Durant®

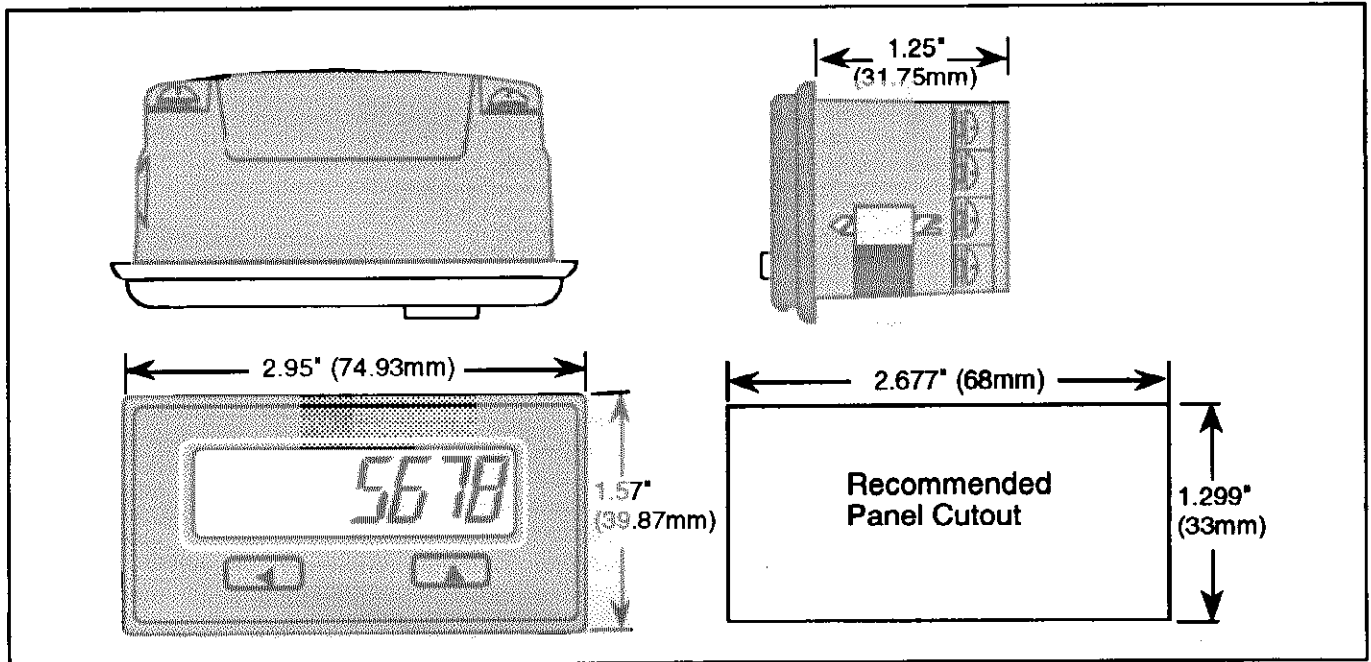## Courier Model: 53300-404 Ratemeter
53301-404 Ratemeter - Extended Temperature Range
53302-404 Ratemeter with Backlight

1.25" (31.75mm)

2.95" (74.93mm)

2.677" (68mm)

Recommended Panel Cutout

1.57" (39.87mm)

1.299" (33mm)

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 53300-404:   0° to 55°C.
Model 53301-404:   -20° to 70°C.
Model 53302-404:   0° to 55°C.
Storage Temperature: -20° to 70°C.
Operating Humidity: 60% R. H. (Non-condensing).
Weight: 2.2 oz. net.
Display Size: .43" high.
Front Panel Rating: NEMA 4X when mounted with gasket provided.
Case Material: Cycolac X-17.

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)
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.
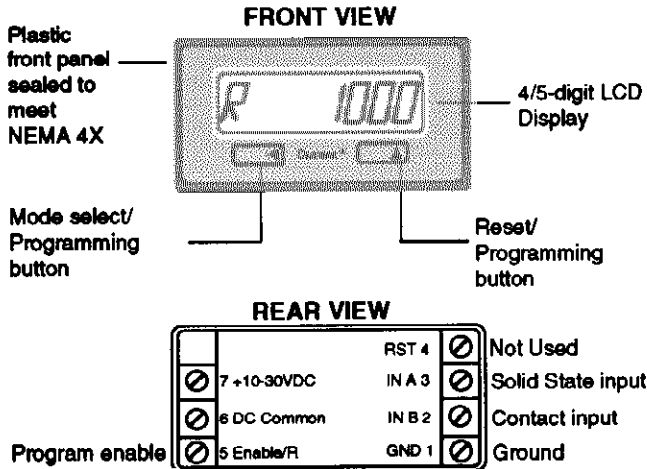**PROGRAM ENABLE INPUT (Terminal 5)**
Operation: Level sensitive (maintained).
COUNT ACCURACY
100% when operated within specifications.

