



# Barton Model 818A Turbine Meter Pre-Amplifier

## Installation Manual

Manual No. 10940, Rev. B  
November 2004

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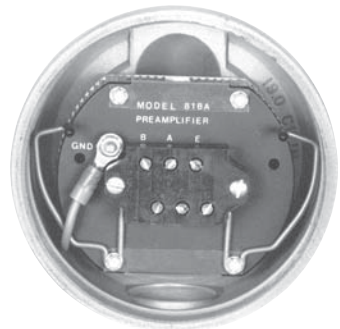
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## SECTION 1 - INTRODUCTION

### General

The Barton Model 818A Pre-Amplifier converts low-level AC signals from turbine meter pickup coils to a higher-energy digital pulse that can be transmitted to electronic processing instrumentation.

The signal is amplified locally at the flowmeter to elevate the signal energy above the ambient electrical noise, eliminating problems with noise being interpreted as flowmeter pulses by the receiving electronics. In other applications, the receiving electronics are not sensitive enough to measure low-level signals; therefore, amplification is required. The 818A is one member of a family of flowmeter signal conditioning products.



Before installing this instrument, become familiar with the installation instructions in Section 2. WARNING notes that appear on the following pages of this manual should be reviewed before proceeding: 8 and 9.

WARNING notes indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if warning is ignored.

## **Product Description**

The 818A consists of the a single circuit board enclosed in an aluminum electronics module, which is mounted in an explosionproof conduit housing. The 818A is usually mounted directly on a turbine meter pickup coil boss with electrical connections made to a terminal block on the electronics module.

## **Specifications**

### Operating Specifications:

Supply Voltage .....	18-36 VDC
Input Signal Amplitude .....	Minimum: 5 mV AC rms (15 mV AC peak-to-peak) Maximum: 6 VAC rms (18 VAC peak-to-peak)
Standard Output Signals.....	0 to 5 V $\pm 0.5$ V square wave* 0.5 to 5.5 mA $\pm 0.5$ mA square wave
Alternate Output Signals.....	7 to 12 mA square wave 0 to 10 V $\pm 0.5$ V square wave*

### Notes:

\* High impedance output - 10K ohm maximum load

For lower operating voltage or higher voltage outputs, consult Cameron's Measurement Systems Division.

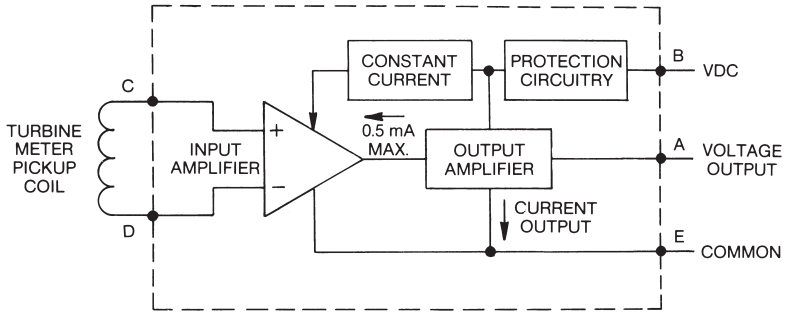
Operating Temperature.....	-40°F/°C to +160°F (+70°C)
Humidity .....	0 to 95% (non-condensing) Maximum
Transmission Distance .....	Current Output: 3 miles (5 km) Voltage Output: 1000 feet (300 m) in closed conduit

### Physical Specifications:

Enclosure .....	Explosionproof/gasket conduit
Classification .....	CSA Class I, Div. 1, Groups C & D; Class II, Groups E, F, & G; Class III, Enclosure 4 operation, Temperature T3C (Optional Group B enclosure available)

Mounting.....	Direct; using stand-off tube to turbine meter boss; remote; supported by electrical conduit.
Conduit Connection .....	1-inch FNPT
Enclosure Material .....	Painted low copper-aluminum
Standoff Tube.....	4 in. long with 3/4 in. NPT turbine coil boss connection (standard) 4 in. long with 1 in. NPT turbine coil boss connection (optional) 18 in. long tube available for high-temperature, direct-mount application (optional)

