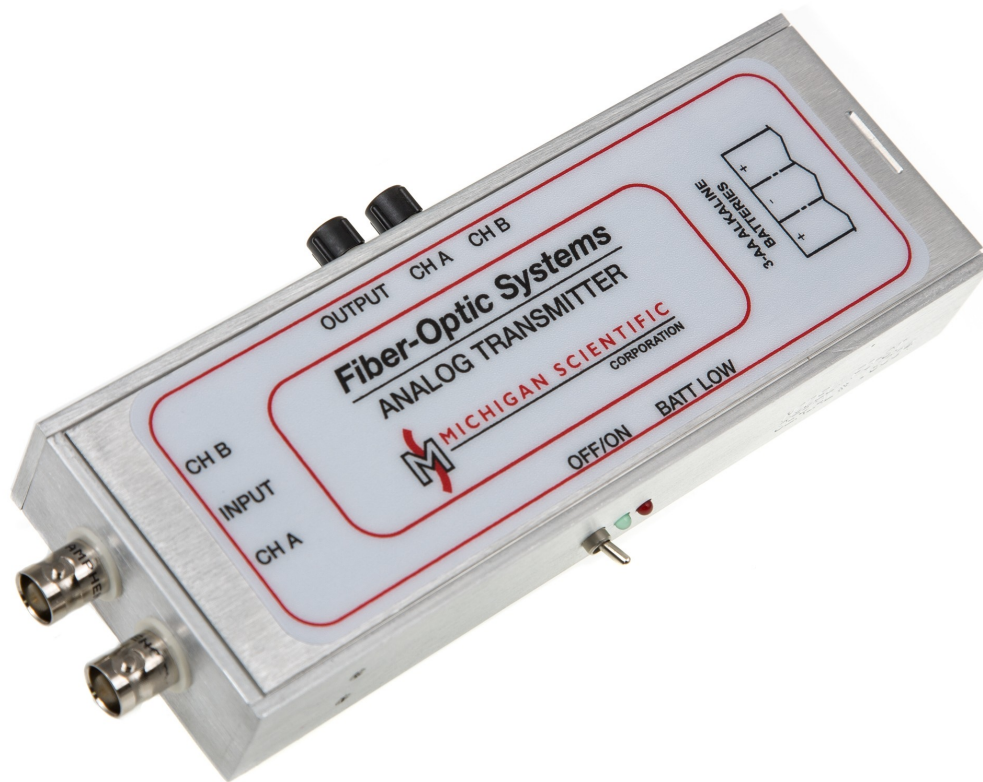


Fiber-Optic Systems

User Manual



Model: FO-ST & FO-SR

DC to 20 kHz 2-Ch EM Hardened Analog Signal Link



1. Description

The FO-ST is a versatile 2 channel fiber-optic analog signal transmitter capable of measuring electrical signals from sources in high electromagnetic fields or anechoic chambers and transmitting over fiber-optic cables to a FO-SR receiver remotely located in a low field area. The FO-ST is able to transmit analog signals with bandwidths from DC to 20 kHz.

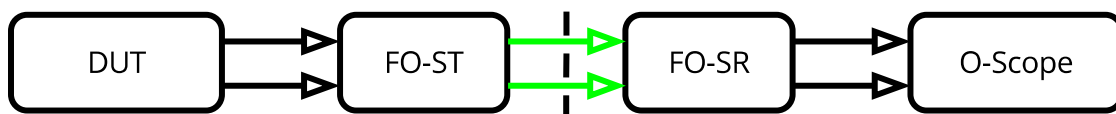


Figure 1: Setup to measure signal

Selectable gain jumpers allow configuration of the transmitter module for full-scale input levels of ± 16 V, ± 32 V, or ± 48 V. Input gain may also be configured to optional full-scale input levels from ± 160 mV to ± 100 V full-scale.

