



# QUICK START GUIDE

Mass Coriolis Flowmeters

Rev. 1.12



This Quick Start Guide contains the essential instructions to install, wire and operate your new TRICOR Mass Flowmeter that has been factory calibrated and configured to your specific application. If the configuration of the transmitter requires changes, download complete instructions for reprogramming from the TRICOR website [www.tricorflow.com](http://www.tricorflow.com).

## UNPACKING

The TRICOR Mass Flowmeter consists of a Coriolis Mass Flow Sensor (sensor) which plumbs into the flow line and an electronic control unit (transmitter) which wires to the sensor. There are three basic TRICOR configurations for transmitter mounting: integral field mount, remote field mount, and remote panel mount. The integral field mount transmitter configuration is shown in Figure 1.



Figure 1: Integral Field Mounted Transmitter Configuration

When the supplied transmitter is for remote mounting the shipment consists of the sensor, a transmitter to sensor interconnection cable and the remote transmitter. The remote transmitter will be either the remote field mount type (cast aluminum housing with mounting bracket) or the remote panel mount type (plastic housing with mounting clips) as shown in Figure 2.



Figure 2: Remote Transmitter Configuration (left is remote panel mount, right is remote field mount)

## SENSOR MOUNTING

A typical plumbing installation consists of a supply tank followed by a pump, the TRICOR sensor, and a downstream on/off flow valve in close proximity to the sensor. Mount the sensor so that it will remain full of the process fluid at all times. To maintain a positive head pressure at the sensor, never mount the sensor in the highest point in the flow line. Orient the sensor so that the flow direction arrow points downstream in the direction of flow. Mount the sensor in the process piping using compatible mating flanges and gaskets or compatible threaded connections and thread sealant.

**Horizontal Flow Line:** In a horizontal line (Figure 3) mount the meter with the case upward for slurries or if solids are present (A) or with the case downward for liquids (B).

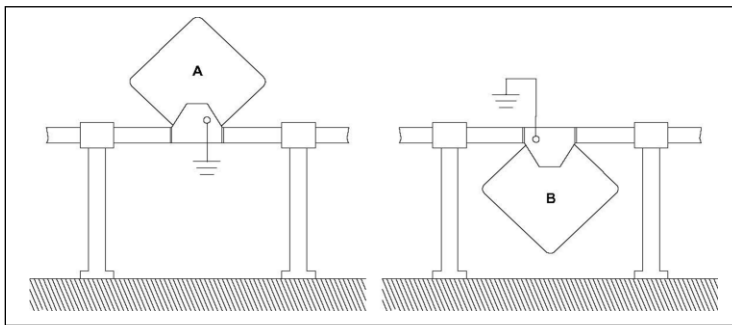


Figure 3: Horizontal Mounting

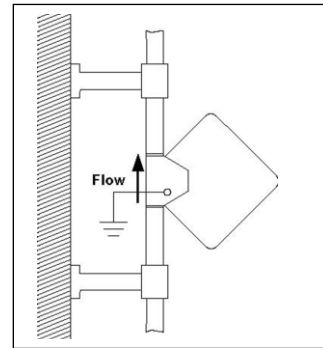


Figure 4: Vertical Mounting

**Vertical Flow Line:** In a vertical flow line, orient the sensor so that the flow is directed upward (Figure 4). In this orientation gas bubbles may accumulate in the smaller sensor flow tubes (TCM300-TCM3000) if the flow rate is very low, which could lead to measurement errors. Horizontal (B) mounting is recommended in this case.

If the piping is well supported, no special supports are required near the sensor. For long piping runs, additional pipe supports are recommended on the piping immediately upstream and downstream from the sensor process connections.

**Caution:** Do not attach pipe supports to the sensor itself. Do not attach mechanical supports to the housing of the sensor.

## TRANSMITTER MOUNTING

**Integral Field Mount:** The integral field mount transmitter can be remounted in any of four 90-degree orientations on the sensor. To do so, remove the four socket head cap screws using a 5mm hex key and rotate the housing to the desired position on the sensor before reattaching with the screws. Additionally, the display module can be unplugged and reinstalled in any of four 90-degree orientations for proper viewing.

**Remote Panel Mount:** The housing requires a square panel cutout of 92 x 92mm (3.625 x 3.625 inches). Remove the mounting clips from the housing by pushing the screw end downward (left side) and upward (right side). Place the housing into the panel cutout, reattach the mounting clips and tighten the screws to contact the panel.

**Caution:** Install the remote panel mount transmitter out of the weather. It is not a weatherproof housing.

**Remote Field Mount:** The remote field mount transmitter comes with an angled bracket for mounting to a panel or a wall using screws.

