MONARCH INSTRUMENT

Instruction Manual

F2A1X

Frequency to Analog Converter Module



CE

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SAFEGUARDS AND PRECAUTIONS

1. Read and follow all instructions in this manual carefully, and retain this manual for future reference.
2. Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.
3. Be sure the power supplied to this instrument does not exceed the 12 to 24 V dc (@ 150 mA max) specification.
4. Be sure all power is disconnected before making or removing any connections to or from this instrument.
5. There are no user serviceable parts in this instrument. Refer service to a qualified technician.
6. This instrument is not intended for use in adverse or wet environments. This may cause permanent damage and void the warranty.
7. Do not allow cables extending from unit to come into contact with rotating machinery, as serious damage to the equipment, or severe personal injury or death may occur as a result.
8. This instrument may not be safe for use in certain hazardous environments, and serious personal injury or death could occur as a result of improper use. Please refer to your facility's safety program for proper precautions.



In order to comply with EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE): This product may contain material which could be hazardous to human health and the environment. DO NOT DISPOSE of this product as unsorted municipal waste. This product needs to be RECYCLED in accordance with local regulations; contact your local authorities for more information. This product may be returnable to your distributor for recycling; contact the distributor for details.

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Monarch Instrument's Limited Warranty applies.
See www.monarchinstrument.com for details.

Warranty Registration and Extended Warranty Coverage information is available online at www.monarchinstrument.com.

1.0 OVERVIEW

The F2A1X Frequency to Analog Converter Module converts a frequency input signal into a proportional analog voltage (0-5 V dc) or current (4-20 mA) output. The output signal is electrically isolated from the input signal and input power source, effectively eliminating troublesome ground loops. The input signal can be supplied from a Monarch Instrument sensor (measuring RPM for example) or any source of digital signal not exceeding 12 volts.

The F2A1X requires 12-24 V dc input power and consumes less than 100 mA. It can be operated freestanding or can be mounted to a panel using the fixed wings on either end of the device.

The device is factory pre-programmed with the input measurement mode (Frequency or RPM) and the analog signal full-scale output as specified when ordered. These settings can be changed using the optional USB Programming Cable and downloadable PM Remote Software (see Section 4.0).

The F2A1X accepts input signals from optical, infrared, laser, or 3-wire proximity sensors, or direct TTL or external ac inputs. There are multiple settings relating to the sensor input that can be set by the user (see Section 3.0).

2.0 INSTALLATION

The F2A1X Frequency to Analog Converter Module is housed in a mountable ABS enclosure 3.2 x 1.6 x 1.2 inches [80 x 40 x 28 mm] excluding the mounting wings. There are screw terminal connections on both ends of the unit.

Before mounting the unit to a panel, make sure all user configurable options have been set. See Sections 3.0 and 4.0.

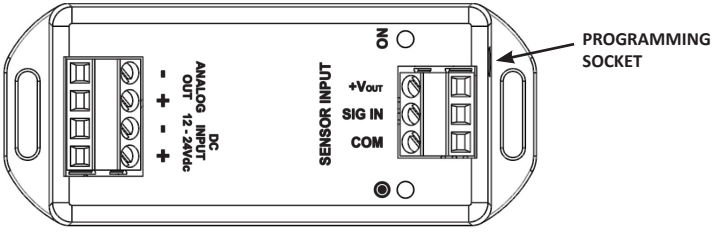


Figure 1 F2A1X Module – top view

2.1 Power

Power to the unit is connected to the half of the 4-way terminal block marked **DC INPUT 12 – 24 Vdc**. Refer to Figure 1 above. Note that these inputs are polarity sensitive. Connect a supply of 12 to 24 V dc (with a 150 mA source capacity) ensuring that the positive wire goes to the + terminal and the common or negative wire goes to the – terminal.

2.2 Analog Output

The F2A1X Frequency to Analog Converter Module may be equipped with either a Voltage Output (0-5 V dc) or a Current Output (4-20 mA) depending on how the unit was ordered. Connections are made to the half of the 4-way terminal block marked **Analog Out**. These terminals are polarity sensitive and are marked **+** and **–** accordingly.

