Edit Configuration** option allows the user to access the global settings and measurement settings for the 928-OMS. The edit configuration option is only available when the device measurements have been stopped.

#### 5.3.3.1 Global Settings

The **Global Settings** option in the configuration menu allows the user to change 928-OMS settings that are not related to a specific optical system. All global settings can be saved in the system configuration XML file.

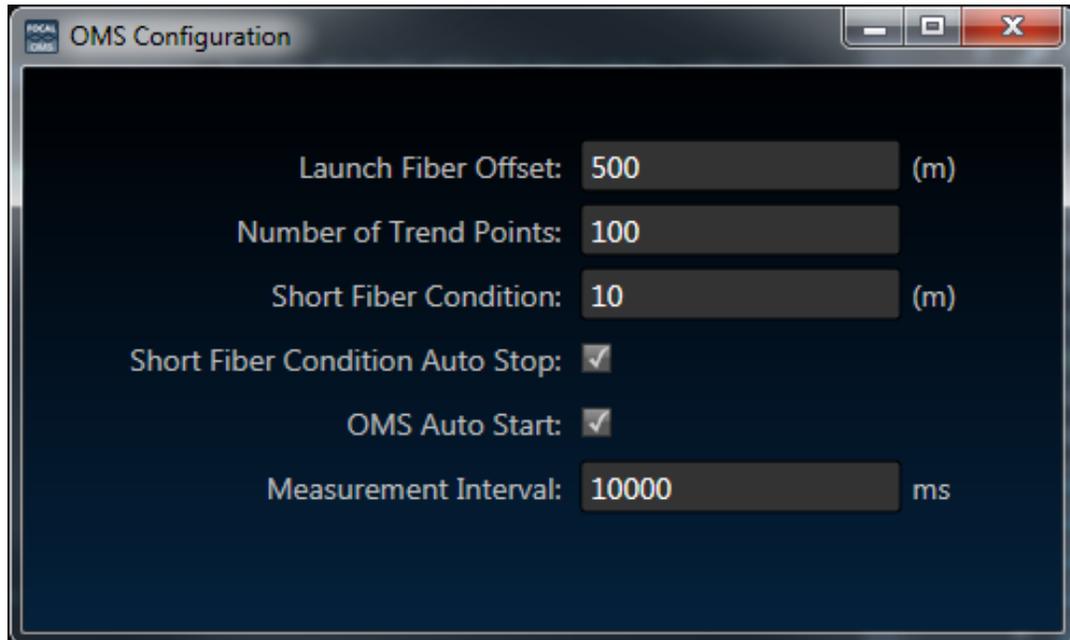


Figure 5-6: System Configuration Global Settings

#### **Launch Fiber Offset**

The 928-OMS includes a ~500 m internal launch fiber and therefore the fiber cable under test can be connected directly to the front panel of the unit. The length of the internal fiber may vary from system to system. To account for these variations the length of the internal launch fiber may be adjusted and saved to the system configuration file. This process is done at the factory.

#### **Number of Trend Points**

By default the 928-OMS keeps of the last 100 calculated optical loss values in volatile memory a record for each component in an optical system. These points are plotted and averaged to provide the user a snapshot and trend of recent data. The number of points saved, plotted and averaged can be adjusted by changing the **Number of Trend Points** value.

#### **Short Fiber Condition**

The 928-OMS implements a safety feature where measurements on a system will automatically be stopped if a short fiber condition is detected. By default a short fiber condition occurs when the 928-OMS is unable to detect any fiber 10 m beyond the front panel connection. The distance for a short fiber condition can be adjusted by changing the **Short Fiber Condition** value. The **Short Fiber Condition Auto Stop** feature can be disabled by unchecking the appropriate check box.

#### **OMS Auto Start**

By default the 928-OMS auto start feature is enabled. This means that when the OMS is powered on it will automatically connect and begin making measurements on any enabled optical systems. To disable the auto start feature uncheck the **OMS Auto Start** check box. When the auto start feature is disabled no measurements will be taken at start up until explicitly triggered by the user.

## Measurement Interval

By default the 928-OMS measurement interval is set to 10 seconds (10000 ms). This means that there will be a minimum of 10 seconds between the start of consecutive optical measurements. If an optical measurement takes less than 10 seconds to complete the unit will wait before switching to the next fiber and beginning the next measurement. It is possible that the 928-OMS will take longer than the measurement interval to complete an individual measurement depending on the measurement settings. In this case the unit will begin monitoring the next fiber as soon as the preceding measurement has been completed. The measurement interval can be adjusted and saved to the system configuration file.

### 5.3.3.2 Measurement Settings

The **Measurement Settings** option in the configuration menu allows the user to read and optimize the 928-OMS measurement settings for each fiber independently. The selected fiber is indicated in the title at the top of the window. The unique settings for each fiber can be saved to the system configuration file.

Three columns are displayed in the measurement settings window. The **Factory Settings** provide access to a number of pre-configured options that can be used for easy configuration of the unit. These options will adjust the measurement settings based on the description of each option. For more specific configurations the **User Settings** can be used. The User Settings allow the user to setup the 928-OMS with specific measurement parameters. The **Active Settings** will display the currently selected options from either the Factory or User Settings.



Figure 5-7: Fiber Measurement Settings Window

#### Active Mode

The active mode property displays whether the 928-OMS settings are taken from **Factory Settings** or **User Settings**. To change the active mode the user can check the **Use Factory Settings** or **Use User Settings** checkbox. Only one of these options may be selected.

#### Lmax

The **Lmax** parameter specifies the total distance range of a 928-OMS measurement. It is recommended that **Lmax** is set to at least %50 greater than the total expected fiber length.

#### Pulse Width

The **Pulse Width** parameter indicates the length of a measurement pulse from the 928-OMS. Generally short pulse widths provide more spatial resolution and are normally used for short fiber lengths. Longer pulse widths are typically required for longer fiber lengths. For example a pulse width of 100 ns can be used to perform measurements over 10 km of singlemode fiber.

### Resolution

The **Resolution** parameter indicates the sampling distance for the 928-OMS measurements. The resolution parameter is set to AUTO meaning the 928-OMS will select the optimal sampling distance.

### Averaging Time

The **Averaging Time** parameter specifies the duration of a complete 928-OMS measurement. During this averaging period many samples are taken and then averaged into a more accurate measurement. For short fiber lengths shorter averaging times may be used and for long fiber lengths longer averaging times are required. The averaging time parameter directly affects the measurement interval of the 928-OMS. Time averaging can be disabled by unchecking the **Time Averaging Enabled** check box. In this case the 928-OMS determines the required averaging time.

### High Resolution Enabled

The **High Resolution Enabled** parameter indicates if the device is in high resolution sampling mode. This mode increases the measurement bandwidth decreasing measurement “dead zones” helping to distinguish between two closely located optical events. This mode increases the noise level of the measurement and should only be used for short fiber lengths.

### Filter Enabled

The **Filter Enabled** parameter is used to remove noise from the 928-OMS measurement. This option should be left on for best results.

### 5.3.3.3 Copy System

The **Copy System** option in the configuration menu is a tool used to simplify and speed up the initial optical system definition process of multiple fibers. This tool allows the user to copy the configuration of one system to another. For example, the user can define a system for fiber F1 and then use this tool to copy all the settings from fiber F1 to fiber F2. Note that once a system is copied the system configuration must be saved for the changes to remain.

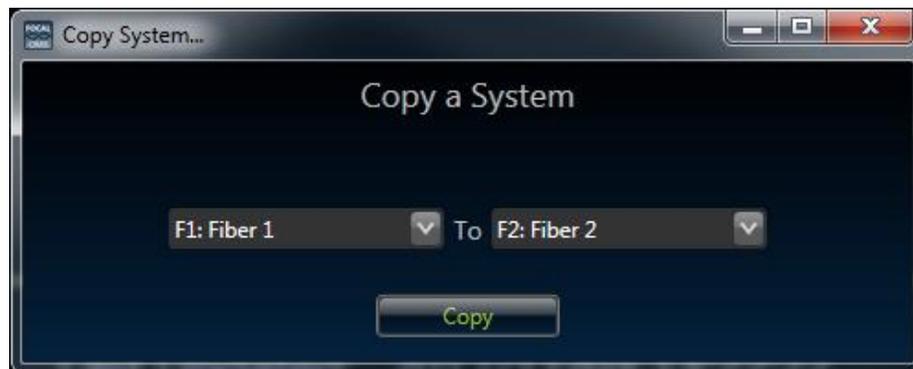


Figure 5-8: Copy System Window

### 5.3.4 OMS Logging Setup

The 928-OMS software allows the user to log two different data files for each fiber. The **Data Logging Setup** window allows the user to select the destination logging directory for each fiber. The user can also select which data log formats should be recorded for each fiber. These settings can be saved to the system configuration file.

