

EA401 SERIES

PULSE INPUT FLOW RATEMETER/TOTALIZER

INSTALLATION & OPERATING INSTRUCTIONS



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WARNING!

This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling* procedures must be observed during the removal, installation, or handling of internal circuit boards or devices.

*Handling Procedure

1. Power to unit must be removed.
2. Personnel must be grounded, via wrist strap or other safe, suitable means, before any printed circuit board or other internal device is installed, removed or adjusted.
3. Printed circuit boards must be transported in a conductive bag or other conductive container. Boards must not be removed from protective enclosure until the immediate time of installation. Removed boards must be placed immediately in protective container for transport, storage, or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, CMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, may exhibit early failure.

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DESCRIPTION & SPECIFICATIONS

DESCRIPTION:

The EA401 is a single input totalizer/ratemeter. The non-integrated totalizer and ratemeter each have their own 5 digit dividing scale factor. The two 5 AMP preset relay outputs can be programmed by the user to apply to the "A" total counter or the "A" ratemeter. The user can view the rate, total and grand total. The B relay can be used to create a scaled pulse output. Analog output is standard with the EA401.

SPECIFICATIONS:

DISPLAY

6 digit, 0.55" High LED

INPUT POWER:

110 VAC \pm 15% or 12 to 15 VDC

CURRENT:

250 mA DC max. or 6.5 VA AC

OUTPUT POWER (AC powered units only)

+12 VDC @ 50 mA, unregulated -10 + 50%

TEMPERATURE:

Operating:

+32°F (0°C) to +130 F (+54°C)

Storage:

-40 F (-40°C) to +200°F (93°C)

MEMORY

EEPROM stores data for 10 years if power is lost.

INPUTS:

High Impedance DC pulse input 4-30 VDC (high), Open or 0-1 VDC (low), 10 K Ω imp. 10 kHz max. speed.

RESET:

Front Panel: Resets displayed total value and control output.

Remote: 4-30 VDC (75-240 V AC/DC, Input 8) negative edge resets total and relay control output.

NOTE: The remote reset does not reset the grand total.

K FACTOR/SCALING

The K-Factors are used to convert the input pulses to engineering units. The 5 digit K-Factor dividers, with decimal keyed into any position, allow easy direct entry of any K-Factor from 0.0001 to 99999. Separate factors may be entered for rate and total.

CONTROL OUTPUTS:

Relays:

2 each N.O. Relay; 5 Amps 120/240 VAC or 28 VDC.

(N.C. relay contacts and NPN transistor output available with solder jumpers. Transistor output is internally pulled up to 10VDC through relay coil, sinks from 10 VDC to .5 V @ 100 mA)

Analog Output:

The output can be programmed to track rate or total. Connections are via a 2 terminal pluggable screw connector. Programming is accomplished by using the front panel in conjunction with rear dip switches.

Accuracy: \pm 0.25% FS

Compliance Voltage: 3 to 30 VDC non inductive.

PRESETS

Two control outputs are provided. To set relay A or B's functionality, press "menu" button until "Relay" appears on the display, the A and B outputs can be assigned to the rate alarm (high/low), or for total/grand total. A 5 digit value can be entered for both presets A and B. The decimal point location is the same as the counter. The outputs can be set to energize from 0.1 to 99.9 seconds or latch (0.0). If a value other than 0.0 is entered, the corresponding totalizer will auto reset at the preset. This may be used to create a relay scaled pulse output.

LOCKOUT

Unauthorized front panel changes can be prevented by entering a user selected 5 digit code, in the "LOC" mode. The front panel can be completely locked out or the presets can remain accessible.

RATEMETER

Accurate to 4 1/2 digits (\pm 1 display digit). The ratemeter can be programmed to:

- accept almost any number of pulses per unit of measurement
- sample from 2 to 24 seconds maximum
- auto-range up to 5 digits of significant information.

The display can be programmed to read in units per Second (SEC), Minute (MIN), Hour (HOUR), or Day (DAY).

TOTALIZER

The two 6-digit totalizers can count at 10kHz speed. They share a 5-digit dividing scale factor. The totalizer advances on the positive edge of each pulse.

HOW TO MOUNT THE UNIT

The unit is designed to be mounted with a gasket providing a water tight seal. Two mounting brackets are provided to secure the unit to the panel. A panel less than .1" may distort if the clamps are screwed too tightly.

Slide the body of the unit through the rubber gasket. Insert the unit into the panel. As shown in "FIG. A", slide the brackets up the groove to press against the back of the panel. Insert screws into rear of brackets and tighten them evenly and alternately. Do not over tighten! A normal level of torque is required. Maximum torque should be 3 inch-pounds.