## Functional Description

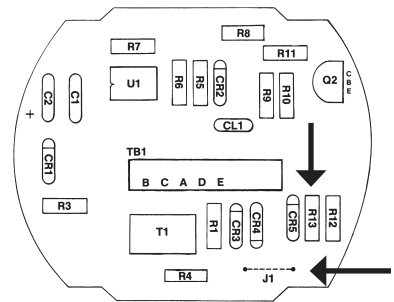


The turbine meter pickup coil is connected to screw terminals C and D, which are connected to the primary of the input transformer. The transformer secondary drives the operational amplifier in a differential mode, with a small amount of hysteresis provided by resistors R5 and R6.

The power for the operational amplifier is controlled by CR1, a zener diode, and filtered by capacitor C2.

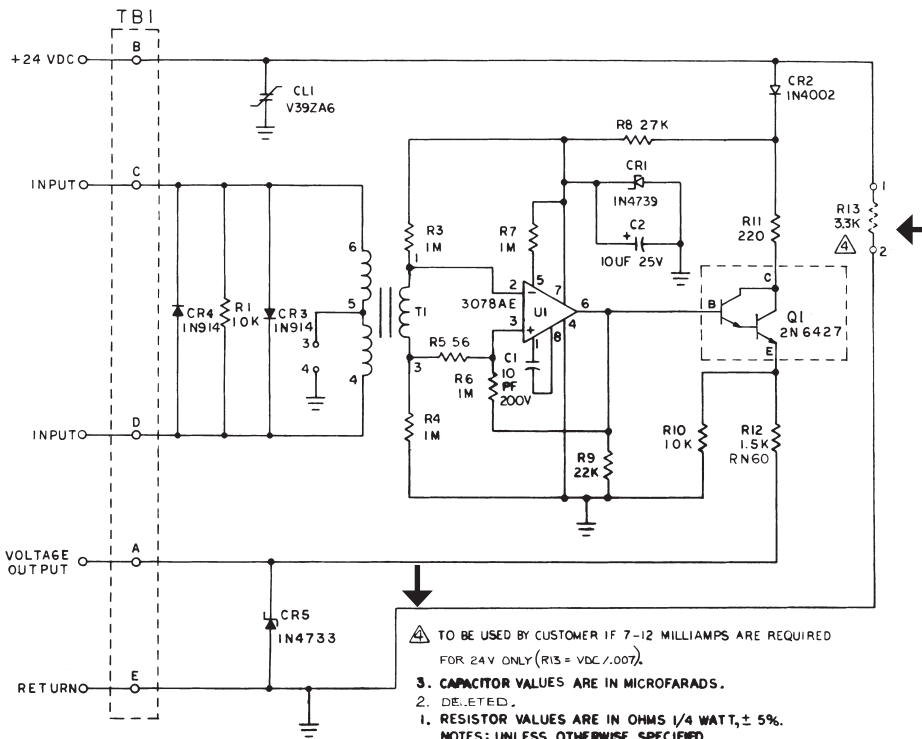
The signal amplifier square wave output is used to control the output Darlington transistor, which provides the final current and voltage output signals. When the drive is high, current flows through R12; when the drive is low, no current flows through R12; thus, a square wave output proportional to the turbine meter frequency is obtained.

When the output is taken from terminal A (with terminal E as common) a 0 to 5 volt pulse is obtained. If a 0.5 to 5.5 mA current output is desired, a jumper is installed between terminals A and E; the output is then taken from the combination across an inline resistor. If a 7 to 12 mA current output is required, an additional resistor (R13) is installed on the circuit board (see note 4 on schematic below).



In addition, a non-linear resistor CL1 absorbs transient energy spikes greater than 39 volts and CR2 protects the circuitry against inadvertent reversal of the power input polarity.