The ANALOG OUT is an OUTPUT. DO NOT CONNECT THE DC POWER TO THESE TERMINALS.

Note: The full-scale output settings must have been specified when ordered, but they can be changed by using the User Programming Cable and downloadable software (see Section 4.0).

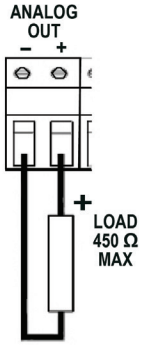
2.2.1 Voltage Output Option

The voltage output is 0 to 5 V dc.

Connections for voltage out are made to the terminals marked **ANALOG OUT**. Connect the positive side of the load to the terminal marked **+** and the negative or common side of the load to the terminal marked **–**.

2.2.2 Current Output Option

The current output is 4 to 20 mA. This output is a current source and has a 10 V dc internal compliance voltage. The maximum load that may be connected is 450 ohms.



Connections for current out (shown right) are made to the terminals marked **ANALOG OUT**. Connect the positive side of the load to the terminal marked **+** and the other side of the load to the terminal marked **–**.

2.3 Sensor Input

The SENSOR INPUT is the input terminal used to connect an external sensor or trigger source. There is a voltage output that may be used to power an external sensor (5 or 12 V dc – user selectable at 75 mA max). The system supports two wire inputs (Signal and Common) or three wire sensors (Supply, Signal and Common). Three-wire sensors can be open collector types – NPN or PNP, TTL output or –ve output types.

Connections and their functions are as follows:

+Vout Positive +5 or +10 V dc (user selectable) to provide power to optical, laser, infrared or amplified magnetic sensors. Maximum load is 75 mA dc.

SIG IN Input signal from signal sources or speed sensor. Accepts TTL pulses or ac signals, unipolar and bipolar, from ±3 to ±12 Volts. Connect the signal wire from 3-wire sensors or the positive side of two wire sources to this terminal. Typical input impedance is 10 Kohms.

COM Common or Negative connection for both signal and power from most sensors/sources.

Refer to Sections 3.0 and 4.0 for input option settings.

Typical connection for Monarch Instrument standard sensors is shown below:

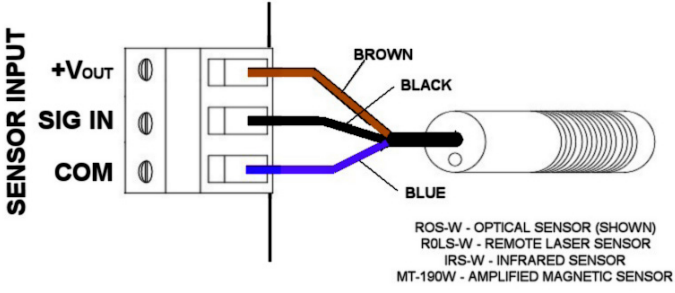


Figure 2 Sensor Connection Detail

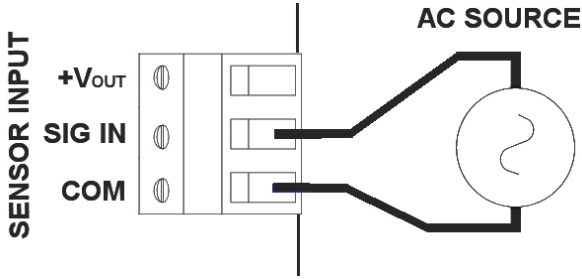


Figure 3 AC Source Connection Detail

3.0 USER SELECTABLE HARDWARE SETTINGS

There are several settings relating to the sensor input that can be set by the user.

The settings are done by moving jumpers on the circuit board inside the housing. To access these jumpers **REMOVE ALL WIRING FROM THE UNIT**. Then remove the two screws on the bottom of the unit and remove the base exposing the circuit board as shown below.