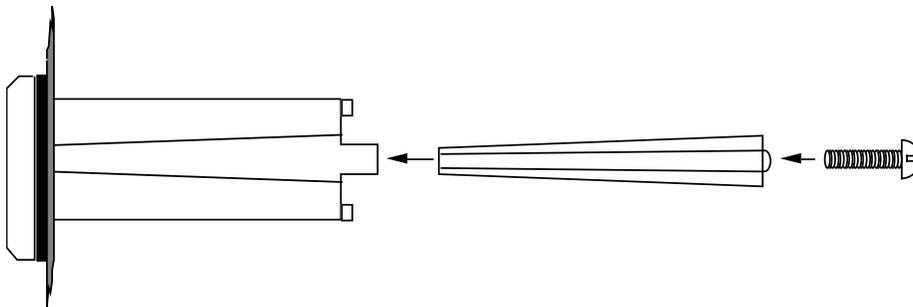
This product is designed to be panel mounted and is NEMA 4 rated if proper mounting procedures are followed and the required and supplied hardware is correctly used.

If the panel in which the unit is mounted is less than .125 of an inch thick, the possibility exists that there will be some flexing. Should this flexing occur, the resulting deformation of the panel could cause a loss of the water tight seal. In case this should occur, the use of silicone or other sealant would be recommended.

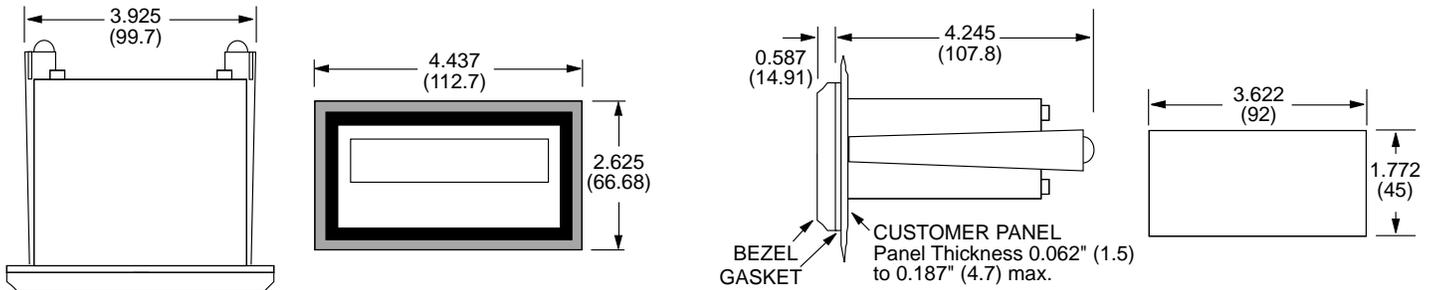
This product is designed to the NEMA 4 rated. However, the fact that we are unable to control either the location in which the device is installed or the actual installation itself requires that the company's liability shall extend only to the repair or replacement of a defective product.

We are prepared to offer additional assistance in those special situations where normal mounting methods do not seem to satisfy the customers needs. This assistance may be obtained by calling the factory and asking for Application Engineering.

FIG. A



DIMENSIONS



WIRING GUIDLINES

The rear terminal contains 12 screw terminals for connecting #14 to #28 gauge wire.

The unit is controlled by a microprocessor and, therefore, an electrically "noisy" environment could cause operating problems. The input power line should not be common to power lines for motors, pumps, contactors, etc.

The unit is designed to be immune from line or transient voltage interference. In some environments voltage spikes of over 1000 volts can occur. When common to a power line driving motors voltage fluctuations can be extreme and rapid. Lines driving DC or AC solenoids, relays, or actuators can also cause problems.

Four sources of noise can occur:

