INTRODUCTION

Your 5330X-403 is a counter with an eight-digit LCD display. A programmable scaler and decimal point allow for display in any engineering unit.

APPLICATIONS

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 counter be scaled?
   • How many pulses per item is the sensor providing?
   • Is a decimal point needed on the display?

2. Calculate the scale factor.

PROGRAM MODE

To enter the program mode, a connection must be made between terminals 1 and 5 (see page 4).

The totalizer has high speed inputs only and is capable of receiving pulses at 10kHz per channel if each signal is a square wave and there is a 90° phase shift between the two signals. For this reason, it is recommended that solid state sensors (PNP output or NPN output with a pull-up resistor) be used.

If the totalizer counts in the “wrong” direction at startup, stop the process and switch the wires at terminals 2 and 3. This will cause the totalizer to count in the “right” direction when the process is re-started.

Screens

There are four program-mode screens in the 5330X-403. Upon entering the setup mode, the counter will display screen 1. Press and hold the ▼ key while repeatedly pressing the ▲ key to advance to successive screens.

<table>
<thead>
<tr>
<th>Screen</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Count Scale Factor</td>
</tr>
<tr>
<td>2</td>
<td>Count Decimal Point</td>
</tr>
<tr>
<td>3</td>
<td>Reset to Offset Value</td>
</tr>
<tr>
<td>4</td>
<td>Reset Key Enable / Disable</td>
</tr>
</tbody>
</table>

OPERATION

Quadrature Counting

Quadrature is a bi-directional count mode requiring an input signal at each of the totalizer’s two count inputs. Quadrature counting is typically accomplished by using a quadrature encoder as the count source although any two sensors with single channel outputs may be used if the sensors are positioned correctly. In either case, both sensor outputs must produce pulses at the same frequency and there must be a phase shift between the signals. The totalizer recognizes the phase shift and uses it to determine if it should be counting up, or counting down. Finally, the signal channels must alternate changes of state. This produces the four distinct input conditions from which the term quadrature is derived. These conditions are off-off, on-off, on-on, and off-on.

Quadrature Signal

Count Inputs

Count inputs A and B (terminals 3 and 2) are pulled down to ground (terminal 1). The sensor must supply between 2.0 and 28 VDC at the count inputs for the totalizer to count.

If the totalizer counts in the “wrong” direction at startup, stop the process and switch the wires at terminals 2 and 3. This will cause the totalizer to count in the “right” direction when the process is re-started.
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
XXXXX = 1 XXXXXXX = 1,000
XXXXXX = 10 XXXXXXXX = 10,000
XXXXXX = 100

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

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 (XXX.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 \( \text{RST} \) key until reaching the desired digit value.

Note: Pressing and holding the \( \text{RST} \) key will cause the numbers to autoscroll.

Next press the \( \text{<} \) key to move the flashing digit one place to the left. Change this digit to the desired value with the \( \text{RST} \) 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 Decimal Point

The second screen is used to enter the decimal point display on the totalizer screen. Press and hold the \( \text{<} \) key and then press the \( \text{RST} \) key to move from screen one to screen two.

Press the \( \text{RST} \) key to move the decimal point to the desired position.

Programming Offset Value

Programming an offset value allows the counter to reset to a value other than zero. The offset may be up to six digits. The offset cannot be a negative number.

The third screen in the program mode is used to enter the offset value.

The far right digit will be flashing. Press the \( \text{RST} \) key until reaching the desired digit value.

Note: Pressing and holding the \( \text{RST} \) key will cause the numbers to autoscroll.

Next press the \( \text{<} \) key to move the flashing digit one place to the left. Change this digit to the desired value with the \( \text{RST} \) key. Repeat this process until all digits are set correctly.

The far right digit will be flashing. Press the \( \text{RST} \) key until reaching the desired digit value.
Enabling the Front Panel Reset Key

The fourth screen in the program mode allows the user to enable or disable the front panel reset key.

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 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 totalizer 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 heat batteries above 95°C
* Do not recharge lithium batteries
* Do not dispose of batteries in fire
* Insert battery with correct polarity

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Input B Count Input</td>
<td>Use with Current Sourcing Quadrature Count Source</td>
</tr>
<tr>
<td>3</td>
<td>Input A Count Input</td>
<td>Use with Current Sourcing Quadrature Count Source</td>
</tr>
<tr>
<td>4</td>
<td>Reset</td>
<td>Connect through Contact Close to Ground</td>
</tr>
<tr>
<td>5</td>
<td>Program Enable</td>
<td>Connect to Ground to Enter Program Mode</td>
</tr>
<tr>
<td>6</td>
<td>Backlight Common</td>
<td>Connect to Power to Light Display</td>
</tr>
<tr>
<td>7</td>
<td>Backlight Power</td>
<td>Connect to Power to Light Display</td>
</tr>
</tbody>
</table>
REPLACEMENT PARTS
36367-202 Battery
46066-210 Gasket
53300-241 Mounting Clip
28772-200 Mounting Screw

COURIER SERIES ACCESSORIES
49750-400 Power Supply (+15VDC, 300 mA)
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
48771-404 Thru-Beam Photoelectric Sensor Receiver (Thru-beam emitter and receiver must be used together)
38151-XXX Standard Duty, Quadrature Shaft Encoder (XXX denotes pulses per revolution. Example: 38151-060 for 60 pulses/rev).
48371-XXX Heavy Duty, Quadrature Shaft Encoder (XXX denotes pulses per revolution. Example: 48371-060 for 60 pulses/rev).

