

INSTALLATION & OPERATION MANUAL

IT150N Remote Totalizer

DOC #: MN-150N-B.DOC



LIQUID CONTROLS SPONSLE, INC.

FLOW MEASURING DEVICES AND CONTROLS

A Unit of the IDEX Corporation

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SPECIFICATIONS

TEMPERATURE:	Operating -40 to 85°C Storage -65 to 125°C
INPUT VOLTAGE:	Internal AA Lithium Battery Battery Operating Life – 4 years
INPUT SIGNAL:	Frequency 0-2500 Hz Amplitude 25 mV – 36 V sine or square wave Sensitivity field adjustable Impedance 10K
DISPLAY:	LCD, 8 Digit .3" Characters Totalizer – 8 Digit Totalizer Reset Externally Initiated Input factoring .00000001 – 1.9999 allows totalization in any engineering unit
OUTPUT	Factored pulse output via Open Drain @ 1A
ACCURACY:	Totalizer +/- 1 Count
FEATURES:	Mounts directly on flowmeter Display Reset Externally Initiated
ENCLOSURE:	FM Approved, C.S.A. Certified Class I Groups B, C, D Class II Groups E, F, G Nema 4 Weight 2.5 lbs.

INTRODUCTION

General

The Model IT150N Industrial Remote Totalizer is a battery powered device that provides flow totalization in any engineering unit. Total is displayed via an 8 digit liquid crystal display. Reset of the totalizer is accomplished externally by a magnetic field. This particular feature retains the unit's integrity permitting complete operational control in hazardous environments.

Negatives previously associated with LCD's – poor cold temperature performances, condensation which is a byproduct of heaters and display ghosting have all been eradicated by incorporating a low temperature coefficient LCD (-35°C). All monolithic and discrete devices of the IT150N have temperature specs of -40 to 125°C.

In addition, the IT150N provides 1 digital interface output. The scaled pulse output is an open drain configuration in which the pulse amplitude assumes the level of the host device. One pulse is generated for each increment of the totalizer.

Theory of Operation

The IT150N amplifies and shapes the incoming pulses generated by the turbines response to flow. The amplified pulse train is then scaled and divided to produce a totalized display in the desired engineering unit.

Calibration

Field calibration is accomplished by incorporating a calibration factor based on the turbine K-Factor. A divider switch provides divisional increments of 10X from 1 to 10,000. The calibration factor is entered via 4 BCD switches, a divider switch, and a 0-1 dip switch. The calibration factor range is 0.00000001 – 1.9999.

(SPONSLER, INC., STRONGLY RECOMMENDS THOROUGH REVIEW AND UNDERSTANDING OF THIS MANUAL PRIOR TO INSTALLATION)

INSTALLATION

Inspection

All units are completely assembled, tested & inspected at the factory prior to shipment. Upon receipt of the unit a visual inspection should be conducted to detect any impropriety or damage that may have occurred during shipment. Report any discrepancy to the factory immediately.

Physical

The IT150N Remote Totalizer is meter mounted and should be positioned as practically as possible taking into account display visibility, accessibility, etc. The IT150N enclosure is rated Class 1, Groups B, C, D; Class II Groups E, F, G and Class III Nema 4 and will withstand the harshest environment.

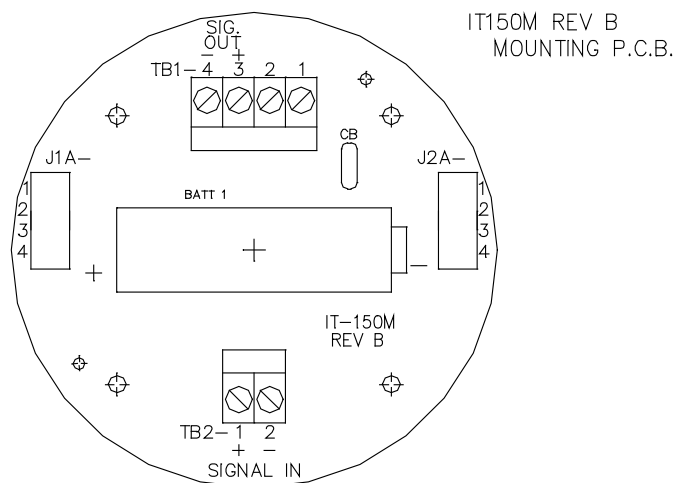
Electrical

The IT150N Remote Totalizer is designed to operate with a single internal AA battery and requires no external wiring for power. Wiring of the digital output can be accomplished in a couple of different methods to fit the application. Shielded cable (Alpha 1710) is recommended to insure adequate noise immunity for the digital signal output.