- 1) AC power line noise - If the unit cannot be connected to a clean power source, an inductive load suppressing device (MOV as GE # V130LA1 or Resistor Capacitor as Paktron # .2 uf/220 ohm @ 400V) can be installed. Although locating the suppressor across the AC supply at the unit should help, best results are obtained by connecting the suppressor across the leads of the "load" at the device causing the spike.
- 2) Input line noise -The noise is carried on the input and D.C. ground lines. Make sure the input wires are never run into the unit in a bundle with power input lines. Also, keep these input lines isolated from inductive lines from devices drawing heavy loads. If there is a possibility of electrical noise, we recommend using shielded cable, with the shield being hooked to the D.C. ground terminal on the instrument, and to "earth" at one point in the circuit, preferably at the D.C. ground terminal of the unit.
- 3) Output lines - The unit has two relay outputs. When these outputs are used to run external relays or solenoids, spikes can be generated upon activation. This noise can spread through the instrument causing operating problems. If the source is a D.C. operated device, a general purpose diode (IN4004) placed across the solenoid prevents electrical noise spikes. Connect the cathode (banded side) to the more positive side of the coil. If the source is an A.C. operated device, use a MOV or Resistor Capacitor across the coil.
- 4) 12 VDC output supply - Noise can be generated on the 12 VDC output supply if it is used to drive inductive loads or if the current draw exceeds 50 mA. Insure that all inductive loads have a diode (such as IN4004) across the coil and that the current does not exceed 50 mA.

TOTALIZER INHIBIT INPUT

In many applications it is sometimes necessary to inhibit totalization while certain operations are present. A high logic level on this input inhibits totalization while the rate indication is still active. This feature is useful during meter proving and may be used with liquid phase detectors.

WIRING INSTRUCTIONS & DIAGRAM

CONNECTING AC / DC POWER

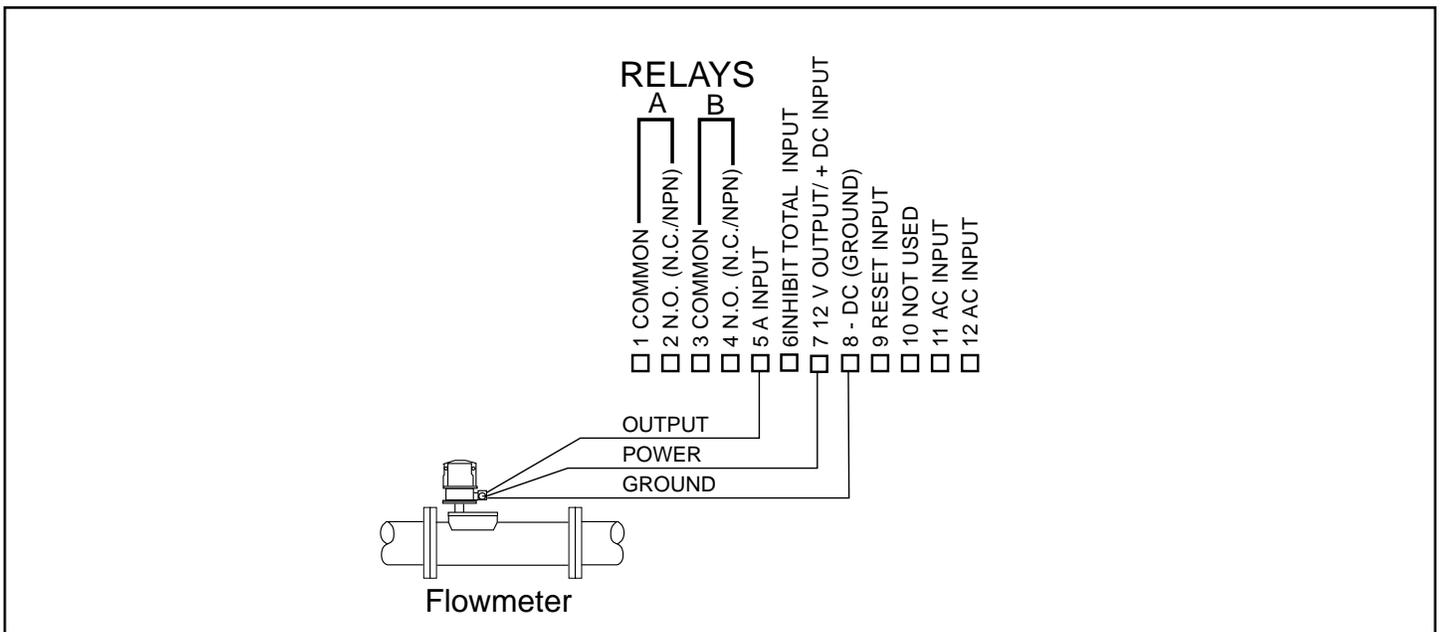
NOTE: Connect power only after other connections are finished. Do not touch the live AC power terminals! The unit has been designed with an isolated AC input. Thus, polarity is not a concern for the AC input. The chassis is plastic, therefore earth ground is not used. For D.C. operation, connect + 12V to pin 7 and - D.C. to pin 8.

