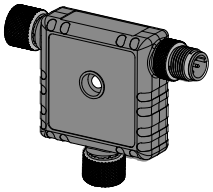
R45C ModBus® to Dual Analog Input-Output Converter Instruction Manual

Features



- Compact ModBus® device to analog converter that outputs an analog value, voltage or current, as presented to the appropriate ModBus register
- The converter also connects to an analog source, voltage or current, and outputs the value to the defined ModBus register
- 5-pin M12 male quick-disconnect connector supports ModBus
- Two 4-pin M12 female quick-disconnect connectors that each support analog inputs and outputs
- Rugged over-molded design meets IP65, IP67, and IP68
- Connects directly to a sensor or anywhere in-line for ease of use

Models

Housing	Function		Male	Female 1		Female 2	Connector
R45	C	-	M	II	-	II	Q
	C = Converter		M = ModBus RTU	II = Analog 1 Current In/Current Out UU = Analog 1 Voltage In/Voltage Out		II = Analog 2 Current In/Current Out UU = Analog 2 Voltage In/Voltage Out	Q = Integral M12 quick disconnect

NOTE: Available models are analog current in/out, and analog voltage in/out.

Overview

Analog In
When an analog input value is received by this converter, the numerical representational value is sent to the appropriate ModBus register.

Analog Input Ranges:
- Voltage = 0 mV to 11,000 mV
- Current = 0 µA to 24,000 µA

Analog Out
This converter also allows for the user to output an analog value by sending the numerical analog value by entering the analog value into the appropriate ModBus register.

Analog Output Ranges:
- Voltage = 0 mV to 11,000 mV
- Current = 0 µA to 24,000 µA

PDO Outside Valid Range (POVR)
If the Process Data Out (PDO) value sent to this converter is outside of the PDO Analog Range value, then the actual analog output value will be set to the one of the three selectable POVR levels after a 2 second delay:
- Low (default): 0 V or 3.5 mA
- High: 10.5 V or 20.5 mA
- Hold: Level retains previous value indefinitely

ModBus Configuration

Analog In/Out Values

ModBus Register Address	Description	I/O Range	Comments	Default	Access
40001	Port 1 - Analog In Value	Current = 0..24000 Voltage = 0..11000	Current = µA Voltage = mV	—	RO
40002	Port 2 - Analog In Value	Current = 0..24000 Voltage = 0..11000	Current = µA Voltage = mV	—	RO
40003	Port 1 - Analog Out Value	Current = 0..24000 Voltage = 0..11000	Current = µA Voltage = mV	0	RW
40004	Port 2 - Analog Out Value	Current = 0..24000 Voltage = 0..11000	Current = µA Voltage = mV	0	RW

Analog Output

ModBus Register Address	Description	I/O Range	Comments	Default	Access	Notes
41200	Port 1 - Mirroring Output Enable	0..1	0 = Disabled, 1 = Enabled	0	RW	If Enabled, then the Analog Out value in register 40003 is ignored
41201	Port 1 - Mirroring Input Port Selection	0..1	0 = Analog In 1, 1 = Analog In 2	0	RW	—
41202	Port 1 - Output Outside of Valid Range	1..2	0 = Hold 1 = Low 2 = High	1	RW	—

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ModBus Register Address	Description	I/O Range	Comments	Default	Access	Notes
41203	Port 2 - Mirroring Output Enable	0..1	0 = Disabled, 1 = Enabled	0	RW	If Enabled, then the Analog Out value in register 40004 is ignored
41204	Port 2 - Mirroring Input Port Selection	0..1	0 = Analog In 1, 1 = Analog In 2	0	RW	—
41205	Port 2 - Output Outside of Valid Range	0..2	0 = Hold 1 = Low 2 = High	1	RW	—

