Specifications

Power Supply	24 VDC, 120 VAC, or 240 VAC, +/- 10% 2-wire
Power Consumption	90 mA powered by 120 VAC 45 mA powered by 240 VAC 200 mA powered by 24 VDC
Output	Modbus RTU Digital
Accuracy	+/-1% Full Scale (Input Signals) Analog to digital sample rate 100 K/sec
Frequency Range	DC Inputs
Inputs	**8** 4-20 mA inputs, three configurations: **1:** Converter supplies 20.6 to 26 VDC to drive the input sensor signal(s) **2:** 4 powered and 4 passive inputs **3:** 8 passive inputs, powered from an external source
Output:	Switch selectable 9600 or 19200 baud RS485 Protocol; 1 Start bit, 8 data bits, even parity, 1 stop bit Data scaled to 0% at 4 mA to 100% at 20 mA, +/-1%
Output Terminals	3 wide, (D+, D-, GND) Finger-safe captive screw, 22-12 AWG rated 75°C minimum
Addressing:	8 wide binary weighted switch, addresses 1-247 (not zero)
Modbus	Slave, RTU (remote terminal unit) interface. Only function 04, "Read Input Registers" is supported
Indication	Green LED: Power On Yellow LED: Busy (working on a response to its address) Red LED: Fault On when there is: a. An error in the query sent by the master, parity, missing stop bit b. Address set incorrectly c. Function code is not four d. Packet is less than three bytes e. Failed CRC test No response is made when Fault LED is on
Environmental	-4 to 122°F, -20 to 50°C Pollution Degree 2
Dominations:	3.7"D x 5.0"W x 2.5"H (94 x 127 x 64 mm)
Mounting:	35 mm DIN Rail
Weight:	11.2 oz., 318 grams
Listings	UL/cUL

Model Number Key

ADC 1 - 420 - 120 - MOD - DIN

Case Style:
DIN - 35 mm DIN rail

Digital Output Protocol:
MOD - Modbus RTU

Power Supply:
24D - 24 VDC
120 - 120 VAC
240 - 240 VAC

Analog Inputs:
420 - 4-20 mA analog signals
005 - 0-5 VDC analog signals
010 - 0-10 VDC analog signals

Input Signal Type:
1 - 8 two-wire loop powered signals, internally powered
2 - 4 loop powered and 4 external powered inputs
3 - 8 external powered inputs

ADC Series Analog to Digital Converter

Note for 24 Volt Supply:
The unit is required to be supplied by Low Voltage Limited Current source (24 VDC isolating power supply protected with a UL listed fuse (JDYX) of 1 amp rating maximum) or a Class 2 source.

Description

ADC Series converters accept up to eight 4-20 mA analog inputs, powered from the converter or from an external source depending on the sensor type used, and convert the sensor signal to digital format so they can be read across a communications network.

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INSTRUCTIONS

ADC Series
Analog to Digital Converter

Quick "How To" Guide

1. Mount ADC Analog Converter to DIN rail in suitable enclosure. Set baud rate as required. Set Modbus address.

2. Connect 4-20 mA sensor outputs to the converter input terminals. Depending on the model, the loop power may be produced by the converter internally.

3. Connect the power supply (24 VDC, 120 or 240 VAC) to the power supply terminals. Use 22-12 AWG copper wires rated to 75°C minimum. Tighten to 6 in-lbs.

4. Connect the Modbus output to the field supplied controller.

5. Energize the converter and read the Modbus output, scaled as 0% at 4 mA sensor output, 100% at 20 mA sensor output.

Wiring

Sensors (ADC Inputs)

Connect the sensor outputs to the ADC terminal blocks 6-21 as shown in the drawing below, following the product labeling, using 22-12 AWG copper conductors, minimum temperature rating 75°C. Tighten terminals to 6 in-lb torque. Double check that the sensors used are appropriate for the converter selected. ADC converters are factory set to accept 2-wire or 4-wire sensors, or a combination of both.

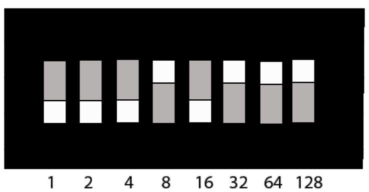
Power Supply Connection:

Depending on the model, supply 120 VAC (hot and neutral) to the terminals 1 and 2; or 240 VAC (hot and hot) to terminals 1 and 2. For 24VDC models, connect ground to terminal 2, +24 VDC to term. 1. **DO NOT REVERSE!** Maximum power consumption is 11 VA.

The converter does not need an equipment ground. The green LED will light when power is supplied.

Output Connection:

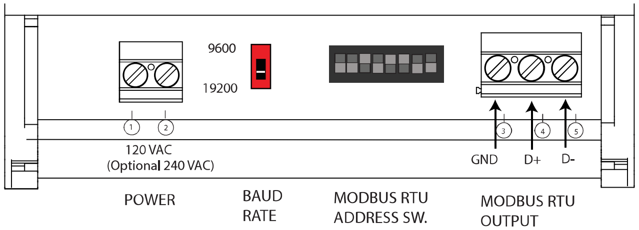
Connect output wiring to supervisory or other controller using terminals 3-5: 3= ground (GND). 4= D+ and 5= D-



Set baud rate to match your network using the switch to the right of the power supply terminals.