CONNECTING SENSOR INPUTS

These diagrams show how to hook a typical input sensor to the unit. The unit supplies an unregulated 12 Volt (50mA) output to power these sensors (Pin 7).

A valid pulse is one which makes a transition from the off-state (0 to 1V) to the on-state (4 to 30V): a positive going edge. The input impedance is 10K Ohms to ground. The unit can be programmed from the front panel for slow switch closure inputs up to 40Hz (select "Lo CPS"), or solid state switches (select "hi CPS") up to 9.99KHz. No rear terminal jumpers are required. Use PNP (sourcing) type pulsers.

TYPICAL SENSOR HOOKUP



WHAT CAN YOU VIEW?

Pressing VIEW shows:

- A) The total of input A. If "reset to 0" is selected A counts up, if "set to preset" is selected A will count down.
- B) The rate of input A.
- C)* The grand total of input A which always count up.

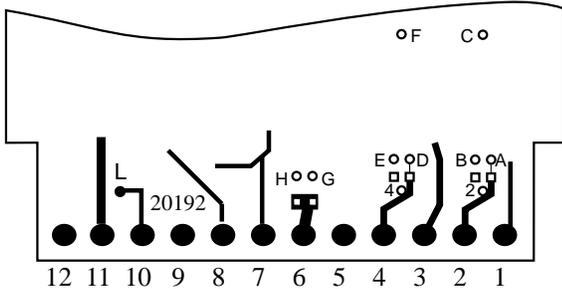
NOTE:

* All decimal points are inverted when "Grand Total" is being displayed to distinguish from the A total.

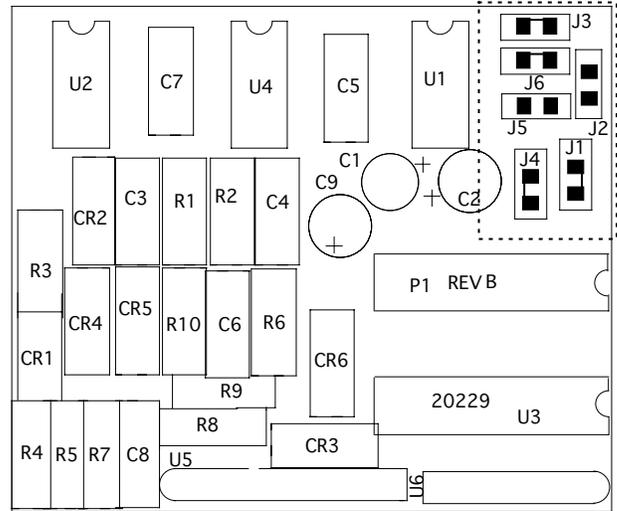
OUTPUT JUMPER SELECTIONS

FUNCTION	MODIFICATION	
"A" RELAY N.C. OUTPUT	CUT AT "A"	JUMPER "B" TO "2"
"B" RELAY N.C. OUTPUT	CUT AT "D"	JUMPER "E" TO "4"
* "A" PRESET TRANSISTOR (NPN)	CUT AT "A"	JUMPER "C" TO "2"
* "B" PRESET TRANSISTOR (NPN)	CUT AT "D"	JUMPER "F" TO "4"

BOTTOM VIEW AT TERMINAL



MILLIVOLT INPUT OPTION JUMPER SELECTIONS



If the unit has the millivolt input bd.# 20229, The A inputs can be solder jumper programmed to accept either a low millivolt or 4-30 V input. The B input should always be set for 4-30 V. Each unit shipped is programmed according to part number. If solder jumpers are made, the part number should be modified to reflect the changes made

* The unit must be removed from the case to access jumpers C & F, all other jumpers can be accessed by removing the plastic extender.

NOTE: All three pads at jumpers 2 and 4 are connected.

C=CLOSE, O=OPEN

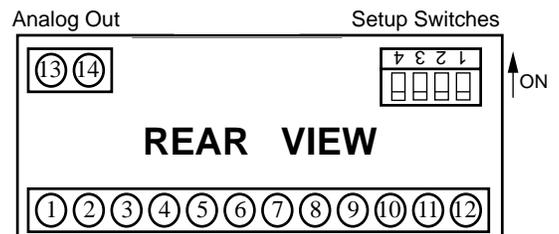
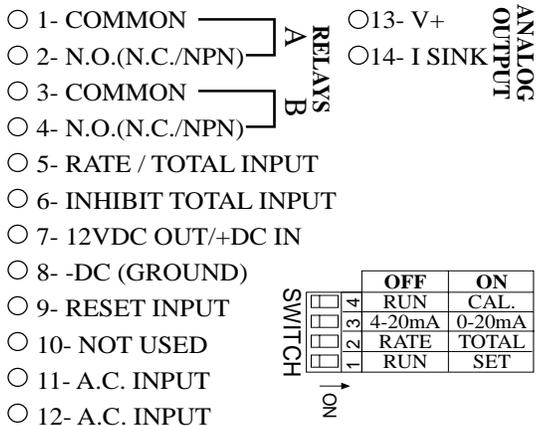
	4-30V INPUT	Millivolt INPUT
Input A	J1-O, J2-C, J3-O	J1-C, J2-O, J3-C
Inhibit Input	J4-O, J5-C, J6-O	