Analog In LED

ModBus Register Address	Description	I/O Range	Comments	Default	Access
41300	Port 1 - Input LED Set Point Hysteresis	0..500	—	Current = 100 uA Voltage = 100 mV	RW
41301	Port 1 - Minimum LED Set Point Value	Current = 0..23999 Voltage = 0..10999	Must be less than maximum If value < Min, value = Min	Current = 4000 uA Voltage = 0 mV	RW
41302	Port 1 - Maximum LED Set Point Value	Current = 1..24000 Voltage = 1..11000	Must be greater than minimum If value > Max, value = Max	Current = 20000 uA Voltage = 10000 mV	RW
41303	Port 2 - Input LED Set Point Hysteresis	..500	—	Current = 100 uA Voltage = 100 mV	RW
41304	Port 2 - Minimum LED Set Point Value	Current = 0..23999 Voltage = 0..10999	Must be less than maximum If value < Min, value = Min	Current = 4000 uA Voltage = 0 mV	RW
41305	Port 2 - Maximum LED Set Point Value	Current = 1..24000 Voltage = 1..11000	Must be greater than minimum If value > Max, value = Max	Current = 20000 uA Voltage = 10000 mV	RW

ModBus Configuration

ModBus Register Address	Description	I/O Range	Comments	Default	Access
40601	Baud Rate	0 = 9.6k 1 = 19.2k 2 = 38.4k	0 = 9600 1 = 19200 2 = 38400	1	RW
40602	Parity	0 = None 1 = Odd 2 = Even	0 = None 1 = Odd 2 = Even	0	RW
40603	Address	1-247	1 to 247	1	RW
40604	Reserved (cannot be read or written)	None	—	—	RW
40605	Restore Factory Configuration	0 = No Operation 1 = Restore	—	—	WO

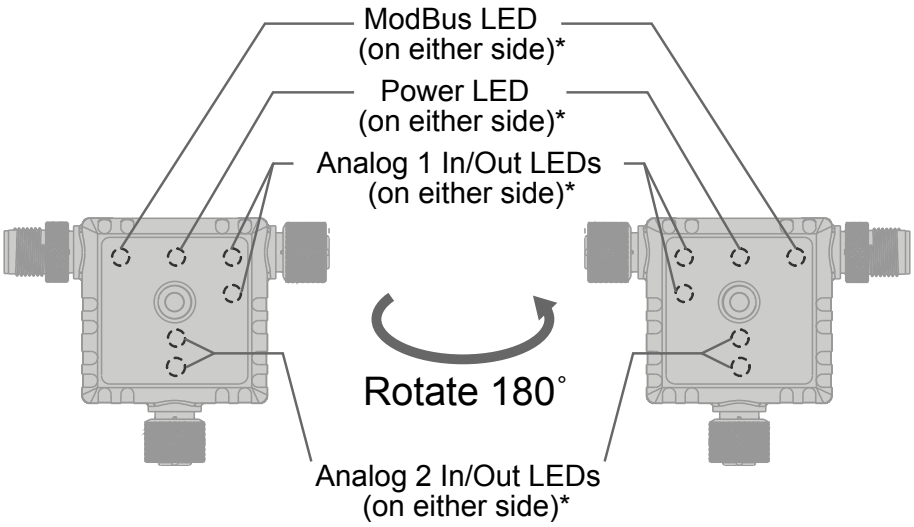
Device Information

ModBus Register Address	Description	I/O Range	Comments	Default	Access
40606-40615	Banner Name	0..65535	—	Banner Engineering	RO
40616-40631	Product Name	0..65535	—	Current = R45C-MII-IIQ Voltage = R45C-MUU-UUQ	RO
40632	Item H	0..65535	Current = 814535 Voltage = 814534 Split into two 16-bit registers	12	RO
40633	Item L	0..65535	—	Current = 28103 Voltage = 28102	RO
40634	Serial Number H	0..65535	—	—	RO
40635	Serial Number	0..65535	—	—	RO
40636	Serial Number	0..65535	—	—	RO
40637	Serial Number L	0..65535	—	—	RO
40644-40659	User Define Tag	0..65535	User writable space	More Sensors. More Solutions.	RW

Status Indicators

The R45C ModBus to Dual Analog Input-Output Converter has four amber LED indicators on both sides for IO-Link and analog communications to allow for installation needs and still provide adequate indication visibility. There is also a green LED indicator on both sides of the converter, which signals the device's power status.