OTHER COURIER SERIES PRODUCTS
53300-400 Totalizerr
53300-401 Add/Subtract Totalizer (Solid State Inputs)
53300-402 Add/Subtract Totalizer (Contact Inputs)
53300-404 Ratemeter
53300-405 Totalizer/Ratemeter
53301-400 Totalizer - Extended Temperature
53301-401 Add/Subtract Totalizer (Solid State Input)
53301-402 Add/Subtract Totalizer (Contact Input)
53301-404 Ratemeter - Extended Temperature
53301-405 Totalizer/Ratemeter Extended Temperature
53302-400 Totalizer w/Backlight
53302-401 Add/Subtract Totalizer w/Backlight (Solid State Inputs)
53302-402 Add/Subtract Totalizer w/Backlight (Contact Inputs)
53302-404 Ratemeter w/Backlight
53302-405 Totalizer/Ratemeter w/Backlight

WARRANTY: Eaton warrants all products against defects in material and workmanship for a period of one (1) year from the date of shipment to Buyer. This is a limited warranty limited to its terms. This warranty is void if the product has been altered, misused, taken apart or otherwise abused. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

BUYERS REMEDIES: Eaton’s obligations and liabilities under the foregoing warranty are limited to repair or replacement of the product without charge. To receive the required Return Goods Authorization number (RGA), contact your local Durant distributor or call 1-800-410-2910. A charge is made for repairing after the expiration of the warranty. IN NO EVENT SHALL EATON BE LIABLE FOR CLAIMS BASED UPON BREACH OF EXPRESS OR IMPLIED WARRANTY OR NEGLIGENCE OR ANY OTHER DAMAGES WHETHER DIRECT, IMMEDIATE, FORESEEABLE, CONSEQUENTIAL OR SPECIAL OR FOR ANY EXPENSES INCURRED BY REASON OF THE USE OR MISUSE, SALE OR FABRICATION OF PRODUCTS WHICH DO OR DO NOT CONFORM TO THE TERMS AND CONDITIONS OF THIS CONTRACT.

INDEMNIFICATION: Buyer agrees to hold Eaton harmless from, defend, and indemnify Eaton against damages, claims and expenses arising out of subsequent sales of Durant products or products containing components manufactured by Eaton and based upon personal injuries, deaths, property damage, lost profits, and other matters for which Buyer, its employees or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L.92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L.93.637), as now in effect or as amended hereafter. The warranties and remedies provided for herein are available to Buyer and shall not extend to any other person.

COMPLIANCE WITH OSHA: Eaton offers no warranty and makes no representation that its products comply with the provisions or standards of the Occupational Safety and Health Act of 1970, or any regulations issued thereunder. In no event shall Eaton be liable for any loss, damages, fines, penalty or expense arising under said ACT.

This manual constitutes proprietary information of Eaton Corp., and is furnished for the customers' use in operating the Durant counter. Reproduction of this material for purposes other than the support of Durant counters or related products is prohibited without the prior written consent of Eaton Corp., Watertown, WI.

In the construction of the Control described herein, the full intent of the specifications will be met. Eaton Corp., however reserves the right to make, from time to time and without proper written notice, such departures from the detail specifications as may be required to permit improvements in the design of the product.

The information included herein is believed to be accurate and reliable; however no responsibility is assumed by Eaton Corp., for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

This equipment is capable of generating radio frequency energy. If not installed and used in accordance with the instructions, this unit may interfere with radio communications.
POWER
Internal battery: 3V, Lithium.
Life expectancy: 5 years +.

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

PHYSICAL
Operation Temperature: 0° to 55°C.
Storage Temperature: -20°C 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.

TOTALIZER
Type: Up/Down Counting.
Digits: 8 digits positive/minus sign and 7 digits negative.
Scaler: 0.0001 to 100.0000.
(0.0000 scales by 100 in the Courier Series).
Decimal Point: 5 positions, programmable.

DC COMMON (Terminal 1)
COUNT INPUTS A & B (Terminals 2 and 3)
Inputs A & B require a quadrature signal with 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: 50 microseconds.
   Min High Time: 20 microseconds.
   (The above times are with a 0 to 5V swing.)
Input Impedance: 2KΩ above 5 VDC.
Voltage Thresholds: Low 0 to 1.2 VDC.
High 2 to 28 VDC.
Max High 28 VDC.

RESET INPUT (Terminal 4)
Resets totalizer 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.