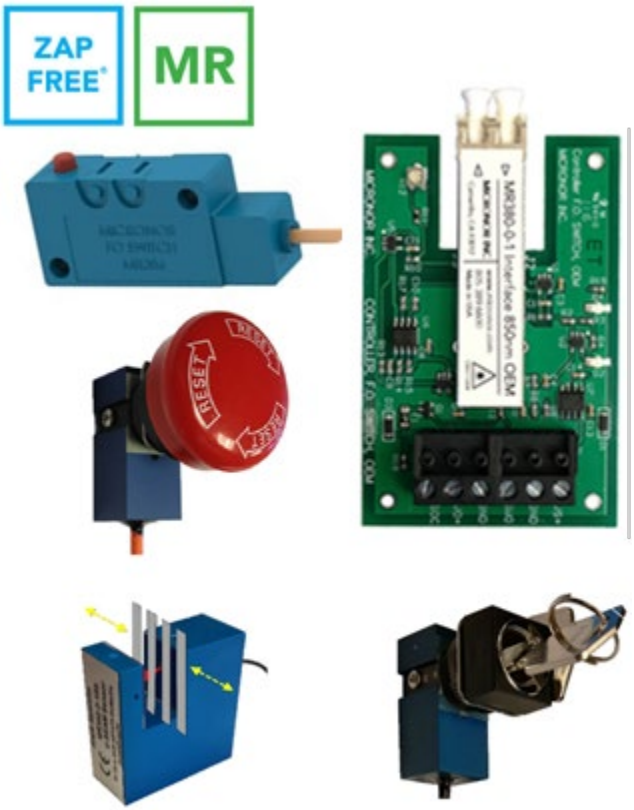
MR380-0
Fiber Optic Signaling
OEM PCB Controller
Instruction Manual

DOC: 98-0380-300
Revision B3 dated 9/27/2019



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Notice of Proprietary Rights

Revision History

REV	Date	Notes
A	2/10/2016	Initial Release
B	8/1/2016	Update for New Terminal Plug
B1	10/20/2016	Added Explosive Atmosphere specification
B2	3/7/2017	Added Extended Temperature model MR380-0-1E
B3	9/27/2019	Added Updated MR380 Declaration of Conformity

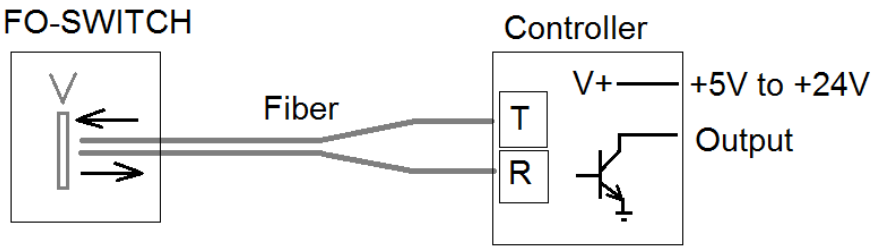
Table of Contents

Figures

1. Product Description

1.1 Fiber Optic Switch Sensor Controller Board

A fiber optic switch works on the basis of interrupting a light beam when a certain event occurs and the switch is activated. Although switches take on various forms such as, Toggle, E-STOP, Push-Button and so on, the principle of sensing the switch state remains the same via interruption of the optical beam. MICRONOR has implemented the concept by using a transmit fiber and a receive fiber. The transmitter sends a constant light level via the transmit fiber and the receive fiber guides the light back. When the switch is not activated, most of the light is guided back to the receiver. When the switch is activated, little or no light is coupled back to the receiver.



The MICRONOR Fiber Optic switches are immune to EMI/RFI and can be deployed at great distances from the electrical controller. Applications include:

- MRI machines operate under an extremely strong electromagnetic field. Special switches are manufactured to be entirely free of metallic materials and, thus, will not interfere with the MRI imaging process.
- Pipe and tube welding produces extreme interference while the welding process is active
- Surgical robots must perform 100% reliably
- Oil & Gas since there is no sparking
- Aerospace actuators operating in and around other noise generating avionics
- Aerial Tramways, Gondolas, Skilifts etc, because immunity to lightening.

An all-optical, non-electronic passive solution, such as the fiber optic switch, provides complete immunity to such interferences.