Cutler-Hammer

F:T•N

INTRODUCTION

Your 5330X-404 is a ratemeter with a 4/5 digit LCD display. A programmable rate scaler and decimal point allow for display of rate in any engineering term.
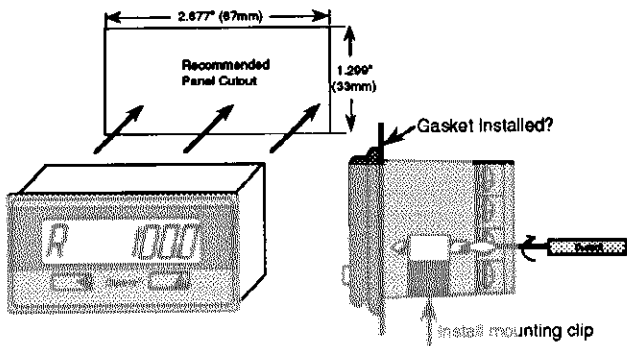
FRONT VIEW

Plastic front panel sealed to meet NEMA 4X

4/5-digit LCD Display

Mode select/ Programming button

Reset/ Programming button

REAR VIEW

	RST 4	⊘	Not Used
⊘ 7 +10-30VDC	IN A 3	⊘	Solid State input
⊘ 6 DC Common	IN B 2	⊘	Contact input
Program enable ⊘ 5 Enable/R	GND 1	⊘	Ground

APPLICATIONS

The 5330X-404 is designed to show you process rate. Certain programming and wiring choices must be made to accomplish your application. We recommend the following sequence:

1. Answer the following questions:

    *   What type of sensor will be used?
    *   To what engineering units should the ratemeter be scaled?
    *   How many pulses per item is the sensor providing?
    *   Is a decimal point needed on the rate display?

2. Calculate the rate scale factor.

MOUNTING

2.677" (67mm)

Recommended Panel Cutout

1.299" (33mm)

Gasket Installed?

Install mounting clip

OPERATION

Rate Inputs

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

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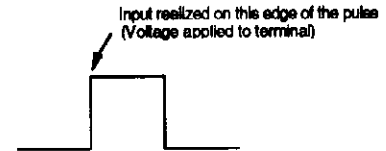
Terminal 3 is pulled down to common. When a sensor output supplies voltage to this terminal, one count is registered on the display. The sourcing signal must supply at least +2.0VDC but no more than +28VDC.

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 rate 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.

Contact Closes   Contact Opens

Input realized on this edge of the pulse
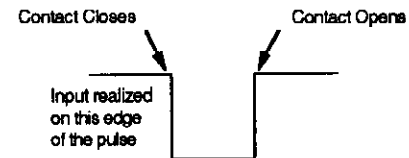
Terminal 2 is pulled up to +3VDC. When a contact closes, pulling the voltage down to .4 VDC or less, one count is registered.

PROGRAM MODE

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

Screens

There are three program-mode screens in the 53300-404. Press and hold the [◀] key while repeatedly pressing the [▲] key to advance to successive screens.

Programming Screens	
Screen	**Function**
1	Rate Scale Factor
2	Ratemeter Decimal Point
3	Rate x1/x10

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 ($F = 1/Tau$), 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:

$$RS = \frac{SEC \times DPF}{PPI}$$

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

Use the rate display decimal point screen to program the desired decimal point position.

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).

$$RS = \frac{60 \times 1}{10} = \frac{60}{10} = 6$$

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

$$RS = \frac{3600 \times 10}{400} = \frac{36,000}{400} = 90$$

Programming Rate Scale Factor

The first program mode screen allows you to enter the rate scale factor.
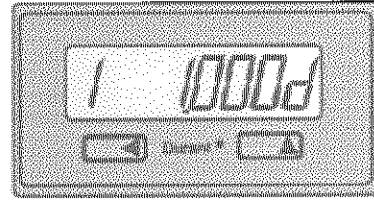
The lower case "d" appears on the right of the display when it is time to enter the decimal point position for the rate scaler.

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

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

Ratemeter Decimal Point

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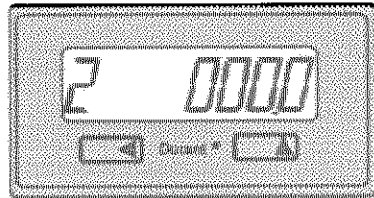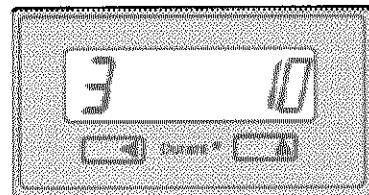

Press the [▲] key until the decimal point is in the correct position.

Rate x1 or x10

The third 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.

Press the [▲] key to select 1 or 10.

WIRING RECOMMENDATIONS

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

Cable: The connection between the count source and the 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: The ratemeter should not be mounted near a solenoid or other inductive devices. Enough ventilation should be supplied to keep the ratemeter operating within the temperature specifications. Do not mount this unit in a heavy vibration area.