If the input device (i.e., pickup coil) is isolated from ground, Jumper J1 (see circuit board above) can be installed to increase the preamplifier's immunity to noise (all Barton Turbine Meter pickup coils are isolated).



## SECTION 2 - INSTALLATION

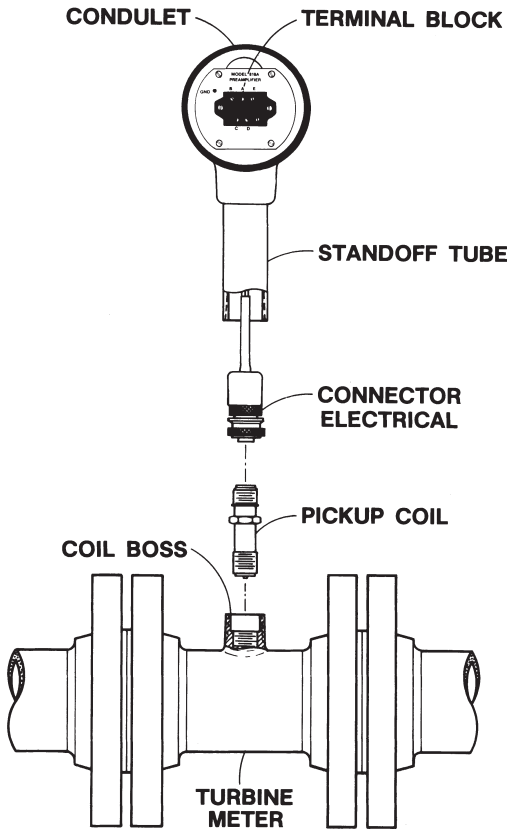
### Unpacking

Remove the unit from the shipping carton and inspect for signs of damage. If damage is evident, notify the shipper and the nearest Cameron Measurement Systems representative as soon as possible.

### Installation

Mount the 818A on a turbine meter coil boss is illustrated below:

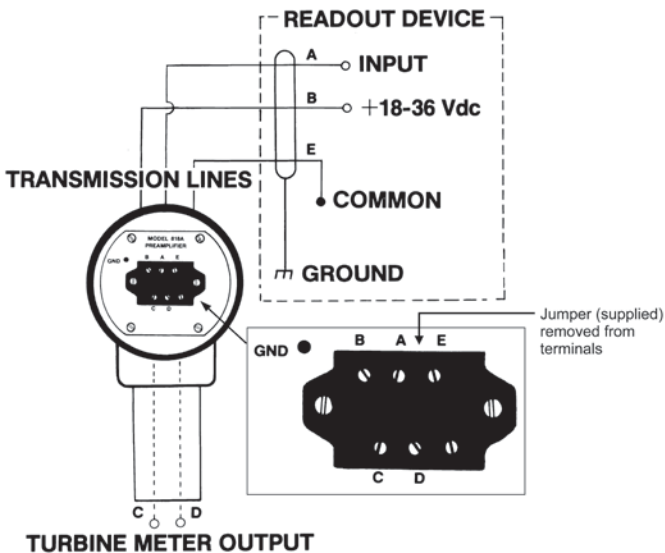
1. Screw a turbine meter pickup coil into the coil boss. Hand tighten until the pickup coil is seated.
2. Attach the electrical connector to the pickup coil and hand tighten the threaded attachment ring.



3. Unscrew the 818A cover.
4. Route the connector wires through the standoff tube and into the condulet.
5. Apply thread lubricant to the threads on the outside of the turbine meter coil boss.