1.2 Fiber Optic Controller Board

The MR380-0 Controller Board is intended for the OEM user in support of deployment of the various Fiber Optic Signaling products. The OEM PCB contains a stabilized transmitter and a sensitive optical receiver. There are two digital outputs

a.) 5V logic Level signals a High when optical power is received.

b.) Open-collect output for activating an external relay (or other electrical load) when sufficieant optical power is received.

This universal PCB may be used in conjunction with many of the MICRONOR signaling devices.

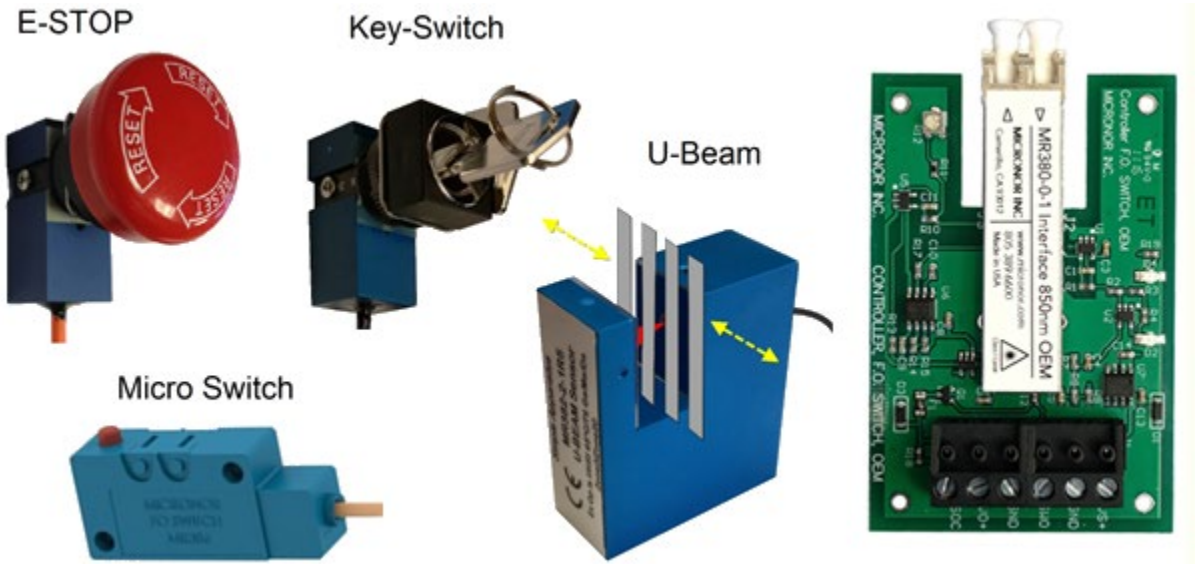


Figure 1. MR380 Fiber Optic Signaling Devices

The MR380-0 is intended for OEM applications where the PCB can be mounted into a suitable enclosure and where it is sufficiently protected from the environment such as water and dust or similar influences. Optically the interface board is compatible with OM1 (62.5µm/125µm) and OM3 (50µm/125µm) fiber cabling.

1.3 Part Numbering

The part number is MR380-0-1. The last digit (1) defines the operating wavelength as 850nm.

1.4 Functional Description

The controller board sends a steady stream of optical pulses at approx. 150kHz to 300kHz frequency. The returned optical signal strength determines wether the electrical output is activated. When sufficient light is received, the outputs are activated.

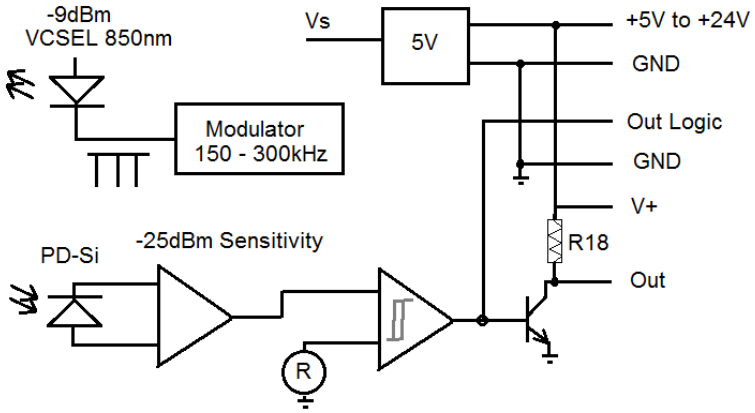


Figure 2. Block-Diagram MR380-0 Controller Board

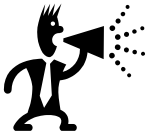
The optical power is internally monitored and held at a constant level over the full operating temperature range. The factory set level is -9dBm coupled into a OM1 fiber (62.5/125µm) and typically -11dBm is coupled into am OM3 fiber (50/125µm).