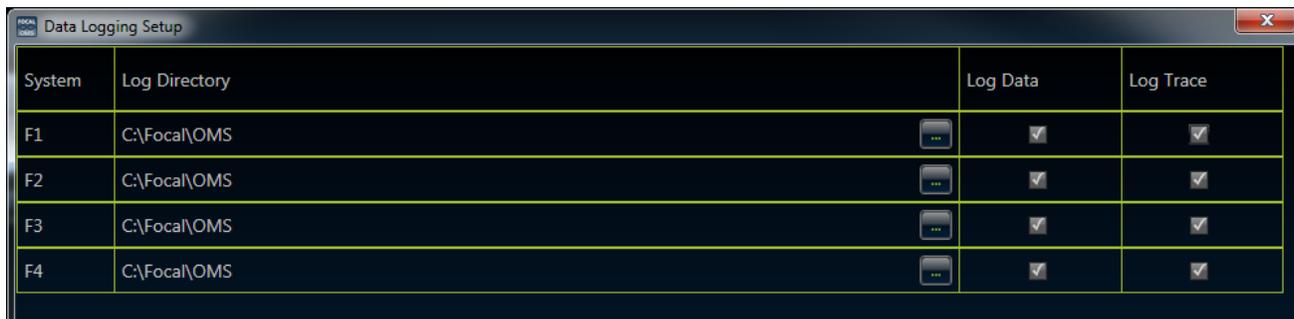


Figure 5-9: Data Logging Setup Window

The two data logging options available are **Log Data** and **Log Trace**. The **Log Data** option will log the analyzed data for a single optical system. Information such as component location, length and losses will be saved into an accumulating .csv file. The **Log Trace** option will log the raw data from each 928-OMS measurement saved in a .sor file.

	It is recommend that the logging directory be set to an external memory location to avoid filling up the internal OMS disk.
---	---

### 5.3.5 Network Information

The **Network Information** window in the configuration menu provides the IP address of all network adapters on the 928-OMS hardware.

### 5.3.6 Restart Application

The **Restart Application** option allows the user to restart the 928-OMS software without re-starting the complete unit. When the **Restart Application** option is used any unsaved settings will be forgotten and the software will re-load the last saved system configuration.

## 5.4 Systems Summary

The **Systems Summary** shows concise status information and high level control for each optical system as shown in the figure below.



Figure 5-10: Systems Summary Display

### 5.4.1 Laser Indicator

The systems summary display includes a laser indicator for each fiber. When the 928-OMS is making a measurement the laser symbol will pulse yellow on the active fiber. This warning indicates the measurement laser is on. When the laser symbol is solid grey the laser is off and no measurements are performed.

### 5.4.2 Current Alarm LED

The current alarm LED is indicated by the letter 'C' in the systems summary display. When the current alarms LED is red it indicates that an alarm was triggered in the last measurement of the specified fiber system. When the current alarms LED is yellow it indicates a warning state was triggered on the last measurement. The current alarms LED will be green when no alarms or warnings were detected in the previous measurement. Alarms and warnings can be triggered by component measurements such as Tx power, Rx power, insertion loss, high back reflection or fiber breaks. The current alarm LED will clear when the alarm condition is resolved. When a current alarms LED is flashing it indicates a measurement is in progress on the specified fiber.

If an alarm is triggered (i.e. current reading is greater than the user defined "Loss Alarm") at the monitoring points of the fiber system then both the 'C' and 'H' LEDs will turn red. Once the detected problem is fixed the 'C' LED will turn back green and the 'H' LED will remain red.

The history can be cleared via the GUI using any of the following methods:

- Right-click on the affected component and selecting "Clear History" (local component history clear)
- OR right-click on the Fx: fiber system name and selecting "Clear History" which will clear the alarm history of all components for that particular fiber.
- OR right-click "System" which contains all fiber systems and selecting "Clear All History" which will clear the history and statistics of all fiber systems and its components.

**Note:** By default the OMS unit is shipped with factory default warning and alarm thresholds which might need adjustments to match the particular system under test. The user can edit the warning and alarm levels to match the optical system under test via the GUI (right-click on the optical component to be adjusted and select **Edit Properties**) and save them in the system configuration XML file.

### 5.4.3 Alarm History LED

The alarm history LED is indicated by the letter 'H' in the systems summary display. When the alarm history LED is red it indicates that an alarm was triggered and latched during the current software session. The alarm history LED will not clear if the alarm condition is resolved. The alarm history can be cleared as described in the previous section.

### 5.4.4 Monitor Control

The **Monitor** checkbox allows the user to select which fibers will be part of the monitoring rotation. After each measurement the 928-OMS will automatically switch to the next fiber with the **Monitor** checkbox enabled. The monitoring enabled/disable state can be saved to the system configuration file.

## 5.5 Optical Systems

The systems expander contains the optical system definitions and data for each of the fibers on the 928-OMS.



Figure 5-11: Optical Systems Container

### 5.5.1 Clear All History

By right clicking on the **Systems** header the user can access the **Clear All History** function. This function will clear the alarm history LEDs for all fibers in the software. This function will also clear the 928-OMS front panel LEDs. In addition to clearing the alarm LEDs this function will also clear component loss statistics such as min, max, average loss, sampling statistics and component plot data.

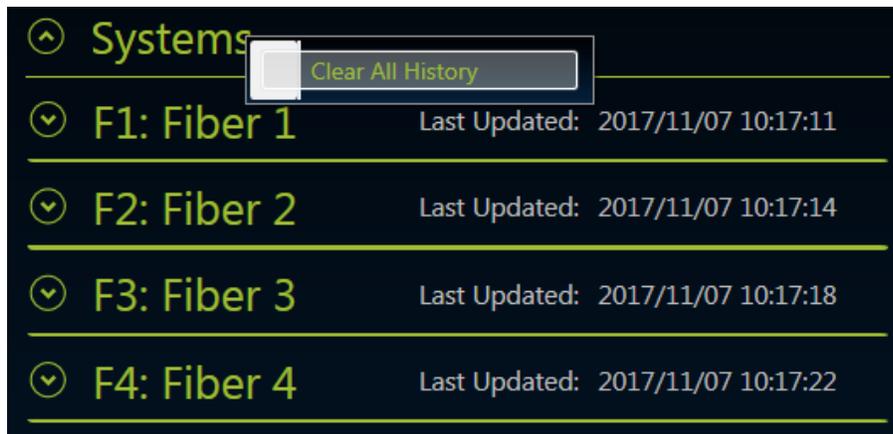


Figure 5-12: Clear All History Function

## 5.6 Single Optical System

A single optical system contains the results of each 928-OMS measurement. The processed data is mapped to the optical system definition to provide the status of the fiber and components. An example of this is shown in the figure below.



Figure 5-13: Optical System Display

### 5.6.1 System Header



Figure 5-14: Optical System Header

The system header provides information about the optical system and right-click access to a system level context menu as shown in the figure below.

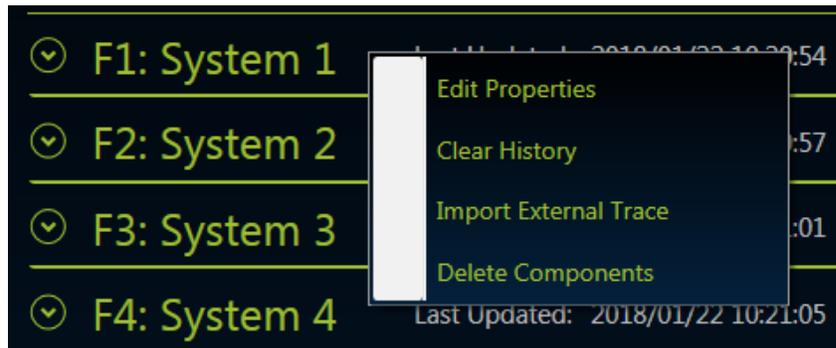


Figure 5-15: Optical System Context Menu

#### 5.6.1.1 Status

The optical system header contains three pieces of information. The fiber number is indicated by the preceding **F#** label. The fiber number is not a configurable parameter. The system name directly follows the fiber number and is user configurable. The **Last Updated** time indicates when the last 928-OMS measurement was taken for the specified fiber.

### 5.6.1.2 Edit System Properties

The **Property Editor** window is accessed by clicking **Edit Properties** in a single system context menu. This allows the user to edit system level properties. Descriptions of the editable properties can be found below.

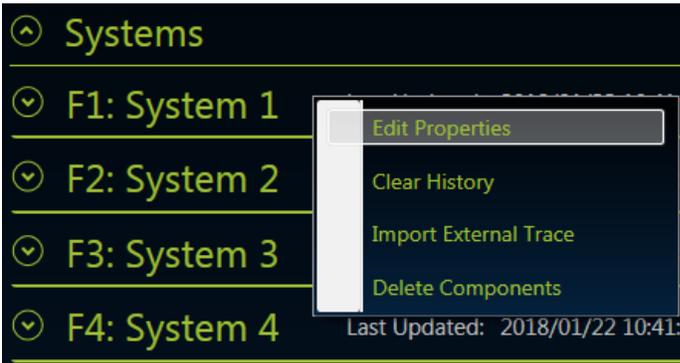


Figure 5-16: System Context Menu - Edit Properties



Figure 5-17: Edit System Properties Window

#### **Name**

The **Name** property is reflected in the system header. It is used to provide a unique identifier to a specified system.