The following is a list of abbreviations as they appear on the display and front panel of the unit.

<u>ABBREVIATION</u>	<u>DESCRIPTION</u>
FREtoR	SCALING FACTOR - Enter the 5 digit dividing scale factor (K-Factor) for the total input (Input A).
dP F A	DECIMAL POINT FOR FACTOR A (rate) - Enter location of decimal point for the rate scaling factor by pressing the button under the digit where the decimal is desired.
dP F b	DECIMAL POINT FOR FACTOR B (total) - Enter location of decimal point for the total scaling factor by pressing the button under the digit where the decimal is desired.
Count	PORTION OF MENU FOR SETTING TOTALIZER VARIABLES
rSt 0	RESET TO 0 - Totalizer will reset to 0. The totalizer will count up from 0.
St Pr	SET TO PRESET - Totalizer will reset to preset A. The totalizer will count down from preset A. The grand totalizer will count up .
dP Loc	DECIMAL POINT LOCATION - Enter desired location of decimal by pushing the button under the digit where the decimal is desired. Changing the decimal will change the decimal location in the totalizer and grand totalizer, but not the rate display.
Hi CPS	HIGH COUNTS PER SECOND - This sets the unit for high count speeds (0-9.99KHz)
Lo CPS	LOW COUNTS PER SECOND – This sets the unit for contact debounce filtering (0-40Hz)
rRtE	PORTION OF MENU FOR SETTING RATE VARIABLES
SEC	RATE PER SECOND - The display will read in rate per second.
min	RATE PER MINUTE - The display will read in rate per minute.
Hour	RATE PER HOUR - The display will read in rate per hour.
dRY	RATE PER DAY- The display will read in rate per day.
nOr ##	NORMALIZING FACTOR - Normalizes (averages) the data being received. Higher settings provide more normalizing (averaging) for a more stable display. Derived from the equation: $\frac{(\text{Old Data} \times \text{"NOR"} + \text{New Data})}{(\text{"NOR"} + 1)}$
FiGur ##	SIGNIFICANT FIGURE - This sets the amount (1-5) of meaningful figures the unit will display. (RATE DISPLAY ONLY). FOR EXAMPLE: If "2" is set as the figure, a rate of 273.45 will be displayed as 270.
dLY##	DELAY FACTOR - The amount of time (02 to 24 sec.) the unit will "look" for valid data, before the display defaults to zero. (RATE DISPLAY ONLY)

- LOCK - This portion of the menu allows you to:
 - 1) lock the program (presets are still accessible)
 - 2) lock all (presets and program are locked).
- LOCK PROGRAM - This will lock the program and allow the presets to be changed when the unit is in the lock mode.
- LOCK ALL - This will lock the program and the presets when the unit is in the locked mode. The presets can be viewed, but not changed.
- LOCK CODE - This message (code) will flash on display for approximately 3 seconds. It will be followed by a 5 digit number (xxxxx). The number you enter here will be the code to lock and unlock the unit.
- RELAY - This portion of the menu allows you to set your relay operation variables.
- RELAY A FOR TOTALIZER - When this is selected relay A will activate when the total has reached Preset A.
- RELAY A FOR RATE - When this is selected relay A will activate when the Rate of input A equals or exceeds preset A.
- RELAY A DURATION - This message will appear when "A TOT" is selected. It is the duration which the relay will remain energized (00.1 to 99.9 sec). If 00.0 is selected, the relay will latch until reset. When the duration is not at 00.0, the unit will autorecycle.
- RELAY B FOR TOTALIZER - When this is selected relay B will activate when the total has reached preset B.
- RELAY B FOR RATE - When this is selected relay B will activate when the rate equals or exceeds preset B. The relay will drop out when the rate falls below preset B.
- RELAY B DURATION - Follow same procedure as A ###.