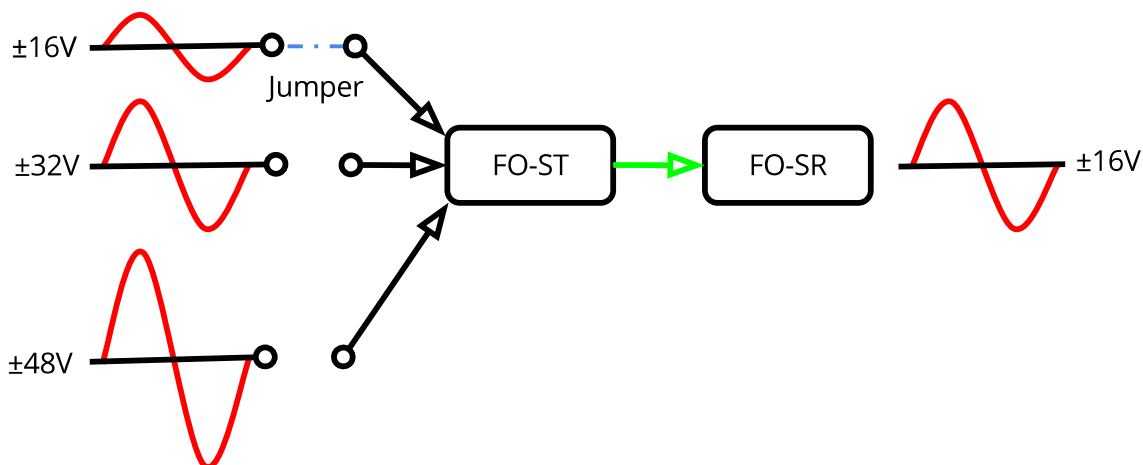


Figure 2: Full-scale input selection

The FO-ST has shielding and custom input filtering to provide high immunity from electromagnetic interference (EMI), electromagnetic pulse (EMP), or high voltages associated with plasma research. This allows for rigorous electromagnetic compatibility (EMC) testing/engineering. The FO-ST is validated for EMC up to 200 V/m (46 dBV/m) at 500 kHz to 18 GHz and 600 V/m (pulsed 5 % duty-cycle, 5 μ s rise-time) 1 GHz to 2.5 GHz.

2. Setup

Connect the FO-ST to a FO-SR with SMA multimode fiber-optic cables. Connect the FO-ST BNC inputs to the DUT as needed using FO-HZ cables.

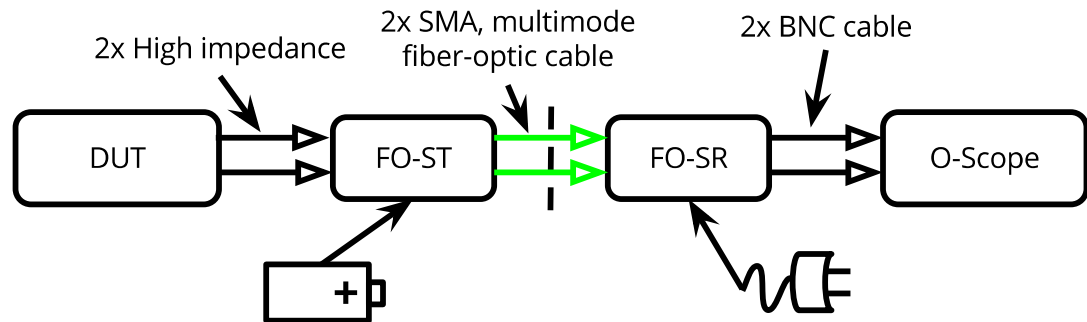


Figure 3: Setup connections

WARNING: The module connected to the DUT must be separated from the ground plane on a 50 mm thick foam block. The module enclosure cannot be touching any other piece of testing equipment (another module, cable harness, etc.).