#### **Search Tolerance**

The **Search Tolerance** parameter specifies the acceptable distance in meters an optical event can occur from a component's expected distance. If no optical event is found within the search tolerance of an expected distance the measurement processing will indicate a component error. It is recommended that the search tolerance be as low as possible once the distance of optical components is known.

#### **Motherboard Reference ID**

The **Motherboard Reference ID** is used to link the diagnostic information from the multiplexer data to the remote and console units in an optical system. The Tx and Rx power data from a referenced motherboard will be copied into the optical system display. Multiple optical systems can share motherboard references when necessary. If a system does not have an associated motherboard the reference ID should be set to 0.

### 5.6.1.3 Clear System History

The **Clear System History** function is accessed by clicking **Clear History** in a single system context menu. This function will clear the alarm history LED for the given system as well as the statistical data and plots for all components in the system.

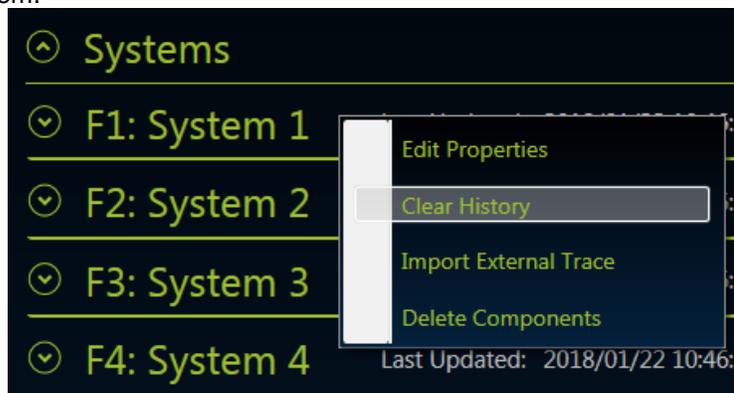


Figure 5-18: System Context Menu - Clear History

### 5.6.1.4 Import External Trace

The **Import External Trace** function is accessed by clicking **Import External Trace** in a single system context menu. This function allows the user to import a previously logged OMS measurement (.sor trace file) into the system display. The import external trace function can be used when the system is not making measurements allowing the user to further analyze recorded data.

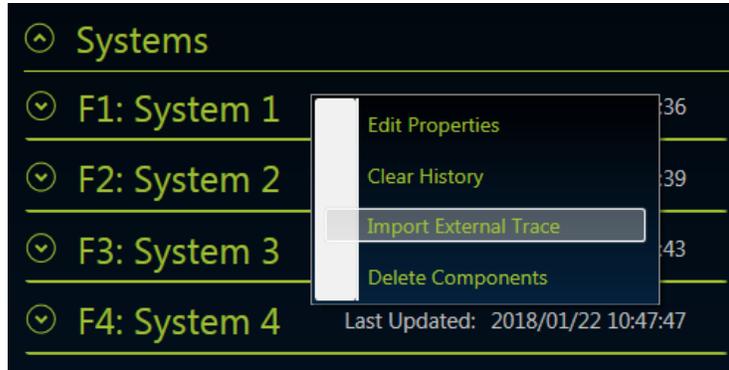


Figure 5-19: System Context Menu - Import External Trace

### 5.6.1.5 Delete Components

The delete components function is accessed by clicking **Delete Components** in the single system context menu. This function is used during system setup and deletes all components from and optical system definition. Once a system is deleted the user has access to the **Add Basic System** option.

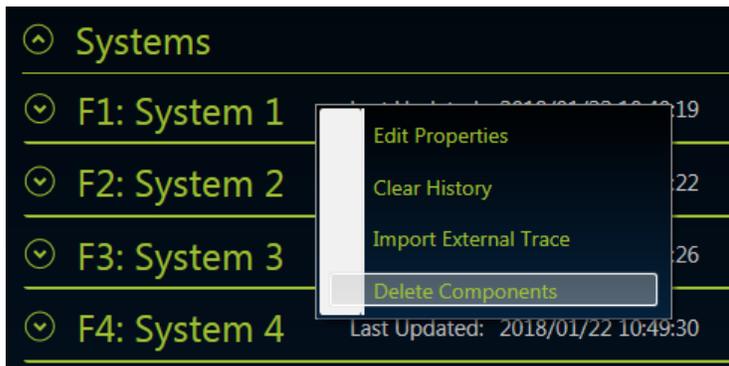


Figure 5-20: System Context Menu - Delete Components

## 5.6.2 System Components

The system components view provides the display for the user-defined system definition. After a 928-OMS measurement the processed data will be presented in the system components view. System definitions provide a software model of an optical system. All system definitions must include at least a console, remote and a length of fiber. If the user system does not include a console or remote the console represents the front panel connection of the 928-OMS and the remote represents the end of fiber. Descriptions of the components in a system definition can be found in the following subsections.

### 5.6.2.1 Console

The console component is found at the beginning of every optical system. A console can represent a multiplexer unit or the 928-OMS when no multiplexer is present.

#### **Name**

The name property is displayed above the component. It is used to provide a unique identifier to a specified component.

#### **Distance**

Represents the connection point at the 928-OMS front panel. If the internal launch fiber length has been set correctly the distance for the console component should read 0 m.

#### **Tx Power**

When a system is linked to a multiplexer the Tx power from the main multiplexer will be displayed at the console component. When no multiplexer is linked to the console the Tx power data will not be displayed.

A Console which is linked to a multiplexer will enter a warning or alarm state when the Tx or Rx power crosses the warning or alarm thresholds.

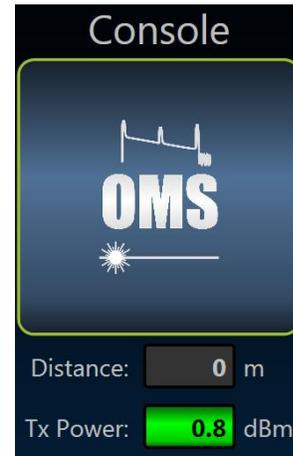


Figure 5-21: Console Component

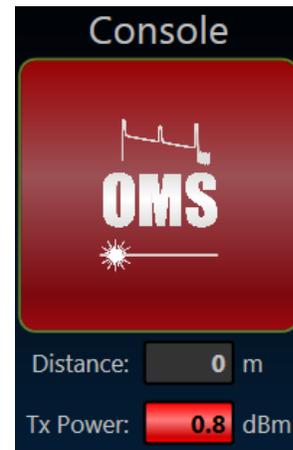


Figure 5-22: Console Component in Alarm State

### 5.6.2.2 Fiber

A fiber component is found in between each component in a system. The fiber represents the lengths of fiber in a user's optical system. The user can use multiple fiber sections to represent the actual system under test.

#### Length

The fiber length in meters is shown above each section of fiber. The length is the distance calculated between the two components on either end of the fiber.

#### Loss

The insertion loss in dB is shown under each section of fiber. The loss is the loss of optical power over the length of fiber indicated.

If the loss calculated over a length of fiber crosses the alarm or warning thresholds this will be indicated by the color of the fiber segment. A yellow color is used to indicate a warning state and red for alarm as shown in the figures to the right.

#### Fiber Brake / Mismatch Length

If the length of a fiber segment is calculated to be less than the expected length (e.g. a fiber brake) the fiber will be displayed as a partially filled fiber with no displayed loss.



Figure 5-23: Fiber Component



Figure 5-24: Fiber Warning Indicator



Figure 5-25: Fiber Alarm Indicator



Figure 5-26: Fiber Length Mismatch Indicator

### 5.6.2.3 Optical Component

An optical component is found in between fiber segments in a system. Examples include fiber connectors, fiber optic rotary joints (FORJs), optical attenuators, etc.

#### Name

The name property is displayed above the component. It is used to provide a unique identifier to a specified component (E.g. TMS Winch).

#### Distance

The distance represents measured distance in meters from the 928-OMS front panel.

#### Loss

The insertion loss in dB is shown under each loss component. The loss is the calculated loss at the specified point in the system.

If the calculated loss on a component exceeds the warning or alarm threshold the color of the component will change to indicate the state.

#### Alarm Occurred Indicator

An **Alarm Occurred** indicator (as shown in the figure on the right) will appear in the icon display for a component if the alarm threshold is exceeded. This indicator will not go away when the alarm condition is removed unless the user explicitly clears the history events.

The user can hover the mouse on top of the icon to verify the component's statics and determine the maximum insertion loss value measured.

#### High Back Reflection Indicator

A high back reflection indicator will appear in the icon display for a component if high back reflection is measured. This indicator will disappear when the condition is no longer detected. The OMS default alarm level is normally sufficient to detect high back reflection events. The user can still adjust the alarm threshold to accommodate specific requirements.