## TRANSMITTER ELECTRICAL WIRING

### Transmitter-to-Sensor Wiring

To connect a remote transmitter to the sensor, use the supplied sensor interconnection cable before applying power to the unit in order to avoid the error message, "NO SENSOR."

**Remote Panel Mount:** Attach the 9-pin D-subminiature connector to the back of the housing and tighten the retaining thumb-screws.

**Remote Field Mount:** Open the cover of the sensor connection head and feed the free end of the cable through the cable gland on the sensor connection head. Tighten the cable gland to seal it around the cable sheath. Connect the individual colored wires to the terminal block according to Table 1. Reclose the connection head cover, tightening the screw to seal it from moisture.

**Integral Field Mount:** This transmitter comes from the factory already wired to the sensor.

Terminal	Wire Color
1	Red
2	Black w/ Red
3	Blue
4	Black w/ Blue
5	Green
6	Black w/ Green
7	White
8	Black w/ White

Table 1: Sensor to Transmitter Wiring

### Power Supply Wiring

The TRICOR flowmeter requires a regulated power supply of 24VDC  $\pm 20\%$  to operate, with the positive lead connected to terminal 50, the negative lead connected to terminal 51 and the cable shield to terminal 52 (protective earth) of the transmitter. At a minimum, this is the only wiring necessary to operate and test the flowmeter and its display.

### Optional Input/Output Wiring

Use only shielded cable to connect I/O devices to the transmitter. Attach the shield to protective earth at only one end of the cable to avoid current carrying ground loops in the shield conductor.

**WARNING:** *Improper grounding and shielding may lead to poor performance due to electromagnetic interference (EMI).*

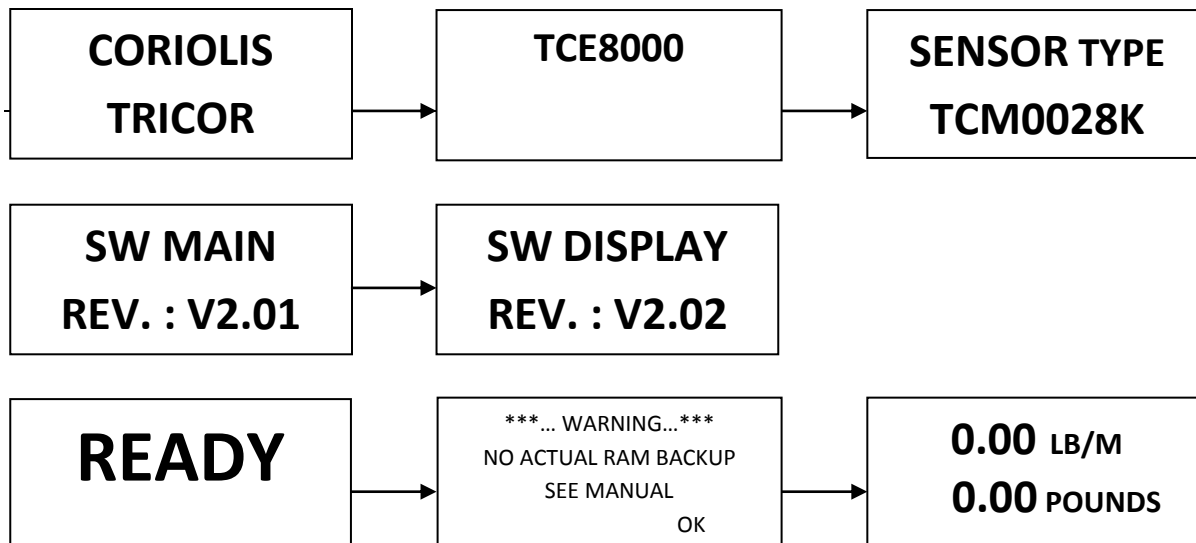
The digital input and output signals are referenced to terminal 8 which is common to the negative power supply. **Note:** *Terminals 8, 20, 51 and 52 are connected inside the transmitter.*

Terminal	Description
1	Passive 4-20 mA loop 1, Positive terminal
2	Passive 4-20 mA loop 1, Negative terminal
3	Passive 4-20 mA loop 2, Positive terminal
4	Passive 4-20 mA loop 2, Negative terminal
5	Active frequency output referred to pin 8
6	Active control output referred to pin 8
7	Active high control input referred to pin 8
8	Ground reference for digital I/O signals
20	Shield for RS-485 interface
21	Line A (+) for RS-485 interface
22	Line B (-) for RS-485 interface

Table 2: Input/Output Wiring

## POWER-ON SEQUENCE

Immediately after power up, the following display sequence appears. Each screen is present for about 2 seconds.