R45C status indicators – front and back



* Indicator LEDs are visible through translucent housing

ModBus Amber LED

Indication	Status
Off	ModBus communications are not present
Flashing Amber (4 Hz)	ModBus communications are active
Solid for 2 Seconds to Off	ModBus communications are lost after connection
Solid for 2 Seconds to Flashing Amber (4 Hz)	ModBus communications momentarily lost, but communication reestablished

Analog In Amber LED

Indication	Status
Off	Analog current value is less than setpoint SP1 OR analog value is greater than setpoint SP2
Solid Amber	Analog current value is between setpoint SP1 AND setpoint SP2
Default Current Values: • SP1 = 0.004 A • SP2 = 0.02 A	Default Voltage Values: • SP1 = 0 V • SP2 = 10 V

Analog Out Amber LED

Indication	Status
Off	Turns off if written PDO analog value is outside the allowable output range
Solid Amber	Turns on if written PDO analog value is inside the allowable output range
Allowable Current Range: 0 mA to 24 mA	
Allowable Voltage Range: 0 V to 11 V	

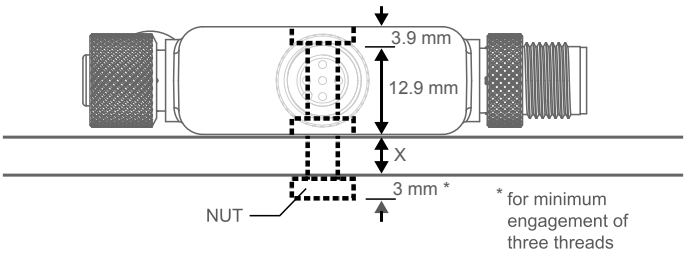
Installation Instructions

Mechanical Installation

Install the R45C to allow access for functional checks, maintenance, and service or replacement. Do not install the R45C in such a way to allow for intentional defeat.

Fasteners must be of sufficient strength to guard against breakage. The use of permanent fasteners or locking hardware is recommended to prevent the loosening or displacement of the device. The mounting hole (4.5 mm) in the R45C accepts M4 (#8) hardware.

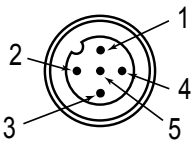
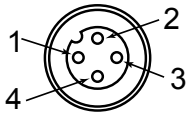
See the figure below to help in determining the minimum screw length.



Screw Length (with screw head fitting in counterbore) = 12.9 mm + “X” mm + 3 mm

CAUTION: Do not overtighten the R45C's mounting screw during installation. Overtightening can affect the performance of the R45C.

Wiring Diagrams

Male	Female	Pin Number	Wire Color
		Pin 1	Brown
		Pin 2	White
		Pin 3	Blue
		Pin 4	Black
		Pin 5	Gray

Male (ModBus and Power)

Pin Number	Signal Description
Pin 1	12 V DC to 30 V DC
Pin 2	RS485/D1/B/+
Pin 3	Ground
Pin 4	RS485/D0/A/-
Pin 5	Banner 1-wire

Female (Analog 1)

Pin Number	Signal Description
Pin 1	12 V DC to 30 V DC
Pin 2	Analog 1 In
Pin 3	Ground
Pin 4	Analog 1 Out

Female (Analog 2)

Pin Number	Signal Description
Pin 1	12 V DC to 30 V DC
Pin 2	Analog 2 In
Pin 3	Ground
Pin 4	Analog 2 Out

Specifications

Supply Voltage
12 V DC to 30 V DC at 50 mA maximum

Power Pass-Through Current
4 A maximum

Analog Input Impedance
Current version: Approximately 250 ohms
Voltage version: Approximately 14.3K ohms

Analog Output Load Resistance

Current version: 1 kilo-ohm maximum load resistance at 24 V DC

Maximum Load Resistance = [(Vcc - 4.5) ÷ 0.02 ohms]

Voltage version: 2.5 kilo-ohms minimum load resistance

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Leakage Current Immunity

400 µA

Accuracy

0.5%

Indicators

Green: Power

Amber: ModBus communications

Amber: Analog input value present

Amber: Analog output value in range

Vibration and Mechanical Shock

Meets IEC 60068-2-6 requirements (Vibration: 10 Hz to 55 Hz, 0.5 mm amplitude, 5 minutes sweep, 30 minutes dwell)

Meets IEC 60068-2-27 requirements (Shock: 15G 11 ms duration, half sine wave)