Figure 5-27: Optical Component

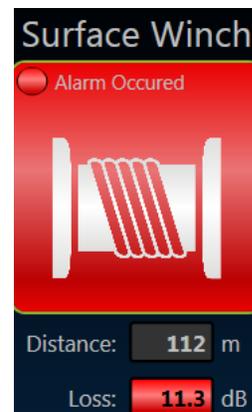


Figure 5-28: Optical Component Alarm State



Figure 5-29: Alarm Occurred Indicator



Figure 5-30: High Back Reflection Indicator

### 5.6.2.4 Remote

A remote component is found at the end of every optical system definition. A remote can either represent a subsea multiplexer or the end of fiber connection. The figure on the right shows an ROV icon. The user can load their own icons or PNG images to match the system under test.

#### Name

The name property is displayed above the component. It is used to provide a unique identifier to a specified component.

#### Distance

The distance represents the distance in meters to the end of fiber.

#### Rx Power

When a system is linked to a multiplexer the Rx power from the multiplexer data will be displayed with the remote components. If no multiplexer is linked to the system the Rx power data will not appear.

Similarly to the Console, the remote component will indicate any Tx or Rx alarms from a linked multiplexer.

For Focal 907 systems the Tx and Rx optical power levels displayed is extracted from the motherboard's SFP diagnostics information.

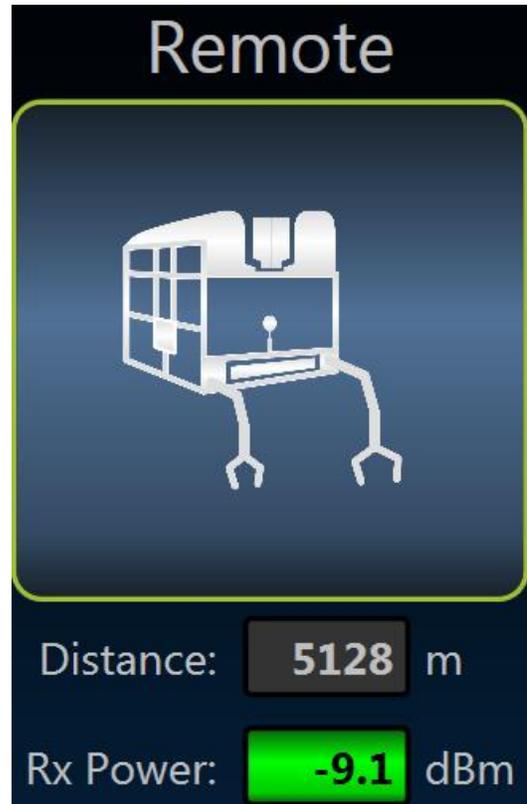


Figure 5-31: Remote Component

### 5.6.3 Component Statistics

Hovering over a fiber or component will display the component's measurement statistics. The statistics include minimum optical loss, maximum loss, mean loss, warning levels, alarm levels, number of valid samples and number of invalid samples. The mean loss is a running average of all loss measurements. An invalid sample occurs when the measurement data does not match the expected distance for a component.

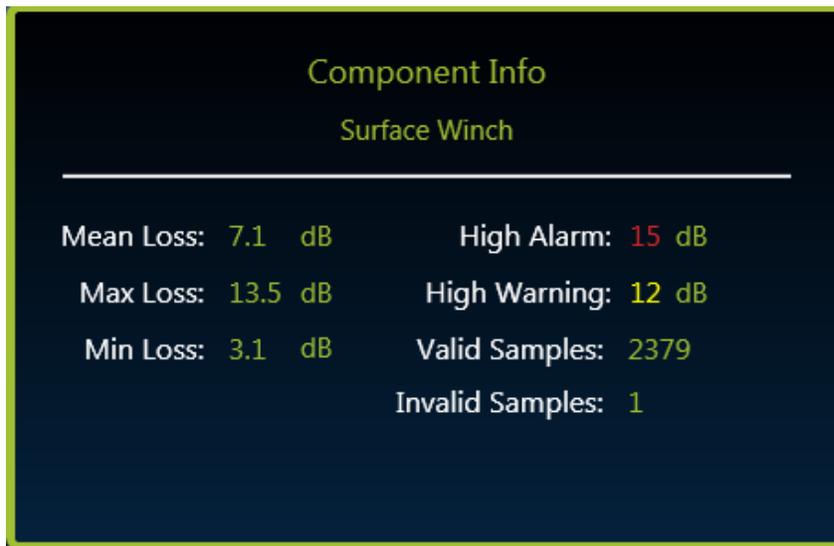


Figure 5-32: Component Statistics

## 5.6.4 Editing System Components

Editing component properties is accessed by right-clicking on a component and selecting the **Edit Properties** option. All component types (Console/Remote, Fiber and Optical Component) include this option.



Figure 5-33: Component Context Menu - Edit Properties

### 5.6.4.1 Console

The **Console Property Editor** allows the user to edit component level properties. All properties can be saved to the system configuration file.

#### Name

The **Name** property is displayed above the component. It is used to provide a unique identifier to a specified component.

#### ID

The **Component ID** is a unique numerical ID for each component in a system.

#### Expected Distance

The **Expected Distance** property tells the 928-OMS software the expected distance in meters at which the particular component is expected to be located in the fiber system with respect to the connection to the front panel of the OMS. For example a surface Winch might be expected to be at 100 m from the front panel connection of the OMS.

**This parameter combined with the search tolerance are critical for proper fiber monitoring and fault location detection.** During the setup process, it is recommended to use the trace acquired by the OMS to confirm expected distances.

#### Image

The **Image** property is used for display purposes only. A number of factory images are provided with the 928-OMS. The user is also able to add their own images (.png file) to the software if desired.



Figure 5-34: Edit Console Properties Window



Figure 5-35: Import User Image

### 5.6.4.2 Fiber

The **Fiber Property Editor** allows the user to edit component level properties. All properties can be saved to the system configuration file.

#### **Name**

The **Name** property for fiber is not displayed but is used for data logging. The name is used to provide a unique identifier to a specified component.

#### **ID**

The component **ID** is a unique numerical ID for each component in a system.

#### **Expected Length**

The **Expected Length** property tells the 928-OMS the expected length of a fiber section in meters. This length is the distance between the two optical components on either end.

#### **Loss Warning**

The **Loss Warning** is used to trigger a visual warning state on the fiber section. If the loss on a section of fiber exceeds the user-defined loss warning threshold the fiber section will change to a yellow color.

#### **Loss Alarm**

The **Loss Alarm** is used to trigger a visual alarm state on the fiber section. If the loss on a section of fiber exceeds the user-defined loss alarm threshold the fiber section will change to a red color.



Figure 5-36: Edit Fiber Properties Window



Figure 5-37: Fiber Warning (Yellow) State



Figure 5-38: Fiber Alarm (Red) State

### 5.6.4.3 Optical Component

The **Component Property Editor** window allows the user to edit component level properties. All properties can be saved to the system configuration file.

#### **Name**

The **Name** property is displayed above the component. It is used to provide a unique identifier to a specified component.

#### **ID**

The component **ID** is a unique numerical ID for each component in a system.

#### **Expected Distance**

The **Expected Distance** property is the estimated distance in meters from the 928-OMS front panel to the component. **The expected distance is used with the search tolerance parameter to locate and measure loss events.**

#### **Image**

The **Image** property is used for display purposes only. A number of factory images are provided with the 928-OMS. The user is also able to add their own images (.png file) to the software if desired.

#### **Reflectance Warning**

The **Reflectance Warning** is used to trigger the high back reflection indicator.

#### **Loss Warning**

The **Loss Warning** is used to trigger a visual warning state for the component. If the loss on a component exceeds the loss warning threshold the loss data field will change to a yellow color.

#### **Loss Alarm**

The **Loss Alarm** is used to trigger a visual alarm state for the component. If the loss on a component exceeds the loss alarm threshold the component icon and loss field will change to a red color. An alarm occurred LED will also appear on the component. The alarm occurred LED will not disappear when the alarm condition is removed and must be removed using a clear history method.



Figure 5-39: Edit Component Properties Window



Figure 5-40: Loss Warning Indicator

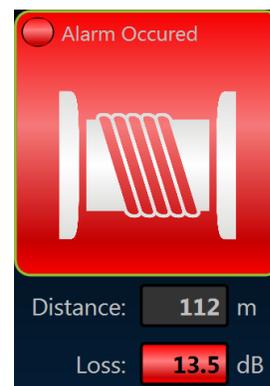


Figure 5-41: Loss Alarm Indicator

### 5.6.4.4 Remote

The **Remote Property Editor** window allows the user to edit component level properties. All properties can be saved to the system configuration file.

#### **Name**

The **Name** property is displayed above the component. It is used to provide a unique identifier to a specified component.

#### **ID**

The component **ID** is a unique numerical ID for each component in a system.

#### **Expected Distance**

The **Expected Distance** property tells the 928-OMS where to expect the component in a fiber measurement. The distance is expressed in meters from the 928-OMS front panel. This combined with the search tolerance are critical for proper fiber monitoring.