The “\*\*\*...WARNING...\*\*\*” screen appears for 10 seconds if changes to the transmitter configuration were not saved to backup EEPROM memory on the previous power up session. The green “OK” LED flashes with a one second period unless there is an error in which case the red “ERR” LED flashes. If there are no errors and the configuration of the transmitter is appropriate for the application, the flowmeter is operational and ready for its first use with flow and for a zero point calibration.

If the configuration of the transmitter requires changes, download complete instructions on reprogramming from the TRICOR website [www.tricorflow.com](http://www.tricorflow.com).

## FIRST OPERATION AND ZERO POINT CALIBRATION

When you have completed all of the previous steps, the meter is ready for introduction of process flow into the sensor and for a zero point calibration.

**Note:** *On new installations, you must perform a zero point calibration to ensure accurate metering.*

Before initiating a zero point calibration, flow the process fluid through the sensor to ensure that the sensor is full and all air has been purged from the flow tube. If the process fluid is a different temperature than the ambient temperature, flow through the sensor for a sufficient period of time to stabilize the temperature of the sensor tubes to that of the process fluid. To view the tube temperature, switch the display of RATE and TOTAL to that of DENSITY and TEMPERATURE by pressing the “Display” key. Press the “Display” key again to return to the display of RATE and TOTAL.

### Zero Point Calibration Procedure

- Shut off the flow and close the upstream and downstream valves to ensure that the flow rate is truly zero.
- Press and hold the “P” key until the following screen appears:

```

MAIN MENU
ZERO OFFSET
UP   DOWN  EXIT
  
```

- Press the “P” key and the following screen will appear:

```

*ENTER MENU CODE!*
  2206
LEFT  UP   EXIT
  
```

- Press the “UP” key to change 2206 to 2207 then press the “P” key and the following two screens will appear:

```

*  USERCODE  *
  OKAY
  
```

```

START OFFSET
PROCEDURE
SLOW  FAST  EXIT
  
```

- Press the “SLOW” key to initiate zero point calibration.

**Caution:** Do not allow any material to flow through the sensor while the following screens are displayed:

```

MAKE ZERO
OLD ZERO:  x.xxx  uS
NEW ZERO:   uS
  
```

```

*END OF ZERO-POINT*
PRESS INFO TO RETURN
OLD ZERO:  x.xxx  uS
NEW ZERO:  y.yyy  uS
  
```

- The zero point calibration is complete. Press the “Info” key to return to the RATE and TOTAL display. The flowmeter is now ready for use in the application.

## KEYBOARD/DISPLAY FUNCTIONS DURING OPERATION

### Normal Operation

The TRICOR TCE8000 transmitter keyboard and display consists of an LCD graphic display, two LEDs and 4 pushbuttons. When the TRICOR flowmeter is operating properly the LED labeled “OK” will flash

green. With the factory defaults the display will indicate FLOW RATE on the upper line and BATCH TOTAL on the lower line. When viewing this display, reset the BATCH TOTAL to zero by pressing the “Reset” key. Press the “Display” key to view the DENSITY on the upper line and TEMPERATURE on the lower line of the display. Press the “Display” key to toggle back to the FLOW RATE and TOTAL display.

### **Abnormal Operation**

When the LED labeled “ERR” is flashing red, the internal diagnostics of the transmitter have sensed a problem that indicates there may be a measurement error occurring. Press the “Info” key to view the problem that has been sensed and to look at additional parameters that are key to the operation of the unit. Note: Press the “info” key during normal operation to view these additional parameters. The display that will appear is similar to the following:

SA: 140	FRE: 142.74
SB: 140	TOT:0.00
DR: 5.51	ZP: 0.00
PT: 1088.5	RS485:01

These parameters are important when discussing operational problems with a TRICOR service technician and correspond to the following data:

SA is the amplitude of Sensor A in millivolts  
SB is the amplitude of Sensor B in millivolts  
DR is the sensor DRive current in milliamps  
PT is the resistance in Ohms of the Platinum Temperature probe  
FRE is the vibrating tube FREquency in Hz  
TOT is the value of the TOTalizer  
ZP is the Zero offset Point in microseconds

### **Programming Operation**

Programming changes can be made intuitively using the “P” key and the other softkeys. A comprehensive discussion of these functions is beyond the scope of this Quick Start Guide but can be downloaded from the TRICOR website, [www.tricorflow.com](http://www.tricorflow.com).



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