The receiver sensitivity is set at -25dBm.
For system planning the dynamic range for OM1 fiber is 15dB and for OM3 fiber it is -13dB.

2. Initial Preparation

2.1 Unpacking and Inspection

The unit was carefully inspected mechanically and electrically before shipment. When received, the shipping carton should contain the following items listed below. Account for and inspect each item before the carton is discarded.



The PCB is an electronic Assembly and susceptible to ESD. Please use appropriate grounding and caution when handling the PCB.

In the event of a damaged product, write or call your nearest MICRONOR sales office.

Please retain the shipping container in case re-shipment is required for any reason.

2.2 Damage in Shipment

If you receive a damaged product you should:

1) Report the damage to your shipper immediately.
2) Inform MICRONOR
3) Save all shipping cartons.

Failure to follow this procedure may affect your claim for compensation.

2.3 Standard Contents

MR380-0 OEM Controller Board:

- PCB board with built-in Duplex LC interface and 3.5mm contact strip.
- CamdenBoss P/N CTB1301/6A
  6C, Screw-Type Terminal Plug, 5mm Contact Spacing

  Note: The Terminal plug may be excluded for customers with special contract agreements.
- Instruction Sheet

This Instruction Manual can be downloaded from www.micronor.com

3. Installation and Operation

3.1 Mounting the Sensor Unit

When installing the sensor, be careful not to bend the fiber excessively. It is recommended to keep the minimum bend radius 25mm (1") or larger. Ensure that the fiber outlet at the switch is protected from excessive pulling or bending.

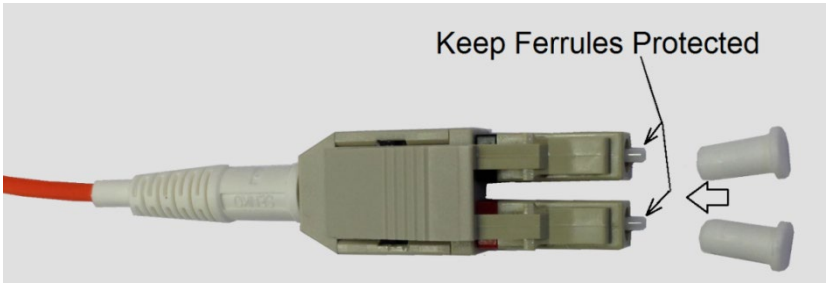


Figure 3. Keep LC Duplex connector ends protected when not in use

Make sure that the fiber optic connector tips are always covered when not in use. Always clean and inspect the connector ends before mating to interface.

Be sure to use proper fiber optic cleaning tools and procedures such as the MICRONOR MR321C Cleaning Kit. Improper tools and/or processes may damage or contaminate the optical interface.

3.2 Mounting the MR380-0 Controller PCB

The controller PCB should be mounted on 4 standoffs.
Clearance shall be available for access to the Fiber Optic Interface.
The mounting holes are suitable for #2-56 or M2.5 screws.
The mounting holes are electrically connected to GND.
Consult Reference Drawing 98-0380-15 for more information

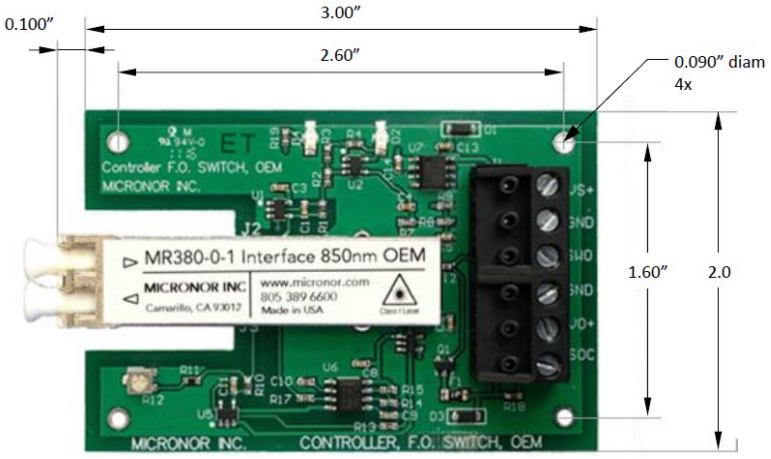


Figure 4. Dimensions of MR380-0 Controller PCB

3.3 Optical Connections to the MR380-0 Controller

A duplex fiber optic cable is used to interconnect the sensor and controller. The sensor incorporates a 1.5m optical pigtail (or as specified by customer). If a longer connection to the controller is required, then a fiber optic extension cable may be used.