## SECTION 2 - INSTALLATION (continued)

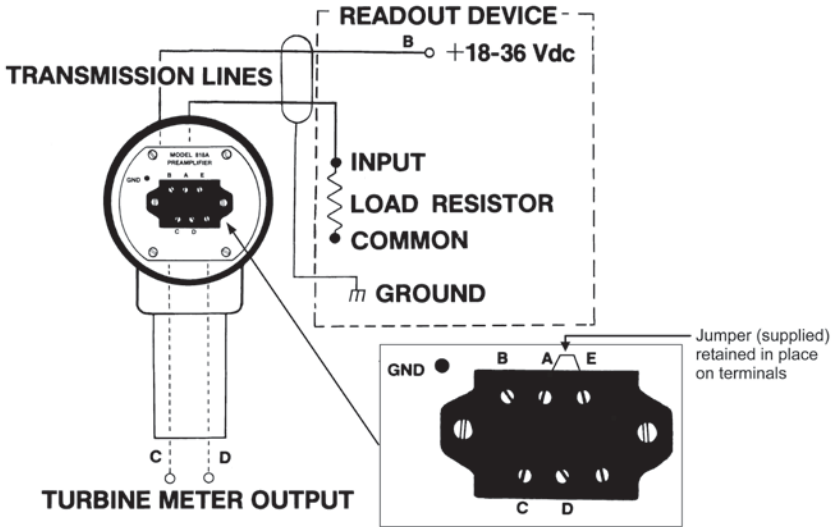
6. Tighten the standoff tube down on the coil boss threads and ensure the threads are sealed.
7. Attach the pickup coil wires to terminals C and D on the circuit board (See illustrations that follow).
8. Attach conduit using 1-inch pipe thread fittings, as required, to the output port of the 818A housing.
9. Output connections are dependent upon the type of output desired (current or voltage). Voltage output is typically used for local transmission and is limited to 1000 feet (300 meters) to ensure immunity to induced noise. The current output is typically used for remote transmission over distances up to 3 miles (5 km). The voltage output is NOT compatible with TTL readout devices. The current output, with a suitable load resistor, is used in applications requiring TTL compatibility.
10. Attach the signal output leads to the 818A terminal block, as follows:
  - a. Voltage Output (3-wire) - 0-5V or 0-10V  
Voltage output should be used only with devices that have an input impedance of 10K ohms or higher. Connections are direct to the readout device - no load resistor is needed.



- b. Current Output (0.5-5.5 or 7-12 mA) (2-wire) - TTL Compatible

A load resistor is used to convert the current signal from the 818A to a voltage signal (required by most readout devices). A voltage source, usually provided by the readout device, is used to supply current to the 818A. Load resistor (RL) should be selected to obtain desired signal voltage (1,000 ohms for a 0.5 to 5.5V signal).

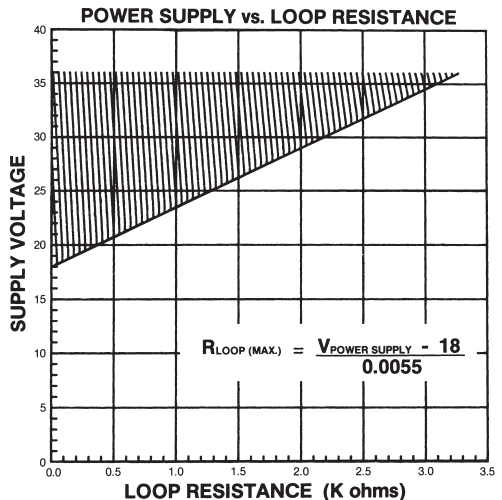
11. Tighten all terminal connections and attach the green ground wire from the electronics module to the ground screw on the conduit housing.
12. Attach and tighten the conduit cover.



### Transmission Line Limitations

The signal wires should be shielded, twisted pair, 22-16 AWG, and jacketed with a suitable protective coating. Belden #9322 or equivalent is recommended when in current output mode. The maximum length of the transmission line is a function of the wire gage, the supply voltage level, the size of the load resistor (see chart on right), and the receiving devices sensitivities to ambient noise that may or may not exist in any given application.

Note: Operating range must be in shaded area of the chart.



