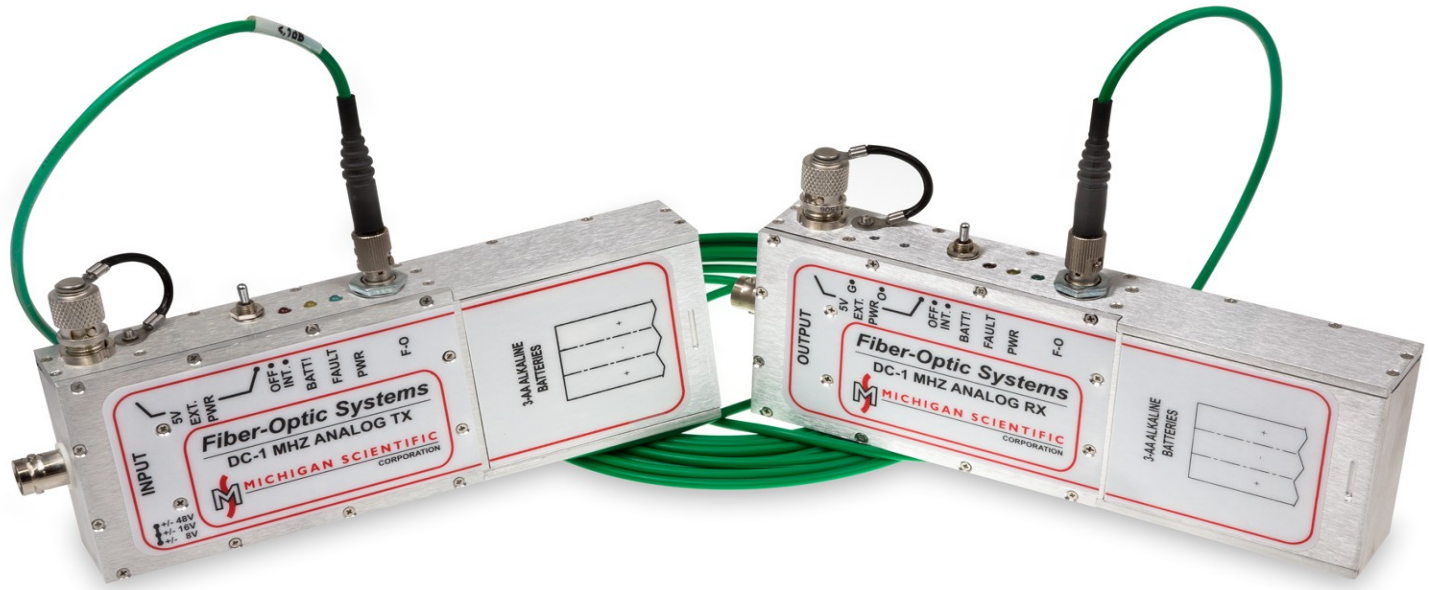
Fiber-Optic Systems

User Manual



Model: FO-HBST & FO-HBSR

DC to1 MHz EM Hardened Analog Signal Link

Michigan Scientific Corporation

1. Description

The FO-HBST (transmitter) and FO-HBSR (receiver) form a versatile fiber-optic, analog signal pair. A DC to 1 MHz voltage signal is monitored or sourced to the device under test (DUT) by connecting either the FO-HBST or FO-HBSR. Fiber-optic cable connects to the corresponding module to monitor or source the desired signal remotely.

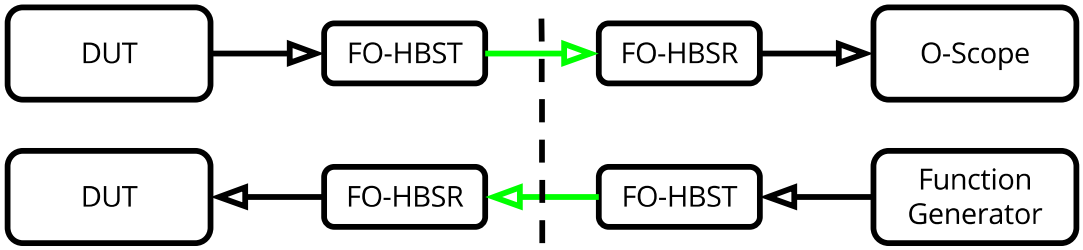


Figure 1: Setup to source or monitor a signal

Full-scale input level on the transmitter is easily changed by a 3-position slide switch to ±8 V, ±16 V, or ±48 V. The receiver outputs up to ±16 V regardless of the input range.