#### **Reflectance Warning**

The **Reflectance Warning** is used to trigger the high back reflection indicator.

#### **Image**

The **Image** property is used for display purposes only. A number of factory images are provided with the 928-OMS. The user is also able to add their own images (.png file) to the software if desired.

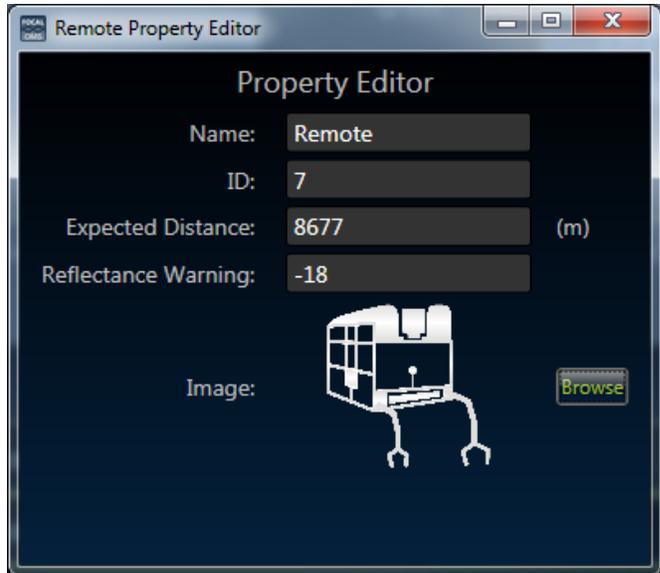


Figure 5-42: Edit Remote Properties Window

### 5.6.5 Display System Component Loss History

The 928-OMS keeps a record of a specified number of loss values for each component. The number of values kept is set in the configuration menu. The data history for each component can be displayed by right-clicking on a component and selecting the **Display Loss History** option.



Figure 5-43: Optical Component Context Menu - Display Loss History

This function will open a new window containing a plot of the last user-defined number of sampled loss values. Based on these values a trend line is also shown for the data.



Figure 5-44: Component Loss History

### 5.6.6 Clear System Component History

The statistics, alarms and loss history for each component can be cleared by right-clicking the desired component and selecting the **Clear History** option.



Figure 5-45: Optical Component Context Menu - Clear History

### 5.6.7 Adding/Deleting Components

The components in an optical system on startup are defined by the system configuration file. These systems can be edited to remove or add components. To remove all components from an optical system see section 5.6.1.5. If no components are defined in the user's system definition the component view will display the **No System Defined** message and the **Add basic system** button.

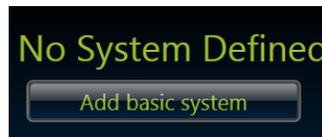


Figure 5-46: Add Basic System Button

When **Add basic system** is pressed this will add the fundamental components of an optical system. All optical systems definitions must contain a console, a length of fiber and a remote as shown in the figure below.

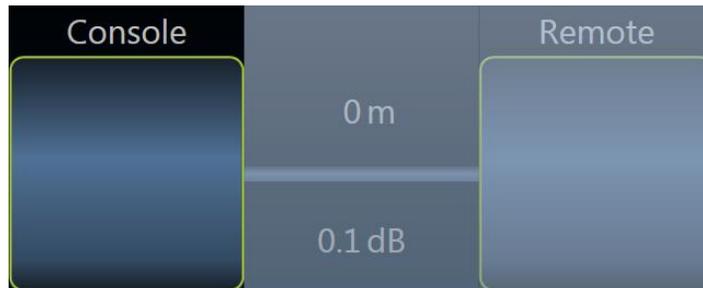


Figure 5-47: Newly Added Basic System

A component and fiber can be added to an optical system by right-clicking on a console or existing optical component and selecting the add component option.

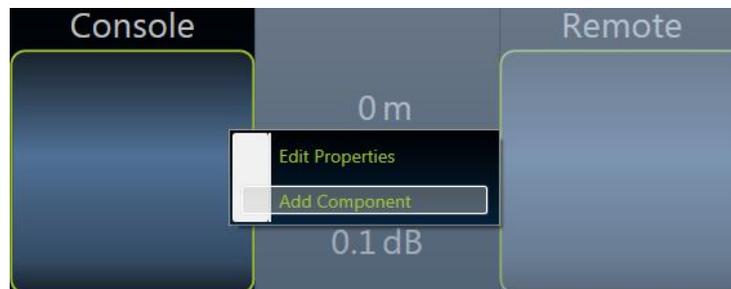


Figure 5-48: Component Context Menu: Add Component

Selecting this option will add a fiber length and optical component directly to the right of the selected component. The component properties must be edited for each newly added console, fiber, optical component or remote.



Figure 5-49: Newly Added Loss Component

An optical component and fiber can be removed from an optical system by right-clicking on an existing component and selecting the **Delete Component** option.



Figure 5-50: Optical Component Context Menu - Delete Component

Selecting this option will delete the selected component and the fiber section directly to the left of the selected component.

### 5.6.8 Invalid Measurement Data

If no data has been found for a component or entire system, the system component icons will be displayed with the data greyed out. In this case the underlying data is invalid until the overlay is removed. The figure below shows an example of the expected display when an entire system is not found.



Figure 5-51: System Component with Invalid Data

### 5.6.9 System Plot

A plot of the 928-OMS trace data for the last measurement on an optical system can be shown by pressing the **Show Plot** button. An example of a trace plot is shown in the figure below.

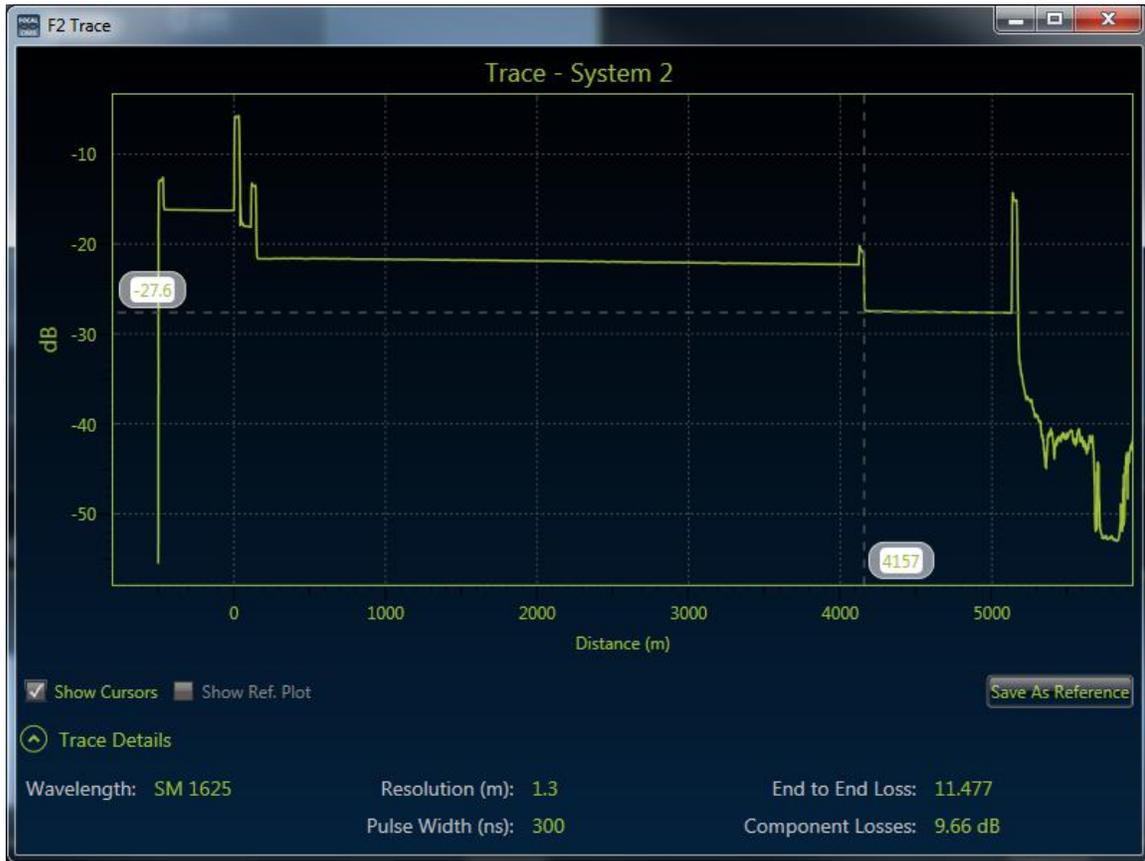


Figure 5-52: Optical System Trace Data

#### 5.6.9.1 Plot

The trace plot is used to visualize the raw data from a 928-OMS measurement. Right clicking on the plot allows the user to “fit” the data to the screen or launch the plot help menu seen below which outlines the plot control functions.