Remove the dust cap form both the cable connector and the optical port on the controller. Insert the LC connector as shown. There should be a positive click when the connector is engaged properly.

Do not force the Fiber Optic Connector!

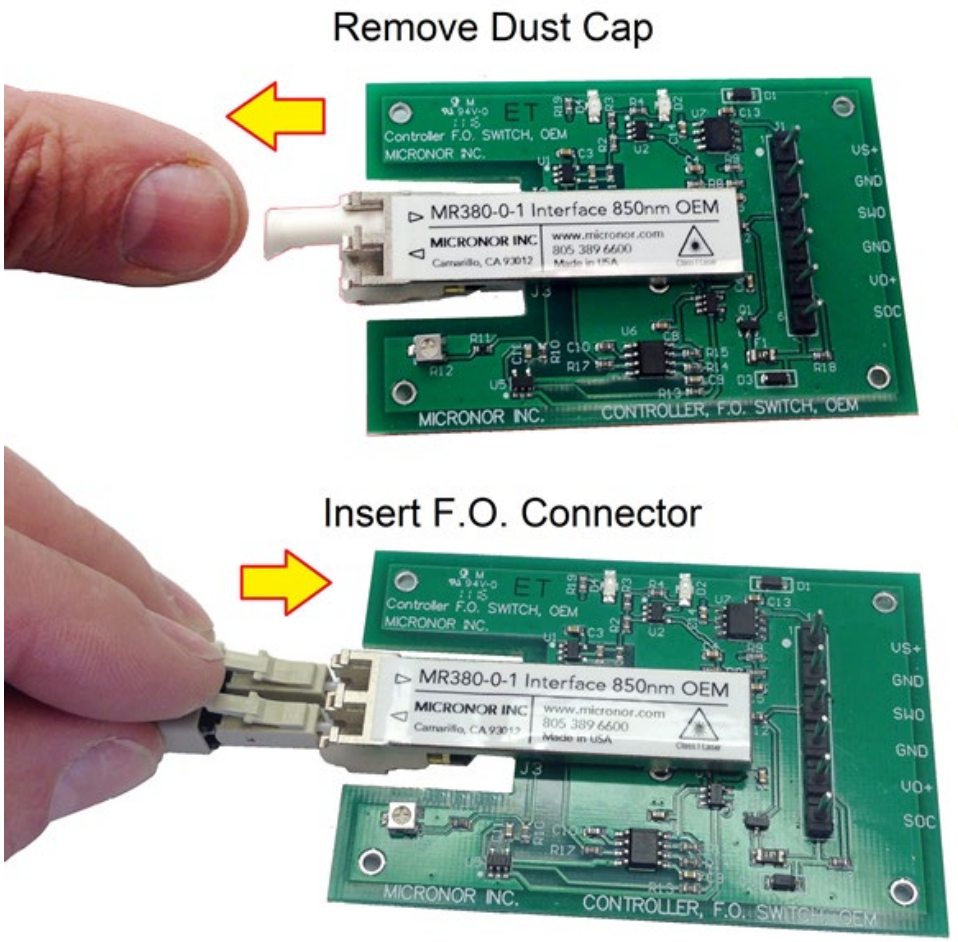


Figure 5. Make optical connection using LC-Duplex optical connector

3.4 Electrical Connections To MR380-0 Controller

The may be unit is powered with any voltage between 5V and 24V DC.
Current consumption is typ. 8mA at 5V DC and +12mA at 24V DC excluding any external load.

CamdenBoss P/N CTB1301/6A (supplied) 6C, Screw-Type Terminal Plug, 5mm Spacing	
PIN	Function
1	+5V to +24V DC Power Supply
2	GND
3	+5V Logic Out
4	GND
5	DC Supply (Out)
6	Open Collector Out

Figure 6. Layout of MR380-1 PCB

NOTE: Mounting holes are internally connected to GND.

When all connections are made, than apply DC voltage in the range of +5V to max +24V.

If the sufficient optical power is received, then the onboard LED will light up. It is OFF when no optical power is received.

3.5 Interfacing with an external Relay

An external relay may be connected to the open-collector terminal (6).

The maximum voltage allowed for this output is up to the power supply Voltage.