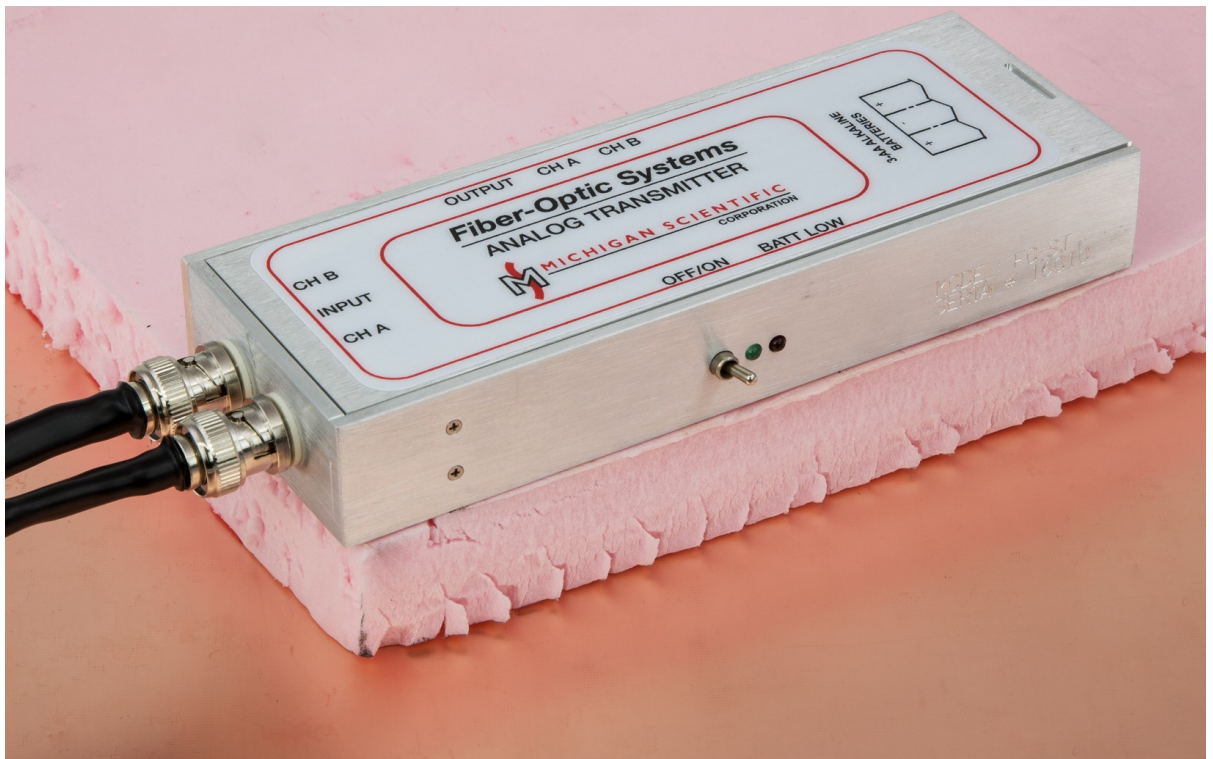


Figure 4: FO-ST on 50 mm of foam

WARNING: The FO-SR can only source a maximum of 16mA. Do not connect the FO-SR to a low impedance device, such as a 50 Ω terminated oscilloscope.

Verify the location of the 4 internal gain setting jumpers inside the FO-ST. The default location is ± 16 V as shown Figure 5.