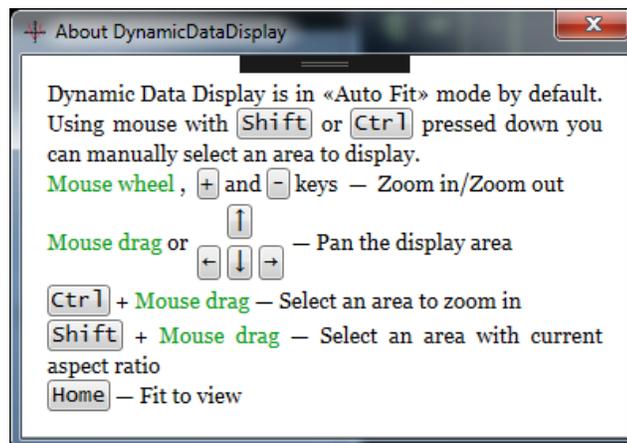


Figure 5-53: Plot Help Menu

In addition to the functionality outlined above the trace data has access to data cursors. The data cursors can be enabled or disabled by checking or unchecking the show cursors check box.

### 5.6.9.2 Trace Details

The trace details provide a summary of the 928-OMS measurement settings such as wavelength, resolution and pulse width when the measurement was taken. Additionally the 928-OMS measured **End to End Loss** is displayed along with the calculated sum of **Component Losses** in the system. The difference in end to end loss and component losses is due to internal losses in the 928-OMS system.

### 5.6.10 Reference Trace

The 928-OMS software has the ability to save measurement data as a reference plot for each system. Pressing the save as reference button will save the current trace data as the reference plot. The reference plot can be displayed on the graph by checking the **Show Ref. Plot** box. The reference plot can be used to monitor the system for changes from a baseline measurement.



Figure 5-54: Optical System Trace with Reference Plot

## 5.7 Multiplexers

The **Multiplexers** container view is a place holder for the diagnostic information received from a connected multiplexer. The 928-OMS can support multiple multiplexer connections. For a 907 type system, the diagnostics information for example comes from a 907-DIAG-E card connected to the RJ45 on back of the OMS.



Figure 5-55: Multiplexers Container

Multiplexers to be monitored can be added to the system by right-clicking on the **Multiplexers** expander when the measurement device is disconnected.

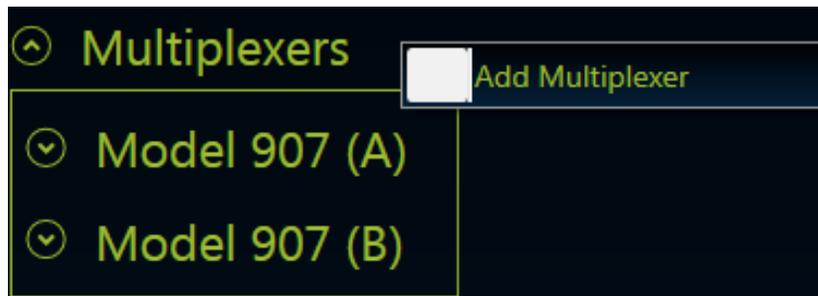


Figure 5-56: Multiplexers Context Menu - Add Multiplexer

This will open a multiplexer creation window. The multiplexer creation window requires the user to setup unique properties depending on the type of multiplexer selected.

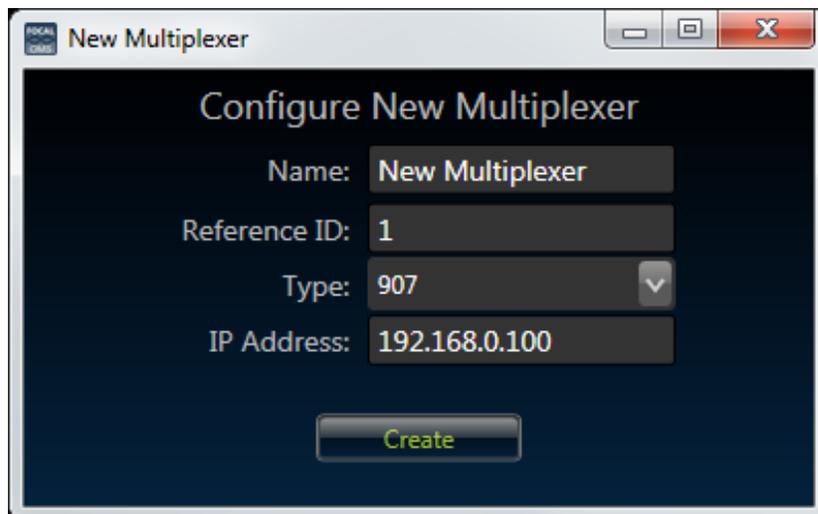


Figure 5-57: Multiplexer Creation Window

Existing multiplexers can be edited or deleted by right-clicking the desired multiplexer in the list and selecting the appropriate option.



Figure 5-58: Existing Multiplexer Options

The **Edit Properties** option will open a multiplexer type dependent property editor window.

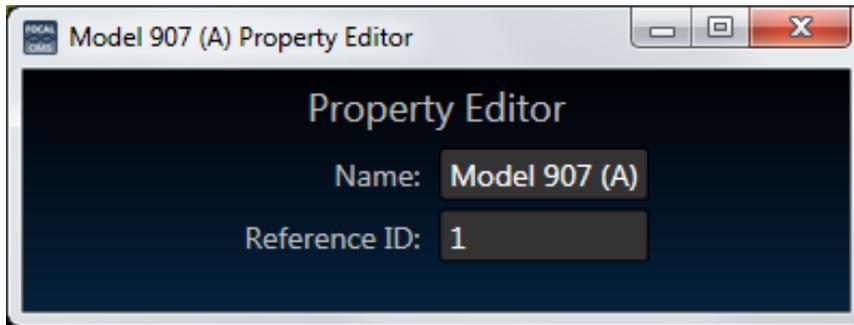


Figure 5-59: Model 907 Property Editor Window

The add, edit, and delete multiplexer options are only available when the measurement device is disconnected. Currently supported multiplexers include Model 907 motherboards with a 907-DIAG-E card and 903 systems with serial diagnostics. Specific details for each one can be found in the subsections below.

### 5.7.1 Model 907 Motherboard

The 928-OMS is able to access diagnostics from a model 907 console and remote motherboard (via a 907-DIAG-E diagnostics card). The connection IP address and refresh rate are specified in the SystemConfiguration.xml file. Each connected diagnostics card is given a user-defined name to identify similar units. The device Name is saved in the SystemConfiguration.xml file.

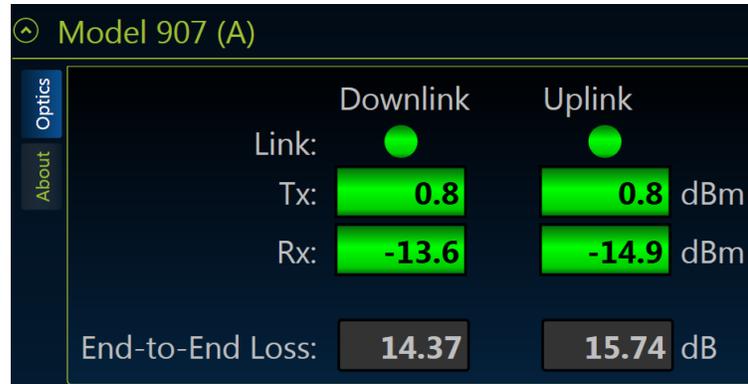


Figure 5-60: Model 907 Multiplexer Display

#### 5.7.1.1 Optics

The 928-OMS software accesses the optical diagnostics from the on-board SFPs on a 907 motherboard. Link status, transmit power and receive power are read from the 907 diagnostics for both the remote and console units. The **End-to-End** Loss is calculated as the difference between the Tx and Rx power of link partners. If no diagnostics information can be retrieved for a specified multiplex the data will be greyed out indicating that it is invalid.

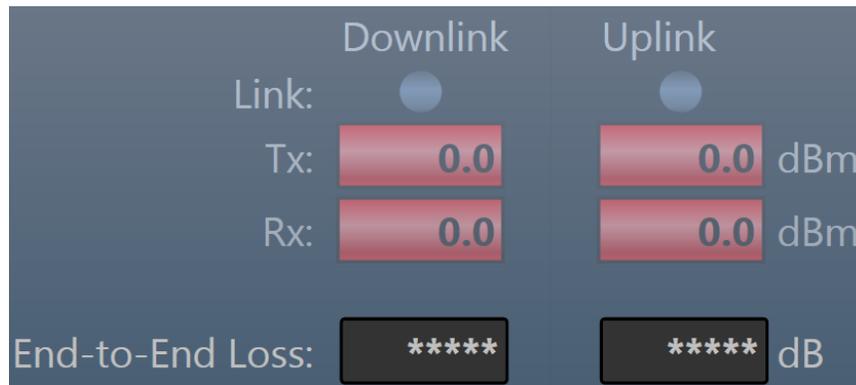


Figure 5-61: Invalid Optical Data

#### 5.7.1.2 About

The **About** tab under a 907 multiplexer provides the Motherboard Type, Reference ID information and IP Address. The Motherboard Ref. ID is critical for linking multiple diagnostics to an optical system. In the case of the 907 Motherboard the Tx and Rx power will be shown for the Console and Remote units respectively.