Signal

A 2 wire twisted pair with molex and tinned terminations are standard. Pin orientation of the molex connector or the tinned terminations is negligible.

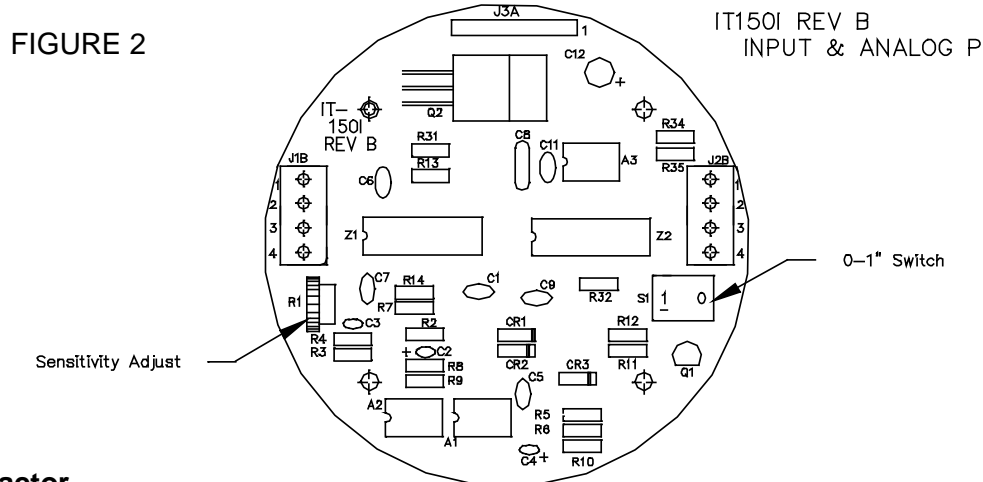
FIGURE 1



CALIBRATION

Sensitivity

The sensitivity adjust R1 is located on the IT150I (Input and Analog) P.C.B. The amplitude of the signal generated by the turbine is proportional to the rate of flow; therefore, sensitivity should be adjusted at the lowest usable flow rate. Rotate R1 completely counterclockwise then slowly rotate R1 clockwise until the display correctly responds then increase R1 slightly clockwise. The nominal R1 position is with the arrow indicating 11 o'clock.



Calibration Factor

The calibration factor is derived from the turbine's K-Factor (Pulses per gallon or other desired engineering unit).

$$C.F. = \frac{\text{Engineering units}}{\text{K-Factor}} \quad \text{Formula \#1}$$

EXAMPLE 1: K-Factor = 250 pulses per gallon
 Engineering Units = gallons
 $\therefore C.F. = 1/250 = .004000$

On the Factoring P.C.B.:

Set S6 #3 'ON' (\downarrow Position) for $\div 100$ (moves decimal point right 2 places)

Set S2@4, S3, 4, 5@0 (.4000)

Set S1 in '0' position (.4000) (On the IT150I P.C.B.)

The electrical accuracy can be verified by injecting a stable frequency @ TB2-1,2 on the Mounting P.C.B. and incorporating the following formula:

$$\text{Total} = \frac{F \times T \times C.F.}{D} \quad \text{Formula \#2}$$

Where F = Frequency in Hz (Frequency = $\frac{\text{K-Factor} \times \text{Flowrate}}{60}$)

T = Time (Duration) of test in seconds

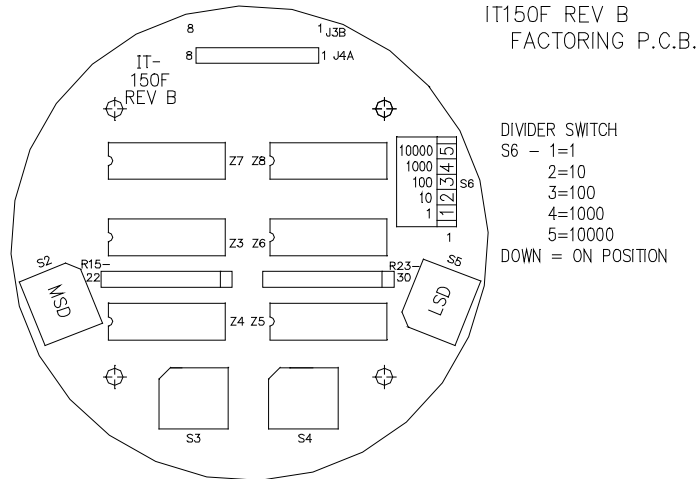
C.F. = Calibration Factor as entered in S1-S5

D = Divider as entered in S6

EXAMPLE #2: F = 500 Hz T = 1 minute (60 sec) C.F. = .4000

$$\text{Total Displayed} = \frac{500 \times 60 \times .4000}{100} = \frac{30,000 \times .400}{100} = \frac{12000}{100} = 120 \text{ in 1 minute}$$

FIGURE 3



Calibration '0-1' Function

The '0-1' function provides enhanced accuracy when totalization encompasses a large quantity or an extended period of time such as SCF produced in a 24 hour period.