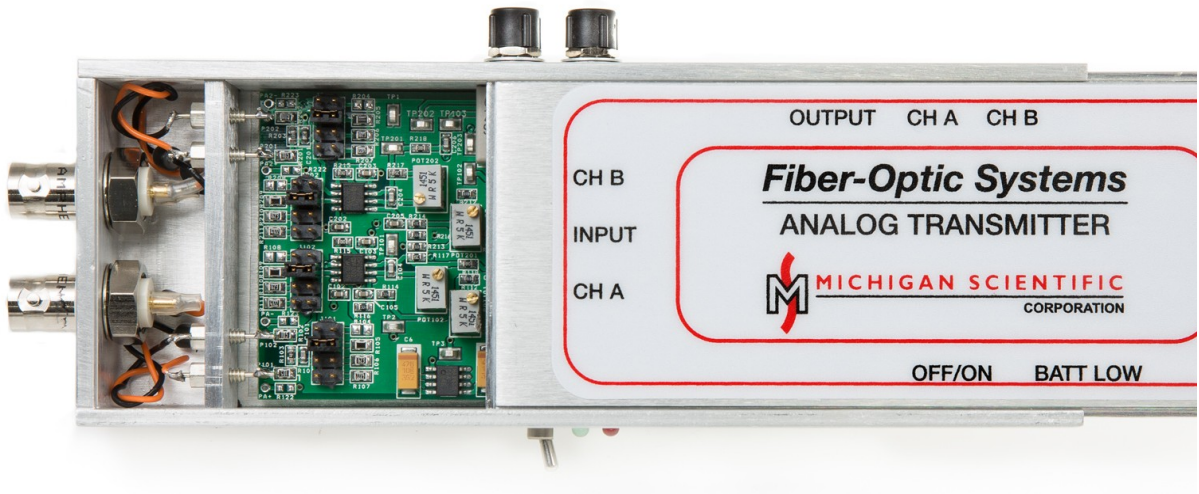


Figure 5: Default jumper locations

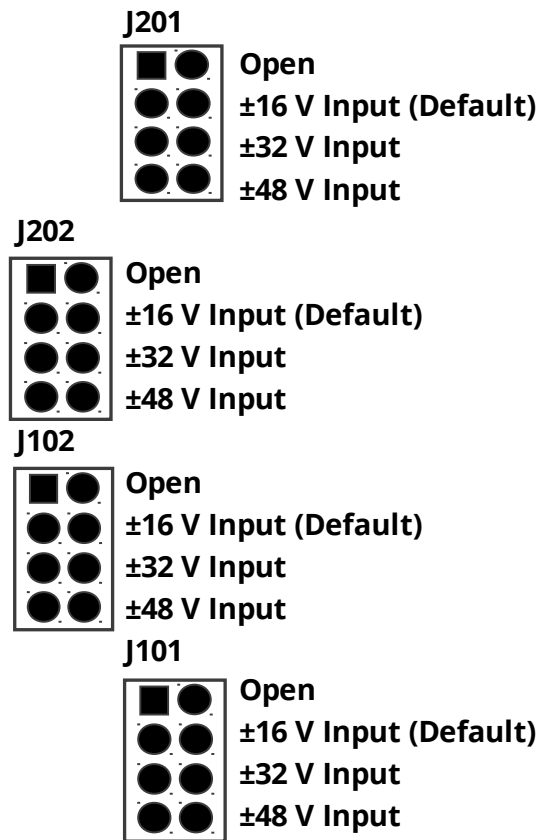


Figure 6: Jumper location setting

Note: Changing the FO-ST gain setting jumper changes the system gain; ± 16 V has a gain of 1 (1:1), ± 32 V has a gain of $\frac{1}{2}$ (2:1), and ± 48 V has a gain of $\frac{1}{3}$ (3:1).

WARNING: No adjustments should be attempted to the FO-ST internal potentiometers. They are preset at the factory and do not need user adjustment.