If the pull-up resistor R8 is removed, then voltages exceeding the V Supply up to 48V are allowed.

The current load shall not exceed 180mA.

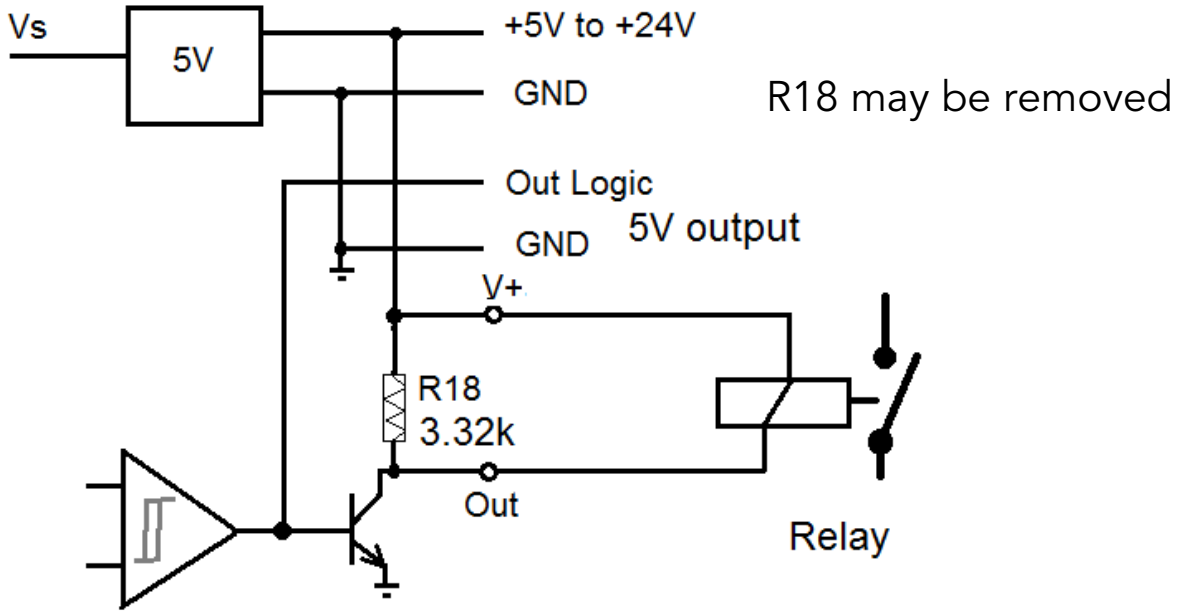


Figure 7. External Relay Connection

4. Warranty Information

Warranty

MICRONOR INC. warrants this product to be free from defects in material and workmanship for a period of 1 (one) year from date of shipment. During the warranty period we will, at our option, either repair or replace any product that proves to be defective.

Applying improper supply voltage (greater then 24VDC or reverse polarity) voids the warranty.

To exercise this warranty, write or call your local MICRONOR INC. representative, or contact MICRONOR INC. headquarters. You will be given prompt assistance and return instructions. Send the product, transportation prepaid, to the indicated service facility. Repairs will be made and the product returned transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days. MICRONOR INC. resreves the option to either repair, or replace product.

Limitations of Warranty

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to Fiber Optic Connector interfaces, improper mouning of the PCB, fuses or AC line cords. This warranty is limited to the maximum price paid by purchaser to MICRONOR INC, excluding any shipping, transportation or duties. This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. MICRONOR INC. shall not be liable for any indirect, special or consequent damages.

Contact Information:

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5. Specifications

5.1 MR380-0 OEM Signaling Controller

Electrical Interface Description	Specification
Connector	CamdenBoss P/N CTB1301/6A 6C, Screw-Type Terminal Plug, 5mm Contact Spacing
Logic Output	High: 4.5V min. (2k Ohm Load) Low: 0.25V max.
Open Collector Output	Maximum Load Voltage 24V Maximum Current 180mA Protected by resettable fuse)
Power Supply Voltage Current Consumption	 +5VDC to +24V DC maximum 8mA max. at 5V DC, 12mA at +24V and R8 installed