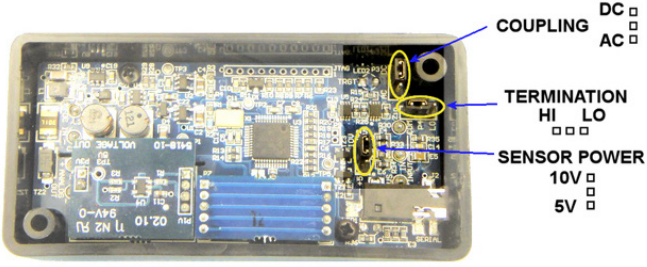


Figure 4 Exposed Circuit Board showing Program Jumpers

There are three jumpers as shown in Figure 4. These are:

3.1 Sensor Power Voltage

This jumper adjusts the supply voltage to the external sensor. It can be set as +5 V dc or +10 V dc depending on the sensor used. Factory default is +5 V.

3.2 Sensor Termination

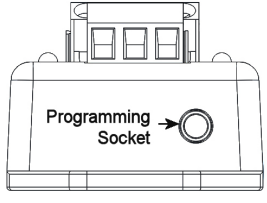
This jumper sets the input termination. It can be set to HI for 10k pull up resistor (to sensor supply voltage) for PNP type open collector sensors (factory default), **LO** for 10k pull down resistor (to Common) for PNP type open collector sensors, or **NONE** (remove jumper altogether) for high impedance input for external termination.

3.3 Input Coupling

This jumper sets the input coupling for the external signal. It can be set to **DC** (factory default) for most digital sources or **AC** for sine wave and bidirectional sources or sensors that provide negative going pulses.

4.0 USER PROGRAMMABLE SOFTWARE SETTINGS

All the programmable settings of the F2A1X Frequency to Analog Converter Module can be set by using the optional USB Programming Cable and downloadable PM Remote PC Software. The cable plugs into the unit via the Programming Socket on the side of the unit below the SENSOR INPUT terminal block (as shown right). The USB end of the cable plugs into a USB port on the PC.



Settings that can be programmed include input scaling, analog output full scale and offset, input pulse polarity, and update rate. In addition, the PM Remote Software can also display data in real-time and data can be recorded to your PC in .csv format – refer to the PM Remote Software manual and help screen.

5.0 SPECIFICATIONS

Specifications*	F2A1X Frequency to Analog Converter Module
Input Range	0.1 to 10 KHz, 5 to 600,000 RPM
Accuracy†	0.02% FS
Voltage Output Option	0 to 5 V dc out, 5 mA 15-bit resolution; zero and full scale settings as specified when ordered or programmable using USB Programming Cable and PM Remote Software
Current Output Option	4 to 20 mA out, 15-bit resolution 10 V dc compliance voltage; zero and full scale settings as specified when ordered or user programmable using USB Programming Cable and PM Remote Software
Resolution	0.003% of Full Scale
Power Supply	12 to 24 V dc ±5% @ 150 mA max
Input	TTL input or ±3 V ac to ±12 V ac
Sensor Supply	5 V dc or 10 V dc at 75 mA – user selectable
Dimensions LxWxH	3.2 in. x 1.6 in. x 1.2 in. [80 mm x 40 mm x 28 mm] excluding the mounting wings

***Specifications are subject to change without notice.**
†Rated accuracy reached after 10-minute warm up period.

5.1 Compliance

This product is CE certified and RoHS compatible.
Manufactured in an ISO9001 facility.

6.0 SENSORS AND ACCESSORIES

For a complete list of accessories, see webpage.