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 Rate Input	Use with Contact Closure to Ground Maximum 20 Hz Count Speed
3	Input A Rate Input	Use with Current Sourcing Sensor Maximum 10 kHz Count Speed
4	Not Used	
5	Program Enable	Connect to Ground to Enter Program Mode
6	Backlight Ground	
7	Backlight Power	Connect to Power to Light Display

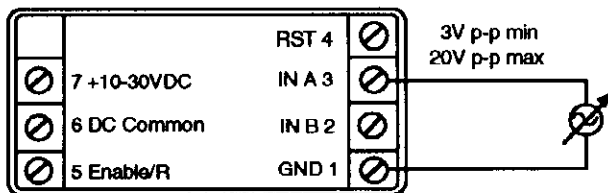## WIRING DIAGRAMS

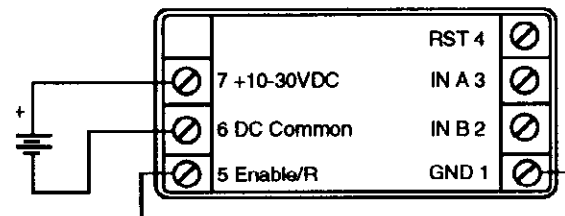### CONTACT CLOSURE RATE INPUT
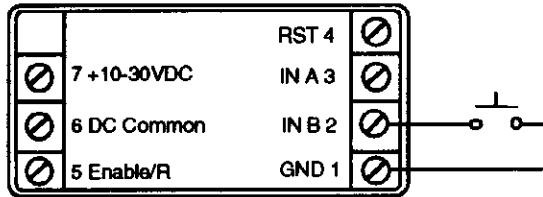
SOLID STATE RATE INPUT
CURRENT SOURCING SENSOR
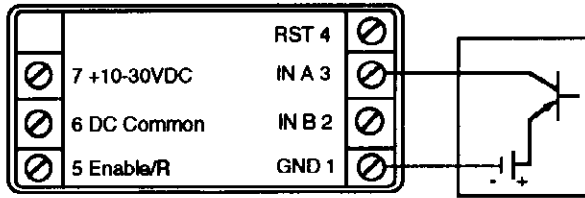
SOLID STATE RATE INPUT
CURRENT SINKING SENSOR

Current Sinking Sensor
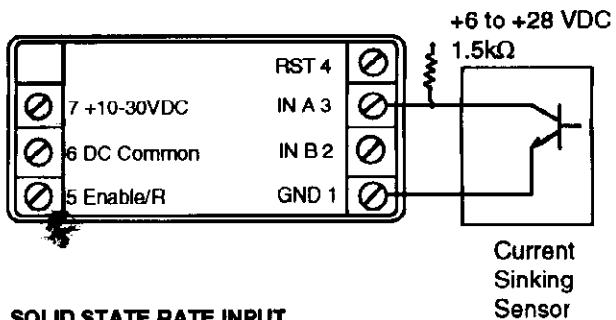
SOLID STATE RATE INPUT
MAGNETIC PICKUP

3V p-p min
20V p-p max

PROGRAM MODE ENABLE and BACKLIGHT WIRING

REPLACEMENT PARTS

36367-202	Battery
46066-210	Gasket
53300-241	Mounting Clip
28772-200	Mounting Screw

COURIER SERIES ACCESSORIES

ES9513-RS	Rotary Contactor
49750-400	Power Supply (+15VDC)
38091-400	Count Source RC Suppressor

Devices Requiring External Power for Proper Operation

48770-401, -402	Inductive Proximity Sensor (8mm, 12mm, 18mm)
48771-400	Diffuse-Reflective Photoelectric Sensor
48771-401	Retro-Reflective Photoelectric Sensor
48771-402	Thru-Beam Photoelectric Sensor Emitter
48771-404	Thru-Beam Photoelectric Sensor Receiver (Thru-beam emitter and receiver must be used together)
38150-XXX	Standard Duty, Single Channel Shaft Encoder (XXX denotes pulses per revolution. Example: 38150-060 for 60 pulses/rev).
48370-XXX	Heavy Duty, Single Channel Shaft Encoder (XXX denotes pulses per revolution. Example: 48370-060 for 60 pulses/rev).

OTHER COURIER SERIES PRODUCTS

53300-400	Totalizer
53300-401	Add/Subtract Totalizer (Solid State Input)
53300-402	Add/Subtract Totalizer (Contact Input)
53300-403	Quadrature Indicator
53300-405	Totalizer/Ratementer
53301-400	Totalizer-Extended Temperature
53301-401	Add/Subtract Totalizer (Solid State Input)
53301-402	Add/Subtract Totalizer (Contact Input)
53301-403	Quadrature Indicator
53301-405	Totalizer/Ratemeter Extended Temperature Rnage
53302-400	Totalizer with Backlight
53302-401	Add/Subtract Totalizer (Solid State Input)
53302-402	Add/Subtract Totalizer (Contact Input)
53302-403	Quadrature Indicator
53302-405	Totalizer/Ratemeter with Backlight

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