3. Operation

3.1. FO-ST

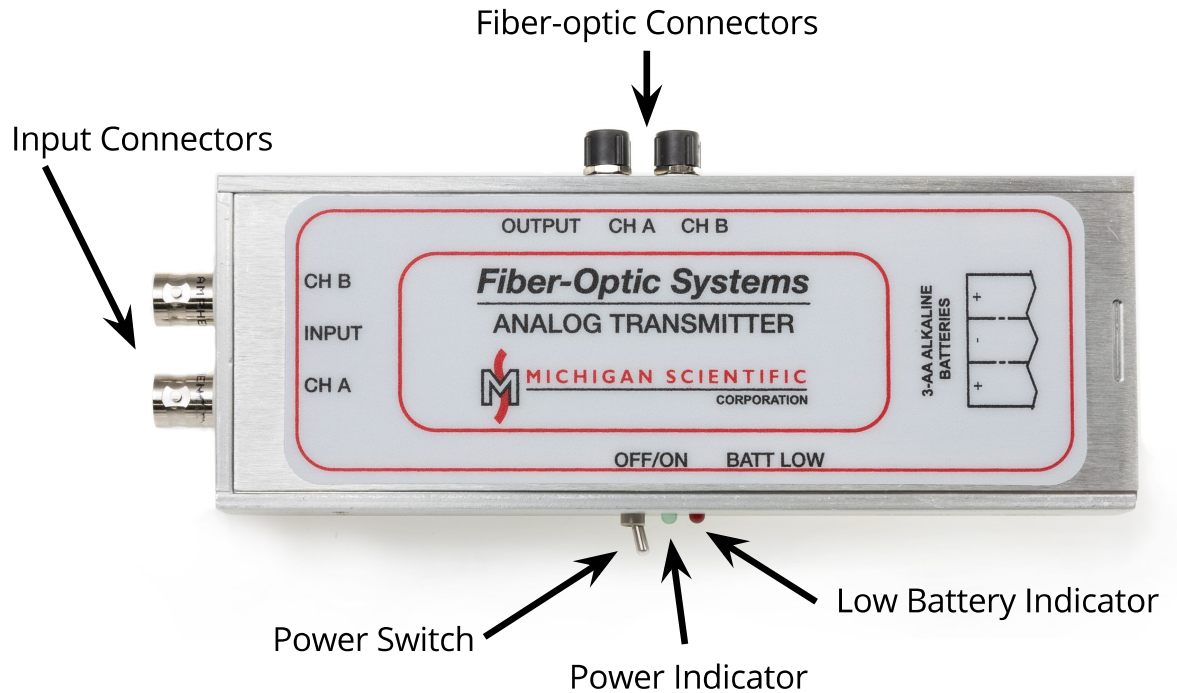


Figure 7: FO-ST point out

The FO-ST was designed for use with alkaline batteries. The red **BATT LOW** indicator illuminates when the alkaline batteries need replacement. NiMH may be used but the low-battery indicator will not work as intended.