## SECTION 2 - INSTALLATION (continued)

To account for lead resistance, a 1000-ft (300-m) loop will have the following resistance:

Wire gage	Ohms
22	32.2
20	20.5
18	12.8

### Optional Operational Check



#### **WARNING EXPLOSION HAZARD**

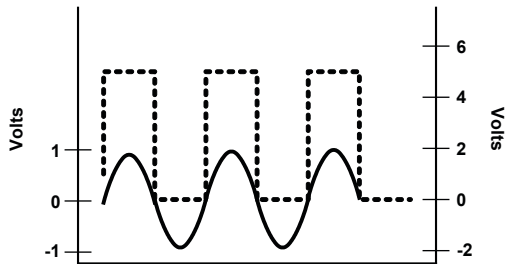
**DISCONNECT 818A FROM POWER SUPPLY BEFORE REMOVING THE 818A ENCLOSURE COVER. KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE.**

The following tests CANNOT be performed in a hazardous atmosphere. To perform these tests, either the area must be certified safe or power must be disconnected from the 818A Pre-amplifier, the electronic module must be removed, and the module tested in a safe location.

In a safe location:

With the conduit cover removed and all connections made to a readout device (and associated power supply):

1. Verify the voltage between terminals B (positive) and E (common) is between 18 and 36 VDC.
2. With the turbine meter operating, examine signal between terminals C and D to verify that the amplitude is at least 5 mV rms.
3. Observe the voltage at terminal A with an oscilloscope. A digital pulse train should appear with a frequency equal to the turbine meter signal frequency.



### Routine Operation

The 818A does not have any adjustments or controls. Once it is installed, operation is automatic.



## SECTION 3 - MAINTENANCE

### **Routine Maintenance**

None.

### **Troubleshooting**

Trouble	Possible Sources	Probable Cause	Corrective Action
No Output	Power Source	Voltage too low.	Check supply voltage (18 V min. at terminals B and E).
	Terminal Block	Connection loose.	Reinstall output connections.
	Pickup Coil	Coil open or shorted.	Replace pickup coil.
	Turbine Meter	Internals damaged.	Replace turbine meter.
	Electronic Component	Various.	Replace circuit board.
High Output	Electronic Component	Various.	Replace circuit board.
Erratic Output	Terminal Connection	Loose or dirty.	Tighten and/or clean as needed.
	Electronic Component	Various.	Replace circuit board.

### **Repair**



### **WARNING EXPLOSION HAZARD**

**DISCONNECT 818A FROM POWER SUPPLY BEFORE REMOVING THE 818A ENCLOSURE COVER. KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE.**

#### **A. Electronics Module Removal**

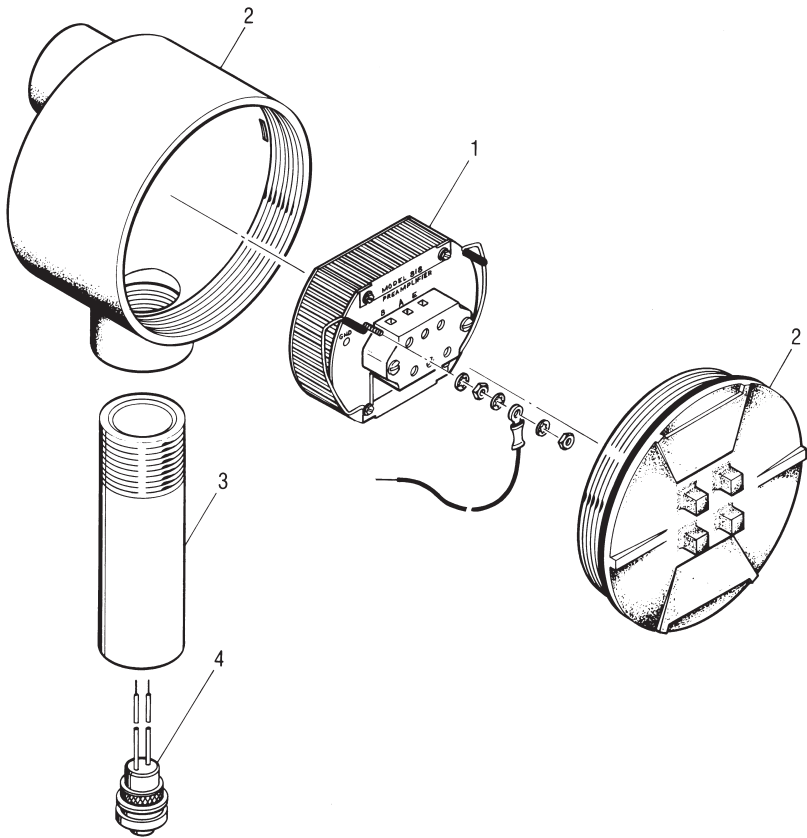
1. Turn off readout device (remove voltage from signal output wires)
2. Remove conduit cover.
3. Disconnect signal wires from electronics module terminals A, B, and E.
4. Disconnect turbine meter pickup coil wires from terminals C and D.
5. Remove the module from the housing by squeezing the (2) clips.
6. Disconnect the ground wire from the conduit housing ground screw.