Network Node Address:

The node address is set through series of eight dip-switches allowing a possible address range of 1-247. The binary value of each switch is stenciled onto the circuit board, and the switch is "on" with the handle pushed to the lower position. As an example, the illustration above shows the address set at the decimal value of 23. Note that the switch reads from



Lower terminals, power supply, baud rate selection, Modbus address selection and Modbus output connections

Wiring and Modbus Field Description

Field supplied sensors connect to terminals 6-21, reading from right to left as shown below and on the product label.

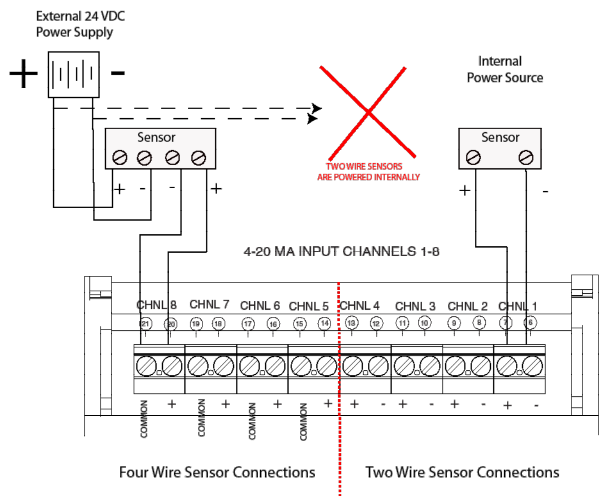
Messages start with a silent interval of 3.5 character times, scaled to the baud rate. The ADC monitors the network bus continuously. The first field transmitted is the device address. When received, and it matches the switch setting, the rest of the data is available. The query from the master device "Start data location hi" is always 00 HEX, and the "start data location lo" is the lowest channel to be read, selected by sending 00 HEX for channel one , 01 HEX for channel two, up to 07 HEX for channel eight. For channel numbers greater than 07 HEX the responses will be function code 84 and 02 and CRC.

Each channel returns two bytes, with the "number of channels hi" always 00 HEX and the "number of channels lo" between 01 HEX and 08 HEX.

A request to read channel six would be: "Start data location lo 05 HEX and "Number of channels lo" 01 HEX.

A request to read channels 4,5 and 6 would be "Start data location lo" 03 HEX and "number of channels lo" 03 HEX. A request to read all eight channels would be "Start data location lo" 00 HEX and "Number of bytes lo" 08 HEX

Top terminals for sensor inputs



ADC converters can be configured for two or four wire inputs. Be certain not to add external voltage to the two wire inputs! Also note that the positive terminal are odd numbered for 2-wire inputs, and even numbered for 4-wire inputs.

The data from each channel is a two byte field, with the first byte zero and the second a value between zero and 120 decimal. 4 mA (+1%,-1%) becomes zero, and 20 mA becomes 100% +/-1%. A reading more than 1% below 4 mA is an error: 00 HEX and AA HEX. A reading over 23 mA is an error: 00 HEX and FF HEX. All measurements are made using a ten bit analog to digital converter. All passive inputs (4-wire) share the same ground on the ADC converter, please be sure that this will work in your installation.

Modbus Register Map

Register	Address	Type	
01	30001	INT16	Zero, channel 1, MSB Percent full scale, channel 1, LSB
02	30002	INT16	Zero, channel 2, MSB Percent full scale, channel 2, LSB
03	30003	INT16	Zero, channel 3, MSB Percent full scale, channel 3, LSB
04	30004	INT16	Zero, channel 4, MSB Percent full scale, channel 4, LSB
05	30005	INT16	Zero, channel 5, MSB Percent full scale, channel 5, LSB
06	30006	INT16	Zero, channel 6, MSB Percent full scale, channel 6, LSB
07	30007	INT16	Zero, channel 7, MSB Percent full scale, channel 7, LSB
08	30008	INT16	Zero, channel 8, MSB Percent full scale, channel 8, LSB

The error checking field contains a 16-bit value implemented as two 8-bit bytes. This value is the result of a Cyclical Redundancy Check calculation performed on the message contents. The CRC field is appended to the last field in the message. The low-order byte is appended first, followed by the high-order byte, which is the last byte transmitted. Below is a typical response frame.

START	ADDRESS	FUNCTION	DATA	CRC	END
3.5 CHAR TIMES	1 BYTE	1 BYTE 04 HEX	EXPANDED BELOW	2 BYTES	3.5 CHAR TIMES

Function code is 04 HEX with no errors, 84 HEX followed by 02 HEX for out of bounds channel or incorrect "Number of channels lo".

Expanded data field:

BYTES TO FOLLOW	FIRST BYTE	SECOND BYTE	THIRD BYTE	FOURTH BYTE	FIFTH BYTE
OY HEX	00 HEX	% DATA	00 HEX	% DATA	00 HEX

A minimum of five and a maximum of 21 bytes are returned to the master. The "Bytes to follow" is a minimum of 02 HEX for a single channel or for an 84 HEX function code and a maximum of 0F HEX for all eight channels.