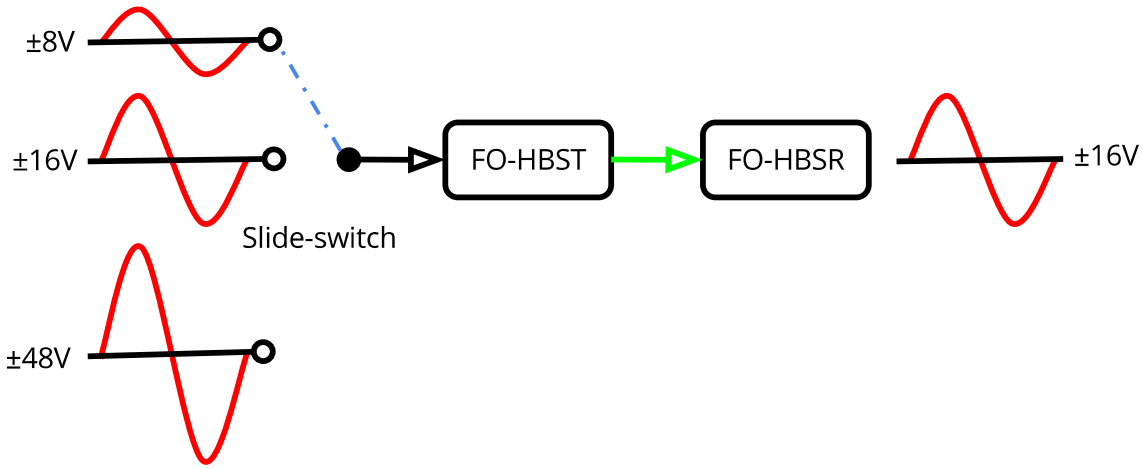


Figure 2: Full-scale input selection

Each module may be powered by 3-AA batteries or an external power adapter.

Both modules have shielding and custom input/output filtering that provides 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 satellite modules are 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 µs rise-time) 1 GHz to 2.5 GHz.

2. Setup

Either the FO-HBST or FO-HBSR may be connected to the DUT to measure or source a signal. Connect the FO-HBST to FO-HBSR with ST multimode fiber-optic cables. The module connected to the DUT must be battery powered. The remote module may be powered by batteries or the external power adapter.

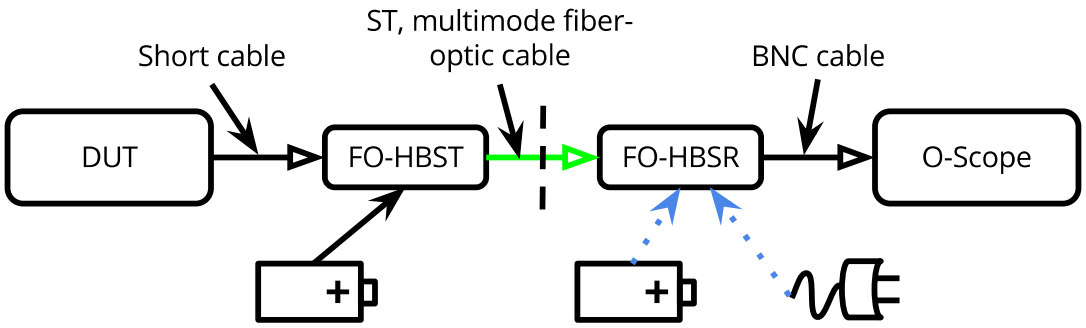


Figure 3: Setup connections

***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.).

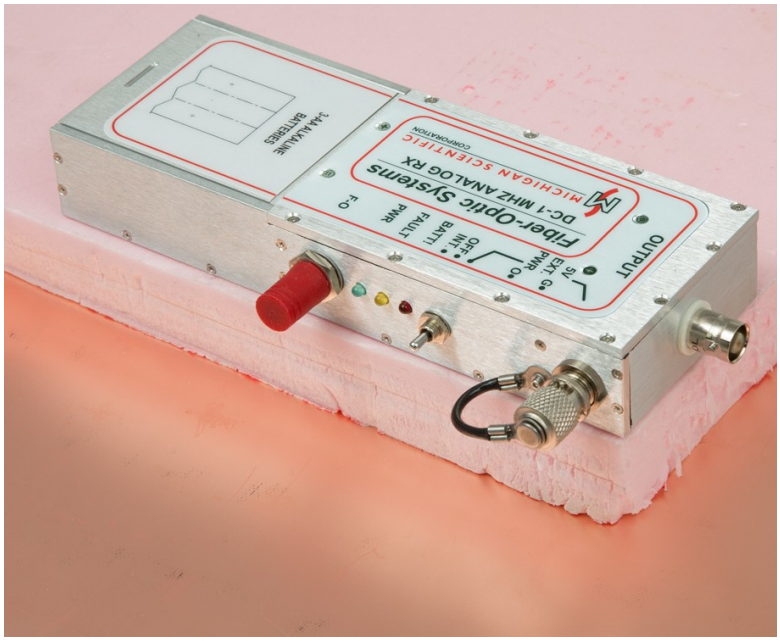


Figure 4: FO-HBST on 50 mm of foam

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

Set the full-scale input range on the FO-HBST as shown in Figure 5.