#### **B. Electronics Module Installation**

1. Connect green grounding wire from module to conduit housing screw.
2. Squeezing (2) clips on module, insert it into the conduit housing.
3. Connect TM pickup coil leads to terminals C and D on module.
4. Connect signal output wires to terminals A, B, and E, per Section 2.
5. Perform an operational check, if desired, per Section 2.
6. Install the conduit cover.

## SECTION 4 - PARTS DRAWING/LIST

### 818A Parts Drawing



### 818A Parts List

Item	Description	Part No.	Per Unit
1	Electronic module	0818.0010B-01	1
2	Housing	0818.0002B	1
3	4-in. Standoff Tube	0818.1028CA-21	1
	18-in. Standoff Tube	0818.1028CA-27	
4	Connector Assembly	100005116	1
5	1-in. NPT Nipple	FQ10-1042C	(1) alternate
6	1-in. NPT Coupling	FQ10-1034C	(1) alternate

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## Product Warranty

### A. Warranty

Cameron International Corporation (“Cameron”) warrants that at the time of shipment, the products manufactured by Cameron and sold hereunder will be free from defects in material and workmanship, and will conform to the specifications furnished by or approved by Cameron.

### B. Warranty Adjustment

1. If any defect within this warranty appears, Buyer shall notify Cameron immediately
2. Cameron agrees to repair or furnish a replacement for, but not install, any product which within one (1) year from the date of shipment by Cameron shall, upon test and examination by Cameron, prove defective within the above warranty.
3. No product will be accepted for return or replacement without the written authorization of Cameron. Upon such authorization, and in accordance with instructions by Cameron, the product will be returned shipping charges prepaid by Buyer. Replacements made under this warranty will be shipped prepaid.

### C. Exclusions from Warranty

1. THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER EXPRESSED OR IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.
2. Components manufactured by any supplier other than Cameron shall bear only the warranty made by the manufacturer of that product, and Cameron assumes no responsibility for the performance or reliability of the unit as a whole.
3. “In no event shall Cameron be liable for indirect, incidental, or consequential damages nor shall the liability of Cameron arising in connection with any products sold hereunder (whether such liability arises from a claim based on contract, warranty, tort, or otherwise) exceed the actual amount paid by Buyer to Cameron for the products delivered hereunder.”
4. The warranty does not extend to any product manufactured by Cameron which has been subjected to misuse, neglect, accident, improper installation or to use in violation of instructions furnished by Cameron.
5. The warranty does not extend to or apply to any unit which has been repaired or altered at any place other than at Cameron’s factory or service locations by persons not expressly approved by Cameron.

## Product Brand

Barton® is a registered trademark of Cameron International Corporation (“Cameron”).

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