The '0-1' function should be incorporated only when both the conditions listed below are met:

- 1) C.F.'s 1st digit right of decimal is 1
- 2) C.F.'s 5th digit right of decimal is not 0

Example #3 Assume a turbine has a K-Factor of 79.58 pulses per SCF and the customer product demand is 520,000 SCF a day

$$\begin{aligned} \text{C.F.} &= 1/79.58 \\ &= .0125659 = .12566 \div 10 \quad \text{Note: Both conditions are met} \end{aligned}$$

Without the '0-1' function:

- Set S6 #2 'ON' (↓ Position) for ÷ 10 (moves decimal point right 1 place)
- Set S2@1, S3@2, S4@5, S5@7 (.1257 rounding fourth digit)
- Set S1 in '0' Position (0.1257) on the IT150I P.C.B.

A usage of 520,000 SCF = 41,381,600 total pulses (520,000 x 79.58) and using the C.F. of S1-S6 the displayed quantity is 520,166 SCF ($\frac{41,381,600 \times .1257}{10}$)

rather than 520,000 for a difference of 166 SCF.

With the '0-1' function:

- Set S6 #3 'ON' (↓ Position) for ÷ 100 (moves decimal right 2 places)
- Set S2@2, S3@5, S4@6, S5@6 (.2566)
- Set S1 in '1' Position (1.2566) on the IT150I P.C.B.

As stated above the 24 hr usage is 520,000 SCF. The displayed quantity is now 520,001 SCF ($\frac{41,381,600 \times 1.2566}{100}$) for a difference of 1 SCF.

Change of Calibration Engineering Units

Assume that liters rather than gallons is the desired engineering unit.

Example # 4 K-Factor = 250 pulses per gallon

Liters = 3.785 per gallon

$$C.F. = \frac{\text{Units per Gallon}}{\text{Pulses per Gallon}} \quad \text{Formula \#3}$$

$$C.F. = 3.785 / 250$$

$$C.F. = .01514 \text{ for display of liters}$$

On the Factoring P.C.B.:

Set S6 #2 'ON' (↓ Position) (moves decimal point right 1 place)

Set S2@1, S3@5, S4@1, S5@4 (.1514)

Set S1 in '0' Position (0.1514) on the IT150I P.C.B.

Note: The '0-1' function was not incorporated because only 1 of the 2 conditions was met- C.F.'s 1st digit right of decimal is 1

Example #5: The Engineering unit is pounds in 10ths CO₂

K-Factor = 250 pulses per gallon

Pounds of CO₂ = 8.470 per gallon

In order to establish 10ths, increase lbs./gal. by a factor of 10

$$C.F. = 84.7/250$$

$$C.F. = .3388$$

On the Factoring P.C.B.:

Set S6 #1 'ON' (↓ Position) (does not move decimal)

Set S2@3, S3@3, S4@8, S5@8 (.3388)

Set S1 in '0' Position (0.3388) on the IT150I P.C.B.

Note: If the gallons per unit volume such as 7.48 gallons per FT³ is known, but not the unit volume per gallon as required to calculate calibration factor; take the reciprocal of gallons per unit volume to derive the unit volume per gallon; i.e. 7.48 gallons per FT³ - 1/7.48 = .13369 FT³ per gallon.

Example #6: The engineering unit is ACF (FT³)

K-Factor = 250 pulses per gallon

ACF = .13369 per gallon

$$C.F. = .13369 / 250$$

$$C.F. = .00053476$$

On the Factoring P.C.B.:

Set S6 #4 'ON' (↓ Position) (moves decimal point right 3 places)

Set S2@5, S3@3, S4@4, S5@8 (.5348 rounding fourth digit)

Set S1 in '0' Position (0.5348) on IT150I P.C.B.

Example #7: Desired Engineering Unit is ACF x 10

K-Factor = 250 pulses per gallon

ACF = .13369 per gallon

In order to establish x 10, decrease ACF/gal by a factor of 10

$$C.F. = .013369 / 250 = .000053476$$

On the factoring P.C.B.:

Set S6 #5 'ON' (↓ Position) (moves decimal point right 4 places)
 Set S2@5, S3@3, S4@4, S5@8 (.5348 rounding fourth digit)
 Set S1 in '0' Position (0.5348) on the IT150I P.C.B.

Field Correction of Calibration Factor

To adjust the calibration factor to reflect the turbine's actual response to the operating conditