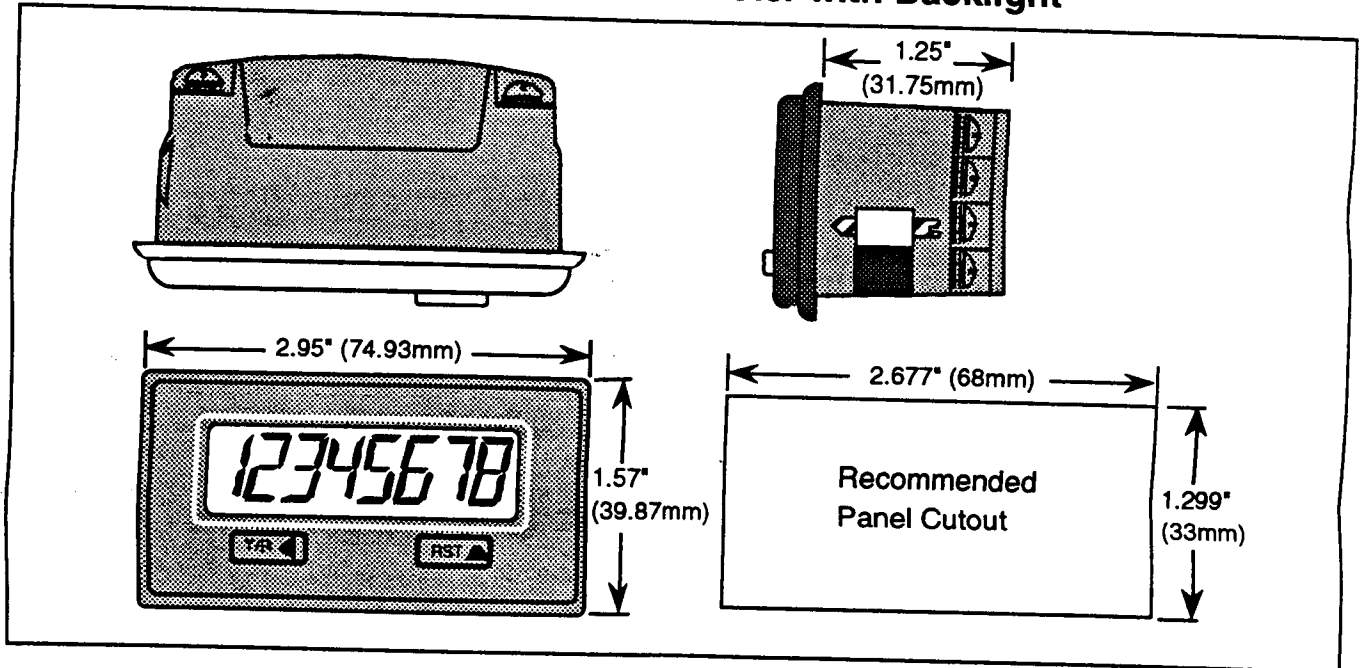


# Durant<sup>®</sup>

INSTALLATION AND OPERATION  
MANUAL NUMBER 53300-905-05

Courier Model: 53300-405 Totalizer/Ratemeter  
53301-405 Totalizer/Ratemeter - Extended Temperature Range  
53302-405 Totalizer/Ratemeter with Backlight



## POWER

Internal Battery: 3V, Lithium.  
Life expectancy: 5 years +.  
Replacement Part: 36367-202.

## BACKLIGHT

10-30 VDC @ 30 mA max.  
(Derate operating temperature 1°C/Volt above 17VDC.)  
Reverse polarity protected.

## PHYSICAL

Operating Temperatures:  
Model 53300-405: 0° to 55°C.  
Model 53301-405: -20° to 70°C.  
Model 53302-405: 0° to 55°C.  
Storage Temperature: -20° to 70°C.  
Operating Humidity: 60% Non-condensing.  
Weight: 2.2 oz. net.  
Display Size: .43" high.  
Front Panel Rating: NEMA 4X when mounted with gasket provided.  
Case Material: Cyclac X-17.

## TOTALIZER

Type: UP counting.  
Digits: 8.  
Scaler: 0.0001 - 100.0000.  
(0.0000 scales by 100 in the Courier Series.)  
Decimal Point: 5 positions, programmable.