Optical Interface	Specification
Connectior	LC Duplex, PC Polish
Fiber Type (Duplex)	62.5/125µm 0.275NA OM1 Multimode Fiber or Or 50/125µm 0.22NA OM2/OM3 Multimode Fiber
Optical Output Power OM1 OM3	 -9dBm (0.11mW) average (850nm VCSEL diode) -11dBm (0.080mW) average
Receiver Sensitivity OM1 OM3	 -25dBm or better -25dBm or better
Switching Hysteresis	1.5dB typical
Optical Dynamic Range Maximum Link Loss	OM1 = 15dB ; OM3 = 13dB Link lengths up to 1.5km are typically achievable. Refer to Application Note AN118 for more information on Link Loss.
Operating Wavelength	850nm
Optical Output Power	< -8dBm (0.158mW) average
Laser Safety Classification	Class 1

Explosive Atmospheres	Inherently Safe Optical Radiation
Ex Classification	Controller shall be installed in non-hazardous location Only Power supply to Controll shall be current limited to 200mA IECEx Test Report GB/CML/ExTR 16.0105.00/00
ATEX	CE EPL Mb/Gb/Gc/Db/Dc
IEC Ex	EPL Mb/Gb/Gc/Db/Dc
NEC	Exempt

Environmental & Mechanical	Specification

Temperature	Standard (MR380-0-1): -10°C to +65°C Extended (MR380-0-1E): -40°C to +70°C
Humidity	0% to 85% RH (non-condensing)
Ingress Protection	IP00 (none)
Vibration/Shock	Performance depends on mounting. Consult factory when designing for high shock and vibration environment.
Mounting	4x #2-56 or M2.5 screws Mounting pattern 1.60" x 2.60 inches
Size	5.08 x 7.62cm (2.00 x 3.00")
Weight	25g (1oz)

Specifications subject to change without notice

6. Reference Documents

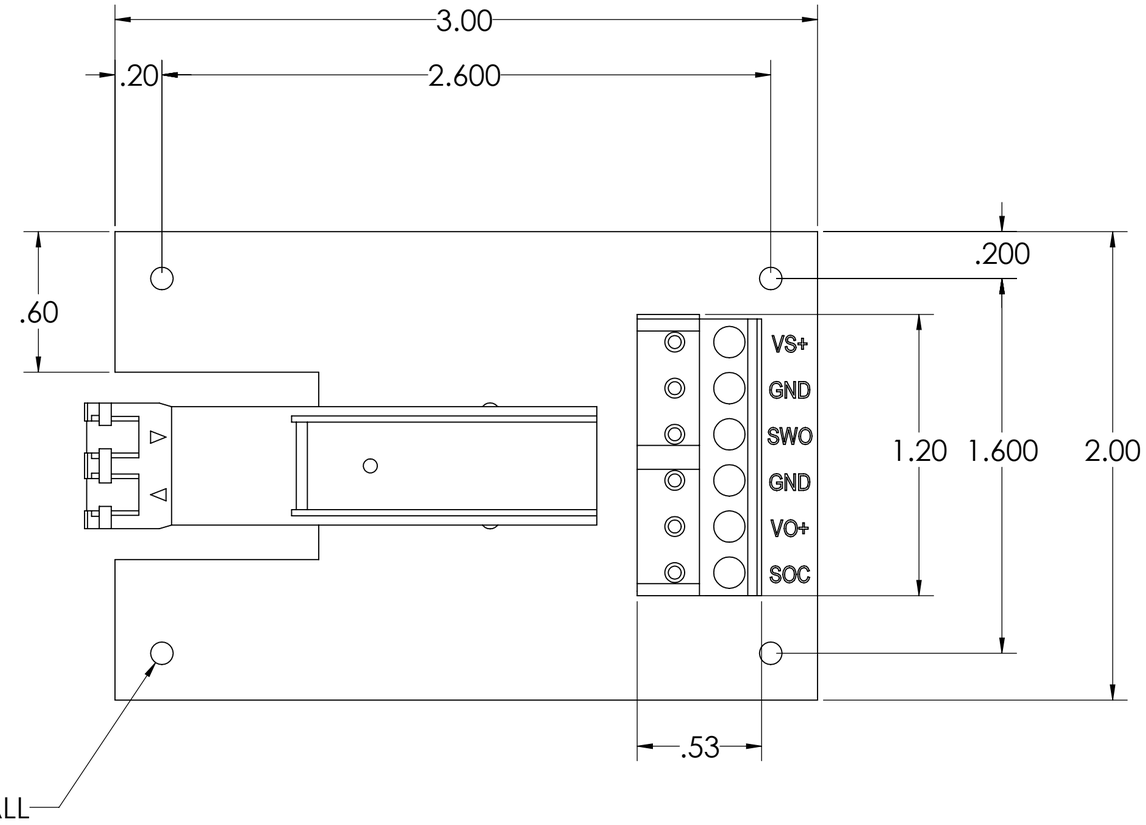
Documents appear on the following pages.