WIRING TERMINATIONS



CALCULATING SCALE FACTORS

There are two separate dividing scale factors, one for rate and one for total. The factors are entered as the number of pulses per the desired unit of measurement. The factor ranges from 0.0001 to 99999. Because the "units per second", "minute", "hour" or "day" are field programmable from the keypad, scale factor calculations for the ratemeter are easy.

RATE (Factor A)

The Rate K-Factor value should be entered in pulses per unit of measure. Be sure to choose the desired Time Base (sec, min, hour, day) in the Rate menu section.

$$\text{Rate} = \frac{\text{Input Frequency} \times \text{Time Base}}{\text{Factor A}}$$

Where Time Base:

SEC = 1
MIN = 60
HOUR = 3600
DAY = 86400

TOTAL (Factor B)

The Total K-Factor (Factor B) value should be entered as pulses per least significant digit for display. The DPLOC (decimal location) under the count section is a "dummy" decimal. Therefore the Total K-Factor must be scaled properly for totalizer decimal adjustments.

EXAMPLE:

Flowmeter Output: K = 56.27 pulses per gallon

<u>FACTOR B</u>	<u>TO READ</u>
56.27	0 GAL
5.627	0.0 GAL
.5627	0.00 GAL

$$\text{Total} = \frac{\text{Input Frequency}}{\text{Factor B}}$$

PROGRAMMING

STEP
1
SETTING
SCALING
FACTORS

<u>PRESS</u>	<u>DISPLAY</u>	<u>REMARKS</u>
<input type="checkbox"/> PRGM	FACtor	This section of the menu is used to set up the scaling factors for rate and total.
<input type="checkbox"/> ENTER	dP F A	This sets the decimal for rate factor. Press the arrow key under the digit where the decimal is desired. To clear the decimal, press the arrow key furthest to the right (PRGM) .
<input type="checkbox"/> ENTER	#####	This is the scaling factor for the rate. To change, press the arrow key under the digit(s) to change. Press ENTER to enter the displayed value.
<input type="checkbox"/> ENTER	dP F b	This sets the decimal for total factor. Press the arrow key under the digit where the decimal is desired. To clear the decimal, press the arrow key furthest to the right (PRGM) .
<input type="checkbox"/> ENTER	#####	This is the scaling factor for the totalizer. To change, press the arrow key under the digit(s) to change. Press ENTER to enter the displayed value.

STEP
2
SETTING
THE
COUNTER

<u>PRESS</u>	<u>DISPLAY</u>	<u>REMARKS</u>
<input type="checkbox"/> PRGM	FRACtor	This section of the menu sets up the totalizer information.
<input type="checkbox"/> PRGM	Count	
<input type="checkbox"/> ENTER	rSt 0 or SEt Pr	Press the PRGM key to choose RST 0 (reset to 0, count up) or SET PR (set to preset, count down), press the ENTER key to enter the displayed choice.
<input type="checkbox"/> ENTER	dP Loc	This sets the decimal location for the totalizer and grand totalizer. Press the arrow key under the desired digit location. To clear the decimal, press the arrow key furthest to the right. Press the ENTER key to enter the displayed location.
<input type="checkbox"/> ENTER	Hi CPS or Lo CPS	Press the PRGM key to choose HIGH CPS (0-9.99KHz) or LOW CPS (0-40Hz). Press the ENTER key to enter the displayed choice.