## RATE INDICATOR

Type: 1/Tau.  
Digits: 4/5, (4 calculated, 5 displayed with fixed 0 in LSD).  
Scaler Range: .001 to 9999.  
Decimal Point: 5 positions, programmable.  
Accuracy: ±0.2%.  
Update Time: .7 seconds.  
Zero Time: 10 seconds.

## DC COMMON (Terminal 1)

### COUNT / RATE INPUTS

Input B (Terminal 2) Low speed input designed for contact closures to DC common.

Speed: 0 to 20 Hz.  
Min Low Time: 10 milliseconds.  
Min High Time: 40 milliseconds.  
Impedance: 101K ohm.  
Voltage Thresholds: Low 0 to 0.4 VDC.  
High 2.0 to 28 VDC.  
Max High: 28 VDC.

Input A (Terminal 3) High speed input requiring a voltage source such as a current sourcing sensor or a current sinking sensor used with the provided pull up resistors.

Speed: 0 to 10 kHz.  
Min Low Time: 80 microseconds.  
Min High Time: 20 microseconds.  
(The above times are with a 0 to 5.0 V swing.)  
Input Impedance: 2kΩ above 5 VDC.  
Voltage Thresholds: Low 0 to 1.2 VDC.  
High 2.0 to 28 VDC.  
Max High 28 VDC.

## RESET INPUT (Terminal 4)

Resets totalizer to zero when connected to DC common.  
Min. Low Time: 0.25 to 1.0 sec. (maintained).  
The required pulse width varies with count speed, scale factor and number of digits displayed.  
Voltage Thresholds: Low 0 to 0.4 VDC.  
High: 2.0 to 28 VDC.

## PROGRAM ENABLE INPUT (Terminal 5)

Operation: Level sensitive (maintained).

## COUNT ACCURACY

100% when operated within specifications.

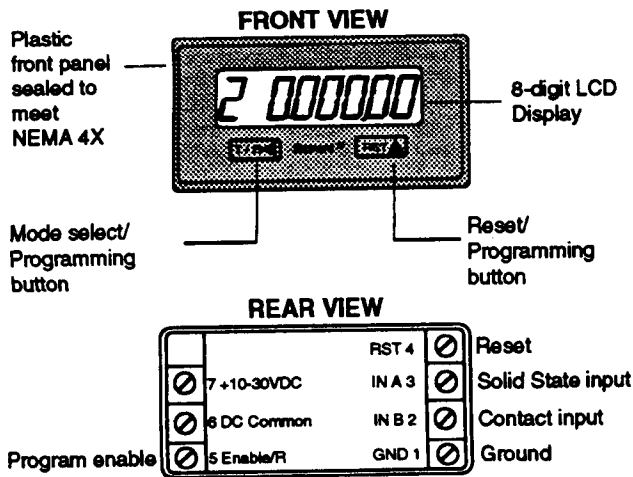
# Cutler-Hammer

# EATON

## INTRODUCTION

The 5330X-405 is a combination UP counting totalizer and ratemeter. The totalizer has an eight digit display. The front-panel reset key can be disabled. A remote-reset terminal is provided. The count scaler and decimal point can be programmed.

The ratemeter has a 4/5 digit LCD display. A programmable rate scaler and decimal point allow for display of rate in any engineering terms.

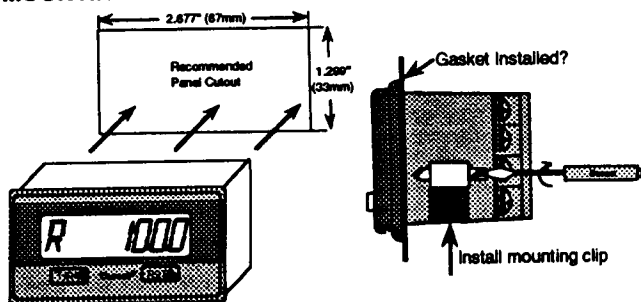


## APPLICATIONS

The 5330X-405 is designed to show both total and process rate. Certain programming and wiring decisions must be made to complete your application. We recommend the following sequence:

1. Answer the following questions:
  - What type of sensor will be used?
  - What engineering units should the ratemeter be scaled to?
  - How many pulses per item is the sensor providing?
  - Is a decimal point needed on the count and/or rate display?
  - Should the front-panel reset key be active or inactive?
2. Calculate the count scale factor and the rate scale factor.

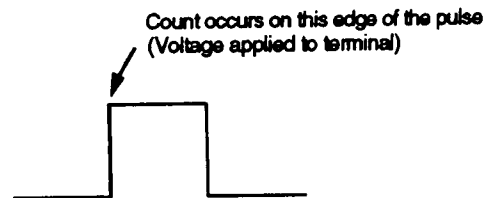
## MOUNTING



## OPERATION

### Count Inputs

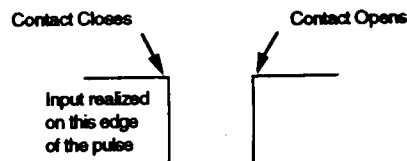
Separate contact and solid state count inputs are provided. The solid state input (terminal 3) requires a current-sourcing sensor and can count up to 10 kHz. Inputs into this terminal are counted on the positive-going edge.



Terminal 3 is pulled down to common. When a sensor output supplies voltage to this terminal, one count is registered on the display. The sourcing signal must supply at least +2.0VDC but no more than +28VDC.

Note: When a sourcing signal is applied to terminal 3, a power assist feature of the Courier extends the life of the battery.

Terminal 2 is the low-speed, current sinking count input designed to be used with a contact closure to ground. It has a maximum count speed of 20 Hz. Inputs into this terminal are counted on the negative-going edge.



Terminal 2 is pulled up to +3VDC. When a contact closes, pulling the voltage down to .4 VDC or less, one count is registered.

## RUN MODE


### Screens

Two screens are available on the 5330X-405.

**Totalizer:** This 8-digit screen shows you the accumulated scaled count inputs. The totalizer has lead-zero blanking.

**Ratemeter:** This 4/5 digit screen shows current process rate.

### Front Panel Keys

Press the  key on the front panel to toggle between the totalizer and ratemeter screens.

Press the **RST** key to reset the totalizer display to zero. This button has no effect on the ratemeter screen.

The front panel reset key provides an edge-sensitive (momentary) reset.

Note: The **RST** key may be disabled. See program mode.

### PROGRAM MODE

To enter the program mode, a connection must be made between terminals 1 and 5.

#### Screens

There are six program-mode screens in the 5330X-405.

Press and hold the **TR** key while repeatedly pressing the

**RST** key to advance to successive screens.

Programming Screens	
Screen	Function
1	Count Scale Factor
2	Totalizer Decimal Point
3	Rate Scale Factor
4	Ratemeter Decimal Point
5	Rate x1/x10
6	Reset Key Enable/Disable

### COUNT SCALER

#### Calculating the Count Scale Factor

The count scale factor is used to convert the incoming count pulses to the desired unit of measure to be displayed (feet, gallons, etc.) or to correct for a known amount of error (wheel wear, viscosity, etc.). This scaler has six digits available with a fixed decimal point.

Count Scaler Range: 0.0001 to 99.9999

Count Scaler (CS) Formula:

$$CS = \frac{DPF}{PPI}$$

where:

DPF is the decimal point factor corresponding to the desired decimal point location.

DISPLAY	DPF	DISPLAY	DPF
XXXXXX	= 1	XXX.XXX	= 1,000
XXXXX.X	= 10	XX.XXXX	= 10,000
XXXX.XX	= 100		

PPI is the number of pulses per item from the sensor (times 2 if doubled count mode).

Example 1: A sensor produces 20 pulses per inch of material travel. Calculate the count scaler required to indicate material used in whole inches (XXXXXX).

$$CS = \frac{1}{20} = 0.05000$$

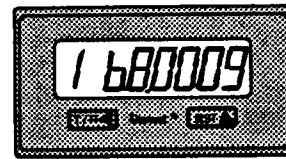
Example 2: An encoder produces 120 pulses per foot. Calculate the count scaler required to indicate material usage in 1/100's of feet (XXXX.XX).

$$CS = \frac{100}{120} = 0.8333$$

(Select the XXXX.XX position on the totalizer decimal point menu).

#### Programming Count Scale Factor

The first screen in the program mode is used to enter the count scale factor.



The far right digit will be flashing. Press the **RST** key until reaching the desired digit value.

Note: Pressing and holding the **RST** key will cause the numbers to autoscroll.

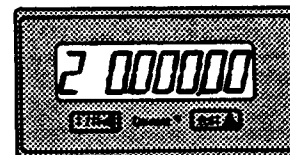
Next press the **TR** key to move the flashing digit one place to the left. Change this digit to the desired value with the **RST** key.

Repeat this process until all digits are set correctly.

(Setting the count scale factor to 0.0000 will allow scaling by 100 in the Courier Series)

#### Programming Totalizer Decimal Point

The second screen is used to enter the decimal point display on the totalizer screen. Press and hold the **TR** key and then press the **RST** key to move from screen one to screen two.



Press the **RST** key to move the decimal point to the desired position.

## RATE SCALER

### Calculating the Rate Scale Factor

This 1/Tau ratemeter calculates rate by measuring the time interval between input pulses, converting to a frequency ( $F = 1/\text{Tau}$ ), and multiplying the product by the rate scaler. The rate scaler is user programmed to convert the count input frequency into the desired rate units for display (feet/minute, inches/second, gallons/hour, etc.)

Rate Scaler Range: 0.001 to 9999

Rate Scaler (RS) formula:

$$RS = \frac{\text{Sec} \times \text{DPF}}{\text{PPI} \times 10} \text{ for } R \times 10$$

where:

SEC is the number of seconds in the rate time unit (items/second = 1, items/minute = 60, items/hour = 3600, etc.)

DPF is the decimal point factor corresponding to the desired decimal point location on the run mode screen:

Display	DPF
XXXX	1
XXX.X	10
XX.XX	100
X.XXX	1000

PPI is the number of pulses per item from the sensor.

Example 1: A sensor produces 10 pulses per foot of material travel. Display rate in whole feet per minute (XXXX).

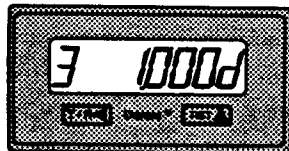
$$RS = \frac{60 \times 1}{10} = 6.000$$

Example 2: A flow sensor produces 400 pulses per gallon. Display flow rate in tenths of gallons per hour.

$$RS = \frac{3600 \times 10}{400} = 90.00$$

### Programming Rate Scale Factor

The third program mode screen allows you to enter the rate scale factor.



The lower case "d" appears on the right of the display when it is time to enter the decimal point position for the rate scaler.

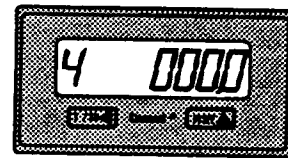
Note: This decimal point is used for the rate scaler only and will not appear on the ratemeter screen.

Press the **RST** key to change the first digit to the correct value. Press the **TR** key to select the next digit to be changed. Repeat this process until all the digits are correct. When the "d" appears, press the **RST** key until the decimal point is in the desired location.

### Ratemeter Decimal Point

The fourth program mode screen is used to enter the decimal point position for the ratemeter run-mode display.

The display will show the screen number (4) and four zero's.

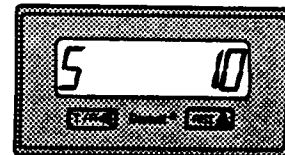


Press the **RST** key until the decimal point is in the correct position.

### Rate x1 or x10

The fifth screen is used to select the rate display multiplier of one or ten. Selecting rate x10 will add a zero to the far right of the display. This zero will not change value and does not affect the decimal point position.

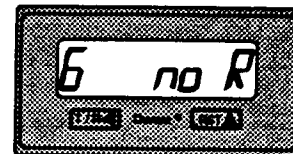
The display will show the screen number (5) and a 1 at the right.



Press the **RST** key to select 1 or 10.

### Front Reset Key Enable/Disable

The last screen in the program mode is used to determine whether the front panel reset key will function. The screen will show a number 6 on the left and an R on the right.



Press the **RST** key to choose the option you want.

Note: The reset terminal on the rear panel is still active when the front reset button is disabled.

To exit the program mode, break the connection between terminals 1 and 5.

## WIRING RECOMMENDATIONS

Following these suggestions will increase noise immunity and lengthen unit life.