Sensors:

ROS **Remote Optical**	PN: 6180-056	Remote optical LED sensor with tinned wire termination, 3-wire connection
ROLS **Remote Optical Laser**	PN: 6180-030	Remote optical laser sensor with 8 ft. cable, 3 tinned leads
RLS **Rugged Laser**	PN: 6180-080	Rugged laser sensor with removable 3 m cable, watertight M12 connector to tinned leads
ROS-HT-W-25 **Remote Optical High Temp**	PN: 6180-058-25	Remote optical sensor for high temperature applications with visible incandescent white light source
P5-11 **Proximity**	PN: 6180-013	Two-wire inductive NAMUR output with 10 ft. cable and tinned leads
PS-12 **Proximity**	PN: 6180-032	Three-wire sensor that outputs an open collector PNP pulse
M-190W **Magnetic**	PN: 6180-012	Magnetic sensor commonly used with 60-tooth 20 pitch gears
GE200 HP **Inductive**	PN: 6180-014	Electromagnetic inductive spark plug sensor with 15 ft. cable



ROS



ROLS



RLS



ROS-HT-W-25



P5-11



PS-12



M-190W



GE200 HP

Accessories:

USB Programming Cable	PN: 6180-031	Enables the user to connect the F2A1X to a Windows® PC USB port to use PM Remote Software to program the unit. The software also allows remote monitoring of the RPM using a graphic display or an Excel™ spreadsheet. Software available for download at monarchinstrument.com
T-5 Reflective Tape	PN: 6180-070	Single pack, 5 ft. x 0.5 in. roll
	PN: 6180-069	Two-pack, 5 ft. x 0.5 in. rolls
	PN: 6180-079	Waterproof, 5 ft. x 1 in. roll

7.0 APPENDIX A - SERIAL PROGRAMMING COMMANDS

Programming the unit requires the optional USB Programming Cable with associated PM Remote software and a PC running Windows XP or later with an available USB port.

All serial commands are @ then two or more characters or words separated by a delimiter "/". One or two numbers follow some commands. All valid commands respond immediately with an "OK" or data, or "ERR" if incorrect. Default Baud rate is 9600. Communication requires the User Programming Cable.

@PI	Product Information, shows name \n Firmware revision \n
@C1	Shows all settings
@C2	Shows all settings with CR after each parameter
@D0	Sends current display value once
@D1	Sends display data continuously (at up to display update rate)
@D2	Stops sending data
@MX	Sends Max reading
@MN	Sends Min. reading
@RE 32	Resets Max
@RE 64	Resets Min.
@RE 96	Resets Max and Min.
@CH_A/TYPE	Shows current type
@CH_A/TYPE = RPM	Sets scale to 60 so displays in RPM
@CH_A/TYPE = FREQ	Sets scale to 1 so displays in hertz
@CH_A/TYPE = SCALE	Scale mode. Enter Scale factor.
@CH_A/TYPE/SCALE = 30.00	This will set the SCALE factor to 30.00
@CH_A/INPUT	Shows Sense of trigger input
@CH_A/INPUT = POS (or NEG)	Sets the sense of the input trigger
@CH_A/LOEND	Sets how long (in secs) with no pulses before the unit outputs 0

@CH_A/LOEND = 12 (or 1_SEC, HALF)	Sets low end time; allows a minimum reading of 5 RPM, 60 RPM, or 120 RPM
@CH_A/GATE	Show Gate Speed (default is 12)
@CH_A/GATE = STD (1/100 Second) or FAST (1/1000 second)	Sets Gate Speed (default is 1/100)
@DECPT	Shows the number of decimal places displayed
@DECPT = NONE, 1, 2, or 3	Sets the maximum number of decimal places
@DAC1/ FSCAL	Shows Analog Out Full Scale
@DAC1/FSCAL = xxx.xx	Sets the Reading value that the Analog output will output Full Scale (5 V or 20 mA); depends on TYPE
@DAC1/0SCAL	Shows Analog Out Zero Scale
@DAC1/0SCAL = xxx.xx	Sets the Reading value that the Analog output will output Zero Scale (0 V or 4 mA); depends on TYPE(default is 0.00)
@DISPR	Shows Display Update Rate
@DISPR = HALF or 1_SEC or 1.5_S.	Sets the maximum display update rate to one half a second, 1 second or 1 ½ seconds between updates
@SERNO	Shows unit serial number

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Track-It™ Data Loggers



Panel Tachometers



Fixed Mounted Strobes



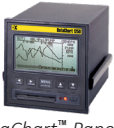
Portable Strobes



Frequency Converters



Speed Sensors



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