STEP
3
SETTING
THE RATE

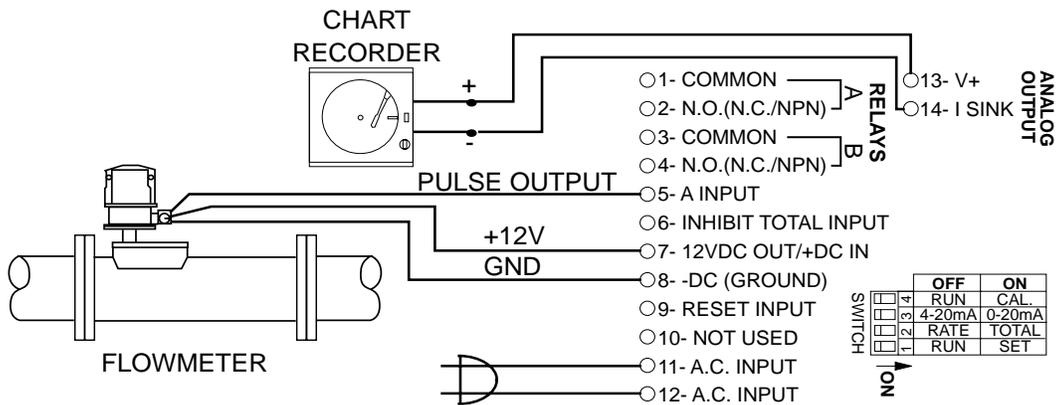
<u>PRESS</u>	<u>DISPLAY</u>	<u>REMARKS</u>
<input type="checkbox"/> PRGM	FAcTOr	
<input type="checkbox"/> PRGM	COunt	
<input type="checkbox"/> PRGM	rAtE	This section of the menu is used to set up the rate information.
<input type="checkbox"/> ENTER	SEC MIN Hour dAY	Press the PRGM key to choose rate time base. SEC (rate per second) MIN(RPM) HOUR (RPH) DAY (rate per day) Press ENTER to enter displayed choice.
<input type="checkbox"/> ENTER	nor #.#	This sets the normalizing (averaging) factor. Press the arrow keys under the desired digits to change. Press ENTER to enter displayed value.
<input type="checkbox"/> ENTER	FiGur #	This sets the minimum number of significant figures to be displayed. Press the arrow key under the digit to change. Press ENTER to enter displayed value.
<input type="checkbox"/> ENTER	dLY ##	This sets the delay time (2 to 24 sec.) that the unit will "look" for valid input data before the display falls to 0. Press the arrow key under the digits to change. Press ENTER to enter displayed value.

OUTPUT WIRING

The following diagrams detail the connection of the relay and analog outputs. Each relay consists of a form A contact (Normally Open). NPN transistor or Normally Closed contacts are available with solder jumpers (see Jumper Options).

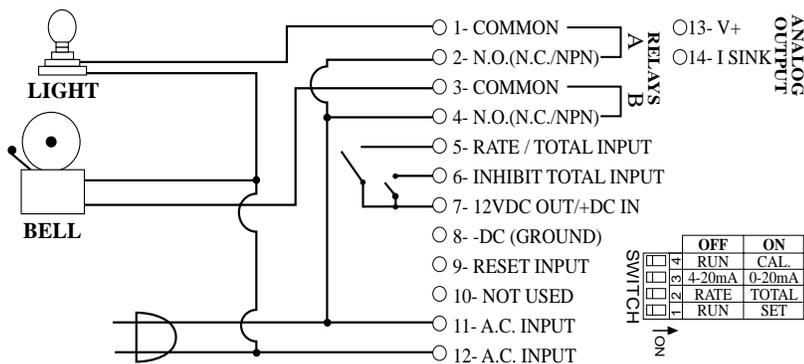
ANALOG OUTPUT

The analog output can be selected to output 4-20 mA or 0-20 mA and can be selected to track the rate or total. Pin 13 supplies 12 to 18V to power the current loop. Pin 14 supplies the current sinking driver. When connecting a chart recorder, make connections as follows:



ALARMS

The relays can be used to trigger alarms which warn the operator that the total or the rate has exceeded a setpoint. The outputs are programmable to be assigned for rate or total. When assigned to the total, the relays can have a user selectable on time (duration) or can be latched until reset. The total autorecycles when set for a selectable on time. This can be use to create a relay pulse output.



ANALOG OUTPUT

Description:

A 4-20mA (0-20mA) output has been added to the EA401 series. The output can be programmed to track rate or total. Connections are via a 2 terminal pluggable screw connector.

Connections: (see FIG. 1)

PIN13 supplies the 12 to 18 VDC to power the current loop.
PIN14 is the control sink driver

Accuracy:

± 0.25% FS

Compliance Voltage:

3 to 30 VDC non conductive

Setup:

The analog output feature uses 4 dip switches on the back for setup. These switches are used as follows:

SW1 - View or change "set low" and/or "set high" values

SW2 - Select output for rate or total

SW3 - Select 4-20mA or 0-20mA

SW4 - Calibrate the unit.

After the regular parameters shown in the programming flowchart have been set, locate the 4 switches on the back of the unit. (see FIG. 1)

Switch Settings:

SWITCH 1: Enter Analog Low & High (normally off)

Switch 1 is used to load in the low (4mA or 0mA) and/or the high (20mA) output settings. With power on, set switch 1 ON (up).

LOW SETTING is viewed or changed by pressing PRE A. If the displayed value is correct, press ENTER. If not, press buttons A through E to step to the desired value and press ENTER. (after the "low set" is entered, the display will show the last total reading).

HIGH SETTING is viewed or changed by pressing PRE B. If the displayed value is correct, press ENTER. If not, press buttons A through E to step to desired value and press ENTER.