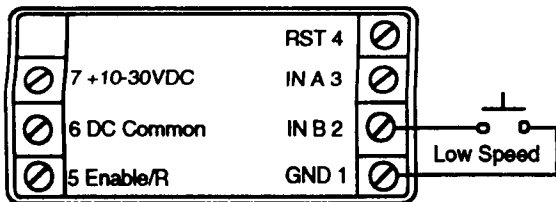
**Cable:** The connection between the count source and the totalizer / ratemeter should be made with a two-conductor shielded cable. The shield should be connected to earth ground at one end only. The connecting cable should not be run in conduits with cables switching high inductive loads.

**Relay Coil Suppression:** If a relay contact is used as a count source, the relay coil should be suppressed. This can be accomplished with an RC network for AC coils or a diode for DC coils. The Durant RC suppressor (38091-400) may be used.

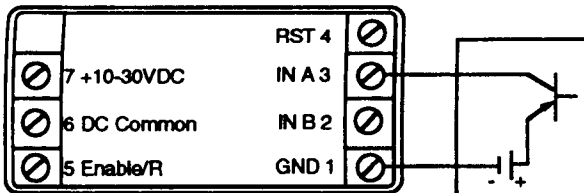
**Mounting:** This totalizer / ratemeter should not be mounted near a solenoid or other inductive devices. Enough ventilation should be supplied to keep the totalizer operating within the temperature specifications. Do not mount this unit in a heavy vibration area.

### WIRING DIAGRAMS

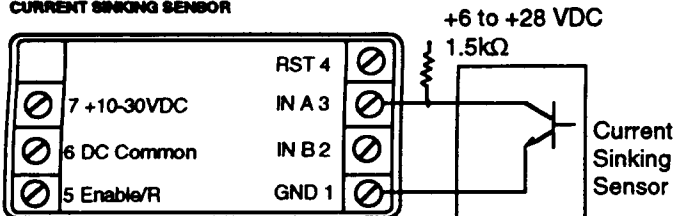
#### CONTACT CLOSURE COUNT INPUT



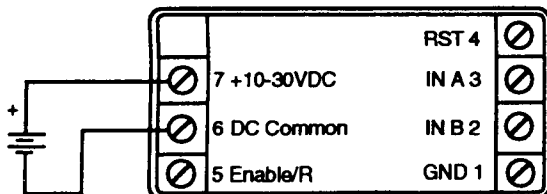
#### SOLID STATE COUNT / RATE INPUT CURRENT SOURCING SENSOR



#### SOLID STATE COUNT / RATE INPUT CURRENT SINKING SENSOR



#### BACKLIGHT WIRING



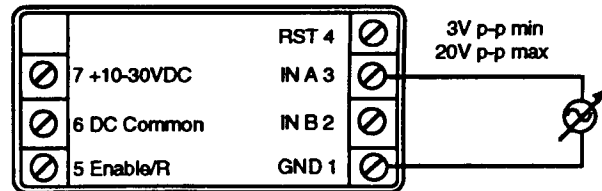
## BATTERY SAFETY

The lithium battery that powers your device contains inflammable materials such as lithium organic solvent, and other chemical ingredients. Explosion or fire may result if the battery is not handled correctly. To avoid an accident follow these guidelines:

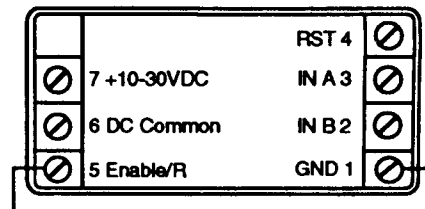
- \*Do not stack or jumble up batteries
- \*Do not heat batteries above 95°C
- \*Do not disassemble batteries
- \*Do not recharge lithium batteries
- \*Do not apply pressure to, or deform batteries
- \*Do not solder to batteries
- \*Do not dispose of batteries in fire
- \*Insert battery with correct polarity

Terminal	Function	Operation
1	Ground	
2	Input B Count Input	Use with Contact Closure to Ground up to 20 Hz Count Speed
3	Input A Count Input	Use with Current Sourcing up to 10 kHz Count Speed
4	Reset	Connect to Ground to Reset Totalizer. This is a maintained or Level Sensitive Reset.
5	Program Enable	Connect to Ground to Enter Program Mode
6	Backlight Common	
7	Backlight Power	Connect to Power to Light Display

#### SOLID STATE COUNT / RATE INPUT MAGNETIC PICKUP



#### PROGRAM MODE ENABLE



#### REMOTE RESET