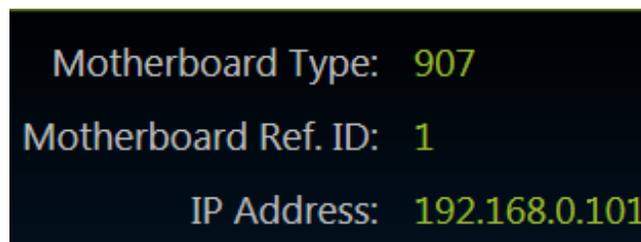


Figure 5-62: Multiplexer About Tab

## 5.7.2 Model 903 FMB-X 2.5 Motherboard

The 928-OMS is able to access diagnostics from a connected model 903 FMB-X-2.5 motherboard and its link partner. The connection serial port is specified in the SystemConfiguration.xml file. Each connected multiplexer is given a user-defined name to identify similar units. The device Name is saved in the SystemConfiguration.xml file.



Figure 5-63: Model 903 Multiplexer Display

### 5.7.2.1 Optics

The 928-OMS software accesses the optical diagnostics from the on-board SFPs on a 903 FMB-X-2.5 motherboard. Link status, transmit power and receive power are read from the 903 diagnostics for both the remote and console units. The End-to-End Loss is calculated as the difference between the Tx and Rx power of link partners. If no diagnostics information can be retrieved for a specified multiplex the data will be greyed out indicating that it is invalid.

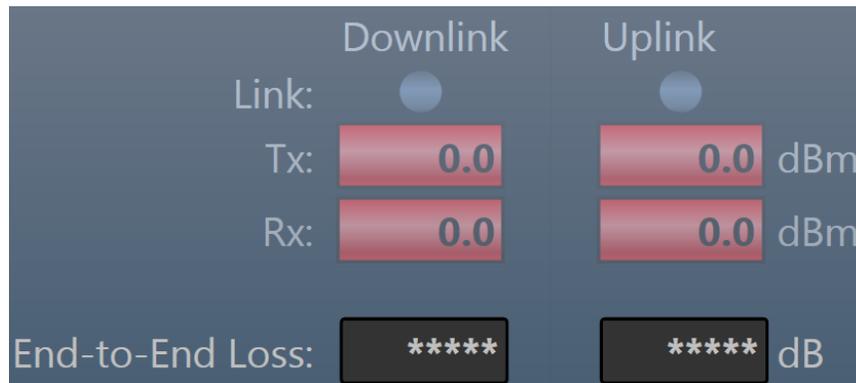


Figure 5-64: Invalid Optical Data

### 5.7.2.2 About

The **About** tab under a 903 multiplexer provides information about the Motherboard Type, Motherboard Ref. ID and Serial Port. The Motherboard Ref. ID is critical for linking multiple diagnostics to an optical system. In the case of the 903 Motherboard the Tx and Rx power will be shown for the Console and Remote units respectively.

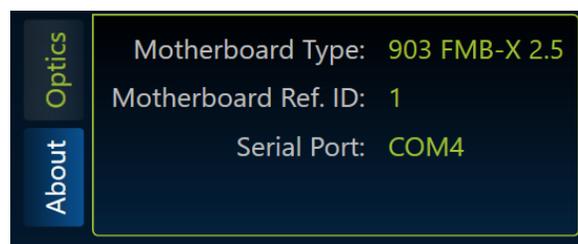


Figure 5-65: 903 Multiplexer About Tab

## 5.8 Model 923 Electronic Data Loggers

The 928-OMS supports select data collection from Focal’s Model 923 Electronic Data Logger (EDL) which include an array of environment sensors and is typically installed on slip rings. The M12 port of the back of the OMS is intended for interfacing a Model 923 board. This port provides power to a single 923 board and also the RS-485 interface for diagnostics communication. The OMS software supports multiple 923-EDLs over the same RS-485 interface as long as each device has a unique node ID. The node ID and reference ID are specified and saved in the SystemConfiguration.xml file.

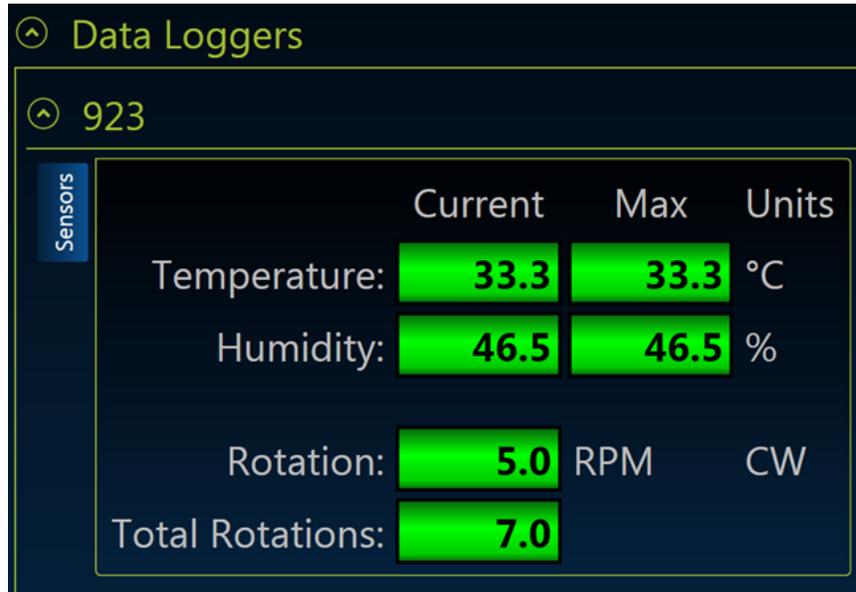


Figure 5-66: 923-EDL Display

New data loggers can be added by right-clicking the **Data Loggers** expander and selecting the **Add Data Logger** option.

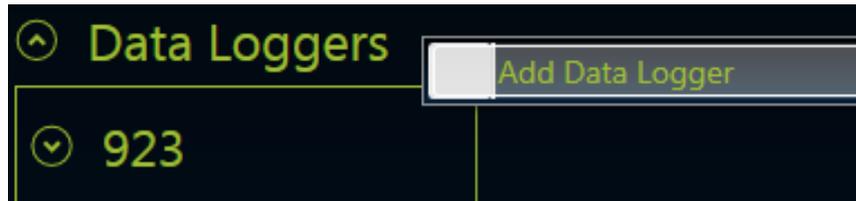


Figure 5-67: Data Loggers Context Menu - Add Data Logger

This will open a serial port selection window which lists the serial ports available connection.

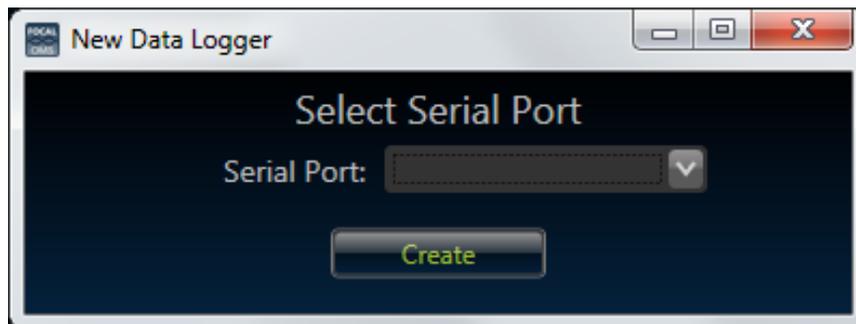


Figure 5-68: Serial Port Selection Window

Existing data loggers can be edited or deleted by right-clicking the desired data logger.

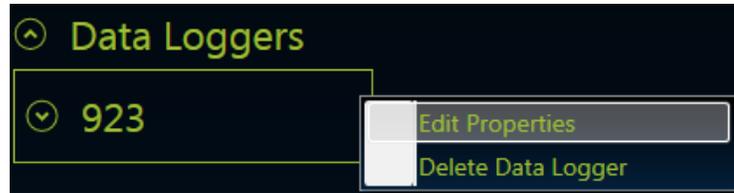


Figure 5-69: Data Logger Context Menu

The **Edit Properties** option will open a data logger property editor window.

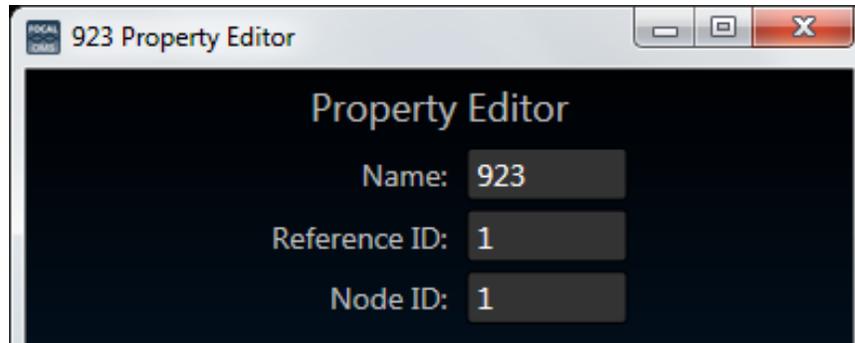


Figure 5-70: Data Logger Property Editor Window

The **Add**, **Edit** and **Delete** data logger options are only available when the measurement device is disconnected.