Return switch 1 to OFF (down) position, PRE A and PRE B buttons now function to view or change relay trip values.

SWITCH 2: Select Count or Rate

SW2 OFF (down): Analog output follows rate

SW2 ON (up): Analog output follows total

SWITCH 3: Select 4-20mA or 0-20mA

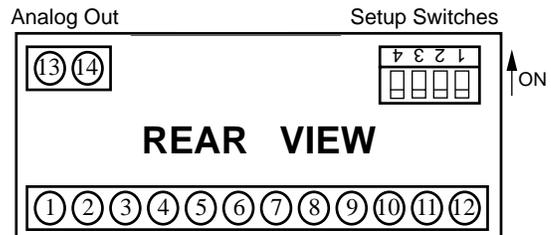
SW3 OFF (down): Selects 4-20mA output range

SW3 ON (up): Selects 0-20mA output range

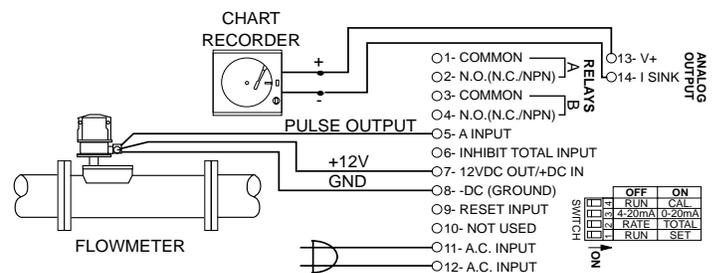
SWITCH 4: Calibrate (normally off)

Switch 4 is used for calibration. Calibration is done at the factory and should not be needed (see SWITCH 1 to enter high and low values). If recalibration is desired, a calibrated 20mA ammeter with 1uA resolution is needed. Attach the "+" lead of the meter to pin 13 and the "-" lead to pin 14. Set switch 4 ON (up). The unit will output approximately 20.000mA and a decimal will light in the third position. Read the output using the ammeter. Press PRE A. If the display is the same as the ammeter reading, press ENTER. If not, press buttons A through E to step to ammeter reading and ENTER. (Disregard display which now shows the last count reading with decimal point in third position) Return switch 4 to OFF (down) position.

FIG. 1



Typical Wiring:



TROUBLESHOOTING GUIDE

<u>PROBLEM</u>	<u>POSSIBLE CAUSES</u>	<u>SOLUTIONS</u>
Power is applied to unit but the display does not light.	1. AC or DC power wiring is incorrect.	1. Recheck power wiring
Unit works, but occasionally the display freezes or skips counts.	1. Line noise is affecting the processor due to a current spike or surge.	1. Use a different power supply or install a surge suppressor.
Input signal is connected but the unit does not count or display rate.	1. Input wiring is incorrect. 2. Scale factors are incorrect. 3. Transmitting device is defective. 4. Wrong debounce filtering selected. 5. The unit is defective.	1. Recheck input wiring. 2. Recheck scale factors and factor calculations. 3. Replace transmitting device. 4. Recheck debounce filtering selection "hi cps" or "lo cps". 5. To confirm set scale factors at one and connect a wire to pin #7 and touch it to pin # 5 (input A). Each time pin #5 is touched counter A should count once. If not, call factory for RMA.
Rate is displaying: r FFFFF.	1. The unit is trying to display a number which it can't (too large). 2. Line noise affected unit on power up.	1. Check scaling factor, if it is correct, lower the number of significant figures. 2. Reprogram the unit and be sure to enter a decimal (enter one and re move it if a decimal is not desired).
Relays are not activating properly.	1. Wrong relay duration. 2. Relay set for wrong activation i.e. count instead of rate.	1. Recheck programmed relay duration. 2. Recheck programmed relay activation mode.
Counter resets before reaching 999999.	1. Relay duration is set at a value other than 00.0. This causes the counter to auto-reset at the preset.	1. If relay outputs are not being used, set the relays for rate. 2. Set the relay durations to 00.0.

WARRANTY

This product is warranted against defects in materials and workmanship for a period of one (1) year from the date of shipment to Buyer.

The Warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Ordering Information

SERIES:

EA401-00 Totalizer/Ratemeter

Power Input : 110 VAC \pm 15% or 12 to 15 VDC

Input: Standard, 4-30 VDC simultaneous inputs, from McCrometer pulse transmitters (E7000, E7500, E8000, EA550, EA630) and digital registers (R0900, RE100) with pulse output options.

Output: Two Relay or NPN transistor pulse outputs and one 4-20mA analog output.