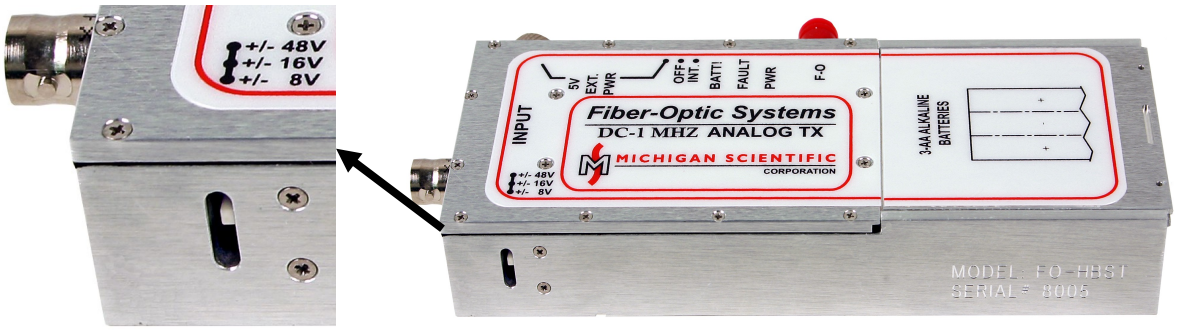


Figure 5: FO-HBST input range switch

Note: Changing the FO-HBST full-scale input changes the system gain; ±16 V has a gain of 1, ±8 V has a gain of 2, and ±48 V has a gain of 1/3.

3. Operation

The FO-HBST and FO-HBSR were designed for use with alkaline batteries. The red **BATT!** indicator illuminates when the alkaline batteries need replacement. NiMH may be used but the low-battery indicator will not work as intended. To power the unit select **INT.•** for internal batteries, **5V EXT. PWR** for the external power adapter, or **OFF•** to turn off.

Note: Only the manufacturer supplied power adapter may be used.

3.1. FO-HBST

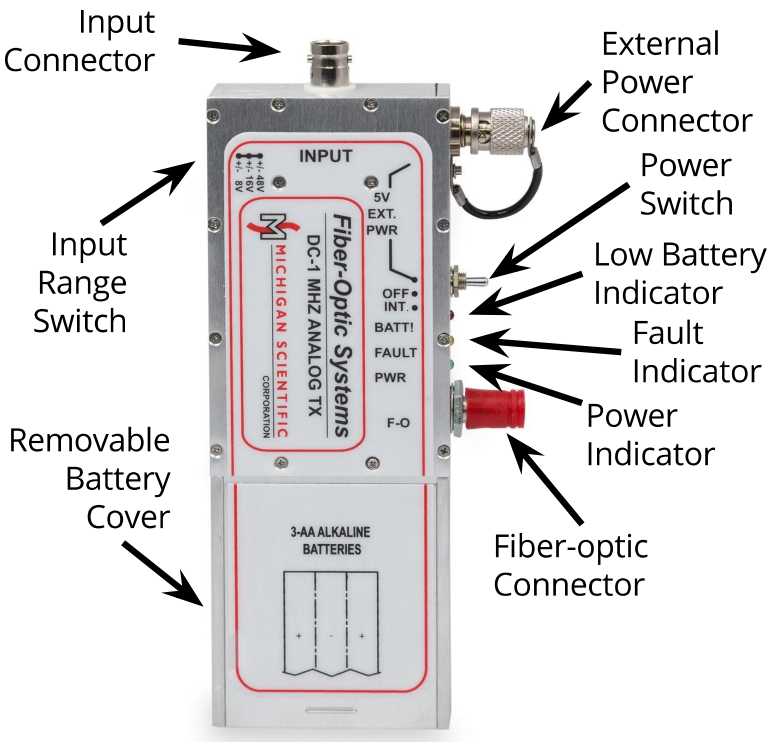


Figure 6: FO-HBST point out

The yellow **FAULT** indicator shows when the input voltage exceeds full-scale.