## 5.9 Notifications and Status Messages

In the bottom left corner of the 928-OMS software is a **Notifications** and status messages area. The following table outlines possible status messages and their meanings. To open the notifications click on the “**Notifications:**” area.

**Table 5-1: Notification and Status Messages**

Status Message	Description
Auto start failed. Press Connect to begin.	Indicates the 928-OMS failed to connect during the auto start process.
Connected	Indicates the 928-OMS has successfully connected to the internal measurement device.
Connecting...	Indicates the 928-OMS is attempting to connect to the internal measurement device.
Connection Error: CONN-DEV-INIT	Indicates the 928-OMS was unable to connect to the internal measurement device. A power cycle to the OMS unit might be required.
Demo mode stopped.	Indicates the 928-OMS is no longer running the demo mode cycle.
Device Disconnected...	Indicates the 928-OMS successfully disconnected from the internal measurement device.
Failed to disconnect...	Indicates the 928-OMS failed to disconnect from the internal measurement device.
Failed fiber switch	Indicates an error occurred when trying to switch fibers
Failed to stop demo...	Indicates the 928-OMS failed to stop running the demo mode cycle.
Finishing measurement...	Indicates the 928-OMS is completing a measurement.
Live data stopped.	Indicates the 928-OMS has stopped taking live measurements.
Measuring on Fiber 'X'...	Indicates that a measurement is being taken on fiber 'X'.
No system present on Fiber 'X'	Indicates no optical system definition is present on fiber 'X'.
Press 'Connect' to begin...	The default message at start-up when auto start is disabled.
Processing...	Indicates that the post measurement processing is in progress.
Running Demo Mode...	Indicates the 928-OMS is running in demo mode.
STRT-MEAS error: EEEEE	Indicates the internal measurement device failed to start.
Trap response error: EEEEE	Indicates a data corruption on the measurement device. Refer to the Troubleshooting section of this document.
Waiting to stop demo mode...	Indicates the 928-OMS is waiting for the current file to be processed before stopping the demo mode.
You must connect before running live data...	Shown when a user attempts to run measurements before connecting to the internal measurement device.

## 6.0 Troubleshooting

### 6.1 Software Closed/Crashed

In the event the 928-OMS software has crashed the software may be restarted by using the Model928OMS-Shortcut on the desktop. The software can also be accessed using windows explorer and navigating to the C:\FOCAL\_SOFTWARE\928-0401-00\_OMS\_GUI\Release folder and running the Model928OMS.exe application. Alternatively, power cycling the 928-OMS will reboot the application software.

### 6.2 Account Log Out

If the 928-OMS PC has logged out the user can simply log back in to the User account using the password **user**. Alternatively power cycling the 928-OMS will trigger an automatic login and launch the 928-OMS software.

### 6.3 Measurement Trace Saturation

A measurement saturation occurs when too much light is reflected back into the 928-OMS. This is indicated by a plateau at the 0 dB mark on the measurement trace as seen in the image below.



Figure 6-1: Trace Saturation

The possible causes and solutions for trace saturation are listed below.

**Table 6-1: Troubleshooting Measurement Saturation**

Item	Possible Cause(s)	Possible Solution(s)
1	Pulse width setting is too long. The longer the pulse width parameter the more light that is transmitted and reflected during the measurement. On short distance measurements this can cause a measurement saturation.	Decrease the pulse width measurement setting.
2	Air gap/bad connection. An air gap or bad connection can cause excessive amounts of light to be reflected back into the measurement device. The large amount of light returning to the device causes a saturation.	Examine the connection at the indicated location. Clean fibers and ensure connectors are properly mated.

## 6.4 Trap Response Error

A trap response error indicates a communication failure internally in the 928-OMS. This will cause device measurements to fail.

**Table 6-2: Troubleshooting Trap Response Errors**

Item	Possible Cause(s)	Possible Solution(s)
1	Internal device communication failure.	This issue has been resolved in the latest version on the 928-OMS software. Contact the factory for a software update.

## 6.5 Optical Interference

WDM systems (typically running at 1310/1550 nm) such as the 903 FMB-X 2.5 might experience interference during OMS measurements. This is an expected result of WDM-based systems that do not provide enough isolation to remove the OMS wavelength.

Table 6-3: Troubleshooting Optical Interference

Item	Possible Cause(s)	Possible Solution(s)
1	The light from the 928-OMS measurement can saturate a remote receiver causing optical link drops (interference) when the 928-OMS is making measurements.	It is recommended for WDM systems to install an optical filter at the remote end as shown below. The remote OMS optical filter recommended is P/N EL-W0656.

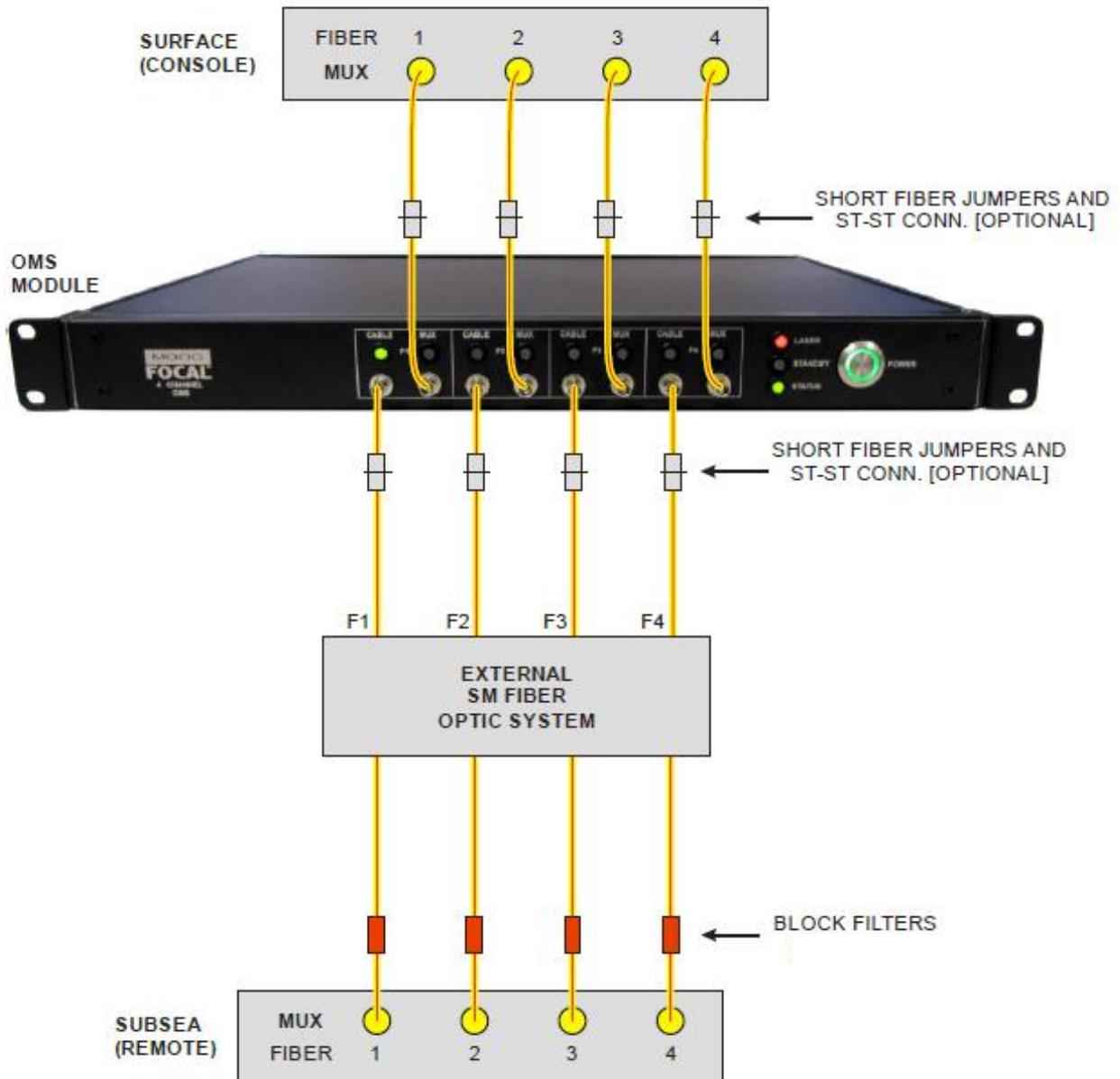


Figure 6-2: OMS Connections with block filter (required for most WDM systems)