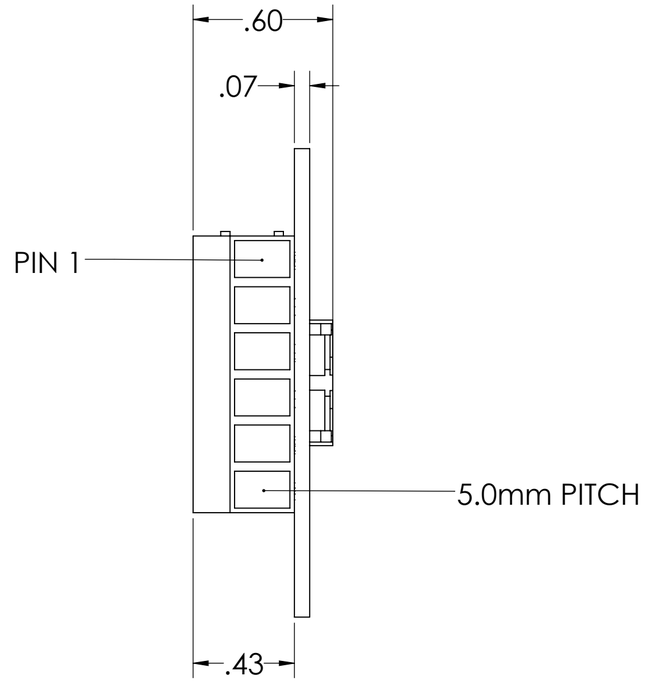
6.1 MR380-0 OEM Controller Reference Drawing

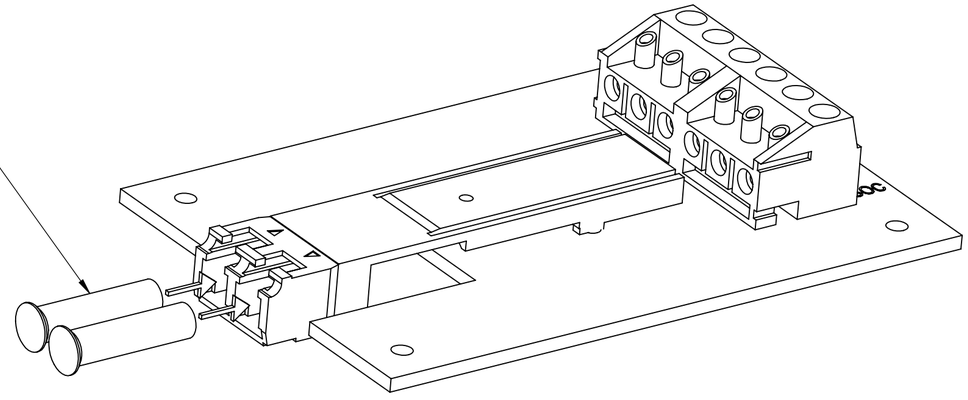
6.2 MR386 Switch Reference Drawing

6.3 MR380 Declaration of Conformity

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	NEW RELEASE	8/4/2016	AD
A1			DNH







PART NUMBER ORDERING CODE

MR380 - X - X X

Temperature Range

Blank Standard, -10C to +65C
E Extended, -40C to +70C

WAVELENGTH

1 MULTIMODE 850nm

PRODUCT

0 PCB CONTROLLER

2 WARNING: KEEP CONNECTOR COVERS IN PLACE DURING STORAGE TO PROTECT OPTICAL CONNECTOR

1 WARNING: AVOID SHARP BENDS IN FIBER CABLING KEEP BEND RADIUS GREATER THAN 0.5 INCH [13MM].

NOTES: UNLESS OTHERWISE SPECIFIED

		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ±.01 THREE PLACE DECIMAL ±.004	DRAWN	A DU	4/28/16
			CHECKED		
			ENG APPR.		
			MFG APPR.		
			Q.A.		
		INTERPRET GEOMETRIC TOLERANCING PER:	COMMENTS:		
		MATERIAL			
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

MICRONOR INC.
CAMARILLO, CA (805) 389-6600

TITLE:
CONTROLLER OEM

SIZE	DWG. NO.	REV
C	MR380-0	A1
SCALE: 2:1	WEIGHT:	SHEET 1 OF 1

micronor

Declaration of Conformity (EU)