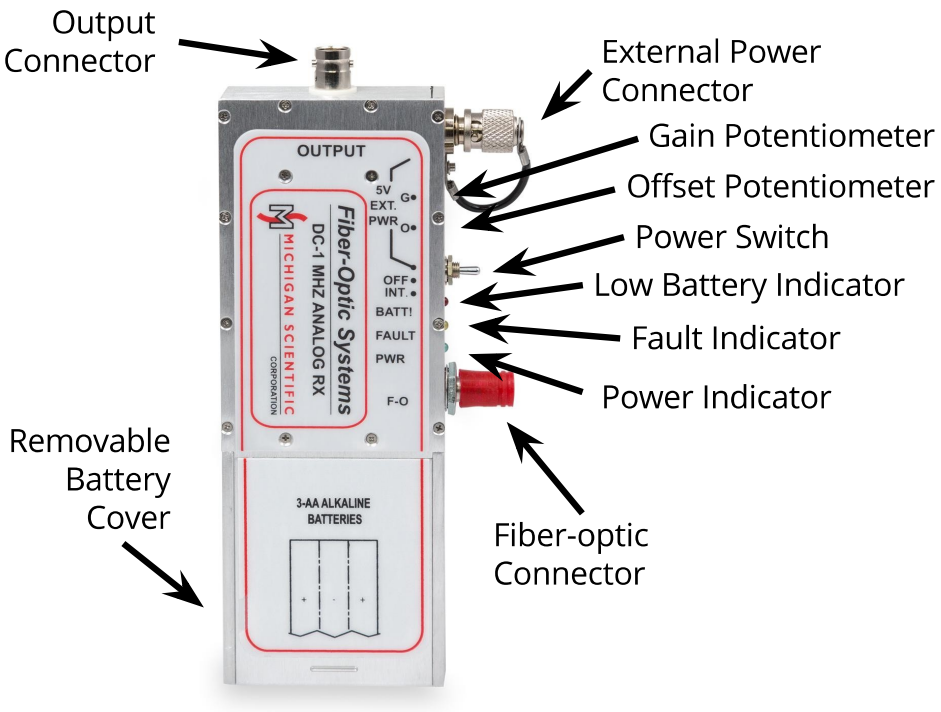


Figure 7: FO-HBSR point out

To adjust the gain (**G•**) and offset (**O•**) potentiometers, carefully insert the provided flat head screw driver and turn. Offset and gain are set by following the Error: Reference source not found. The yellow **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 cable for optical loss greater than 10 dB.

***WARNING*:** The FO-HBSR potentiometers can be damaged by applying too much force.

4. Calibration

Michigan Scientific Corporation does not recommend the recalibration of the FO-HBST or FO-HBSR 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.

5. User Adjustment Procedure

Note: Perform a user adjustment at the start of each testing day and when the FO-HBST input range is changed.

1. Turn on both the FO-HBST and FO-HBSR and allow for 5 min to warm-up
2. Note the FO-HBST input range setting (±8 V, ±16 V, or ±48 V)
3. Connect a digital volt meter (DVM) to the FO-HBSR output
4. Connect a voltage reference to the FO-HBST input
5. Set the voltage reference to apply 0 V to the FO-HBST input
6. Adjust the FO-HBSR offset potentiometer until output indicates 0 V on the DVM
7. Apply a known voltage that is 75 % of full-scale to the FO-HBST input

   Note: Use 6 V, 12 V, or 36 V for ±8 V, ±16 V, or ±48 V respectively
8. Adjust the FO-HBSR gain potentiometer until output reaches 12 V (75 % of 16 V) on the DVM
9. Repeat from step 5 until within specification

6. Technical Support

For technical support please contact:

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7. Specifications

Transmitter (FO-HBST)

Voltage range	slide-switch selectable to ±8 V, ±16 V, ±48 V
Impedance (±8 V, ±16 V, ±48 V)	72.5 kΩ / 145 kΩ / 435 kΩ
Over-voltage protection	±100 V continuous, ±350 V peak
Resolution (±8 V, ±16 V, ±48 V)	4 mV / 8 mV / 24 mV
Battery life	25 h

Receiver (FO-HBSR)

Noise	10 mV RMS
Impedance	100 Ω
Maximum current	16 mA
Battery life	16 h (load dependent)

System General

Signal type	differential input/ signal-ended output
Signal connector	BNC
Bandwidth (10 V peak to peak sine)	1 MHz (-3 dB)
Flatness (10 V peak to peak sine)	±1 dB up to 500 kHz
Rise/fall times	300 ns (20 % to 80 %)
End to end delay	1.8 µs
Offset voltage drift	0.5 % full-scale across temperature range
Optical connector	ST
Optical cable	multimode
Operating temperature	-12 °C to 85 °C
Power requirement	3-AA alkaline batteries or external adapter
Dimension (L x W x H)	172 mm x 76 mm x 25 mm
Weight	285 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