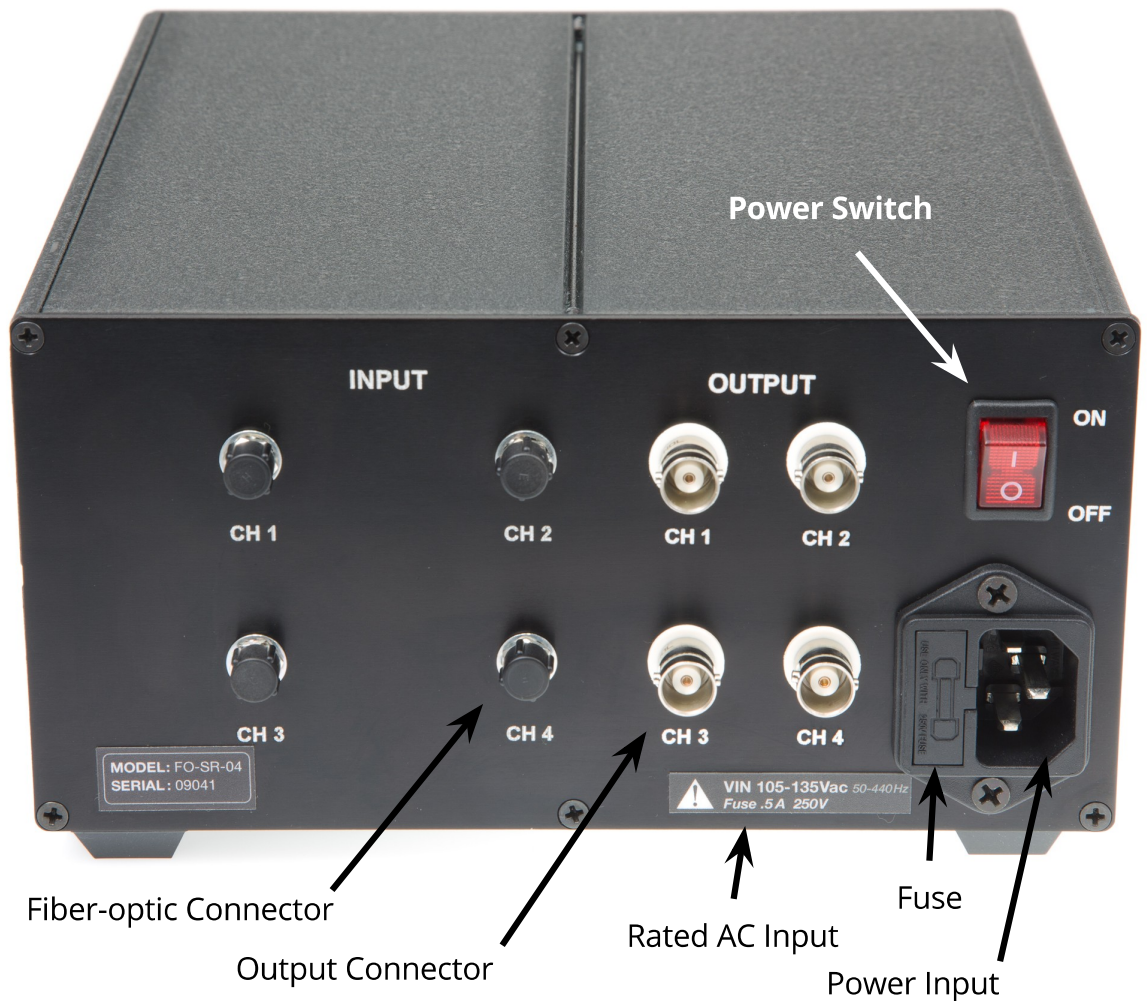


Figure 8: FO-SR point out

Adjustment of the gain and offset potentiometers is done by following the user calibration procedure. The **OK** and **FAULT** indicators show when a valid fiber-optic signal is being received. The **FAULT** indicator will trigger if there is no fiber-optic cable connected or the fiber-optic cable is causing too much optical loss. Test the fiber-optic cables for optical loss greater than 10 dB.

4. Custom Gain Configuration

Upon customer request MSC can permanently alter the gain setting options of a FO-ST module. A single custom gain setting can be added to the 4th jumper location setting. Alternatively, MSC can modify each of the 4 settings to any \pm full-scale range from ± 160 mV up to ± 100 V. See section Technical Support.

5. Calibration

Michigan Scientific Corporation does not recommend the recalibration of the FO-ST or FO-SR based on time interval. If equipment is found to be out of specification it is in need of repair. All repairs performed by Michigan Scientific Corporation include calibration.

6. User Adjustment Procedure

Note: Perform a user adjustment at the start of each testing day and when the FO-ST gain setting jumper is changed.

Each channel in the system needs to be calibrated separately with the following procedure:

1. Turn on both the FO-ST and FO-SR and allow for 30 min to warm-up
2. Note the intended FO-ST gain setting jumper value (± 16 V, ± 32 V, or ± 48 V)
3. Connect a digital volt meter (DVM) to the FO-SR channel output
4. Connect a voltage reference to the FO-ST channel input
5. Set the voltage reference to apply 0 V to the FO-ST channel input
6. Adjust the FO-SR offset potentiometer until output indicates 0 V on the DVM
7. Apply a known voltage that is 75% of full-scale to the FO-ST channel input
Note: Use a 12 V, 24 V, or 36 V for ± 16 V, ± 32 V, or ± 48 V respectively
8. Adjust the FO-SR gain potentiometer until output indicates 12 V (75% of 16 V) on the DVM
Note: Remember to take into account the FO-ST gain setting
9. Repeat from step 5 until within specification

7. Technical Support

For technical support please contact:

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8. Specifications

FO-ST (Transmitter)

Voltage range	Jumper selectable to ± 16 V, ± 32 V, ± 48 V per each channel
Impedance	1 M Ω
Over-voltage protection (± 16 V full-scale)	± 100 V continuous, ± 350 V peak
Operating temperature	-20 °C to 85 °C
Power requirement	3-AA alkaline batteries
Battery life	60 h
Dimension (L x W x H)	175 mm x 75 mm x 25 mm
Weight	405 g
EMC	300 V/m 500 kHz to 1 GHz 200 V/m 1 GHz to 18 GHz 600 V/m pulsed 1 GHz to 2.5 GHz

FO-SR

Voltage range	± 16 V
Impedance	1 k Ω
Max current	16 mA
Operating temperature	0 °C to 70 °C

System General

Optical connector	2x SMA
Optical cable	multimode
Signal to noise	90 dB
Stability	<2 % of full-scale over operating temp.