We, the manufacturer,

Micronor Inc.
900 Calle Plano, Suite K, Camarillo, CA 93012, USA
Telephone +1-805-389-6600, Email sales@micronor.com

declare that this DoC is issued under our sole responsibility and belongs to the following products:

- Fiber optic switch and signaling system, consisting of:
- MR380-0, MR380-1, MR380-2 or MR382-1, Controller
- MR380 series Sensor, MR381/MR382/MR383/MR384/MR385/MR386/MR387

That the equipment is in conformity with the following relevant European Union harmonization legislation:

- Equipment for Potentially Explosive Atmospheres Directive (ATEX), 2014/34/EU
- Electromagnetic Compatibility Directive (EMC), 2014/30/EU
- Low Voltage Directive (LVD) 2014/35/EU

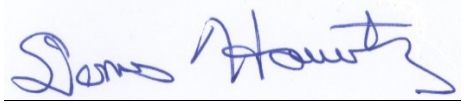
to which this declaration relates in conformity with the following standards or other normative documents (latest version of EN or corresponding IEC document used per Appendix C):

- EN 60079-0:2018
- EN 60079-14:2014
- EN 60079-28:2015
- EN 60825-1:2014
- EN 61010-1:2010
- EN 61000-6-2:2005+AC:2005
- EN 61000-6-4:2007+A1:2011

Certification Agency

- Certification Management Ltd, EU Notifying Body 2503, IEC Ex Certification Body
- CML Evaluation Report R1198C, GB/CML/ExTR 16.0130/00

Signed for and on behalf of:



Camarillo, CA 2019-09-27 Dennis Horwitz, VP

Ref: J:\Declaration of Conformity\MR340 Controller DOC\MICRONOR_98-0340-09_A_MR340 Declaration of Conformity_DRAFT_22-March-2019.docx

micronor

Declaration of Conformity (IECEx and North America)

We, the manufacturer,

Micronor Inc.
900 Calle Plano, Suite K, Camarillo, CA 93012, USA
Telephone +1-805-389-6600, Email sales@micronor.com

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- MR380 series Sensor, MR381/MR382/MR383/MR384/MR385/MR386/MR387

That the equipment is in conformity with the following International (IEC) and North American requirements:

- Explosive Atmospheres/Hazardous Locations, IEC Ex
- Electromagnetic Compatibility for Industrial Environments, IEC and FCC
- Electrical Safety, IEC and FDA/NEC

to which this declaration relates in conformity with the following standards or other normative documents:

- IEC 60079-0:2017, Edition 7.0
- IEC 60079-14:2013, Edition 5.0
- IEC 60079-28:2015: Edition 2.0
- IEC 60825-1: 2014, Edition 3.0
- IEC 61010-1:2010. Edition 3.0
- IEC 61000-6-2:2005, Edition 2.0
- IEC 61000-6-4:2006, Edition 2.0 +AMD1:2010 +ISH1:2011
- US CFR, FDA, Title 21, Chapter 1, Subchapter J, Parts 1000-1050
- US CFR, FCC, Title 47, Chapter 1, Subchapter A, Part 15
- US NFPA 70, NEC, 2014

Certification Agency

- Certification Management Ltd, EU Notifying Body 2503, IEC Ex Certification Body
- CML Evaluation Report R1198C, GB/CML/ExTR 16.0130/00

Signed for and on behalf of:

Camarillo, CA 2019-09-27 Dennis Horwitz, VP

micronor

Declaration of Conformity (EAEU)

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- MR380 series Sensor, MR381/MR382/MR383/MR384/MR385/MR386/MR387

That the equipment is in conformity with the following relevant EAEU harmonization legislation:

- On safety of low-voltage equipment, TR-CU-004/2011
- On safety of equipment intended for use in explosive atmospheres, TP-TC-012/2011
- Electromagnetic Compatibility of Technical Products, CU-TR-020/2011

to which this declaration relates in conformity with the following standards or other normative documents (latest version of corresponding IEC document used per Appendix D):

- GOST 30804.6.2-2013
- GOST 30804.6.4-2013
- GOST 31610.28-2017
- GOST R IEC 60079-0-2011
- GOST IEC 60079-14-2013
- GOST IEC 60825-1-2013
- GOST IEC 61010-1-2014

Certification Agency

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Signed for and on behalf of:

Camarillo, CA 2019-09-27 Dennis Horwitz, VP