Resolution

14 bits

Connections

(1) Integral 5-pin M12 male quick-disconnect connector

(2) Integral 4-pin M12 female quick-disconnect connector

Construction

Coupling Material: Nickel-plated brass

Connector Body: PVC translucent black

Environmental Rating

IP65, IP67, IP68

UL Type 1

Operating Conditions

Temperature: –40 °C to +60 °C (–40 °F to +140 °F)

90% at +60 °C maximum relative humidity (non-condensing)

Storage Temperature: –40 °C to +80 °C (–40 °F to +176 °F)

Product Identification

SNAP SIGNAL®

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	1.0	30	0.5

Certifications

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1831 Diegem, BELGIUM

Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

LISTED

FCC Part 15 Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

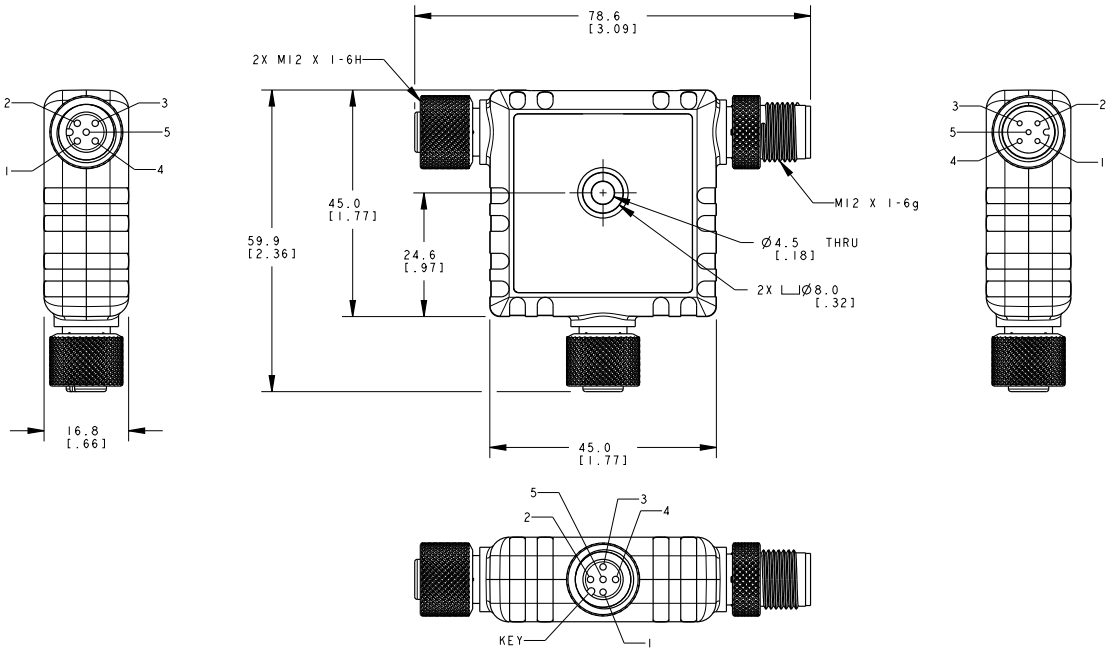
Industry Canada ICES-003(B)

This device complies with CAN ICES-3 (B)/NMB-3(B). Operation is subject to the following two conditions: 1) This device may not cause harmful interference; and 2) This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la norme NMB-3(B). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

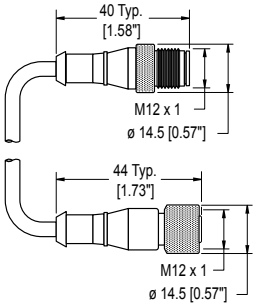
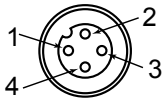
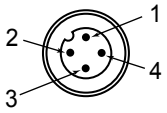
Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.



Accessories

Cordsets

4-Pin Threaded M12 Cordsets—Double Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout**
MQDEC-401SS	0.31 m (1 ft)	Male Straight/Female Straight		Female  Male  1 = Brown 2 = White 3 = Blue 4 = Black
MQDEC-403SS	0.91 m (2.99 ft)			
MQDEC-406SS	1.83 m (6 ft)			
MQDEC-412SS	3.66 m (12 ft)			
MQDEC-420SS	6.10 m (20 ft)			
MQDEC-430SS	9.14 m (30.2 ft)			
MQDEC-450SS	15.2 m (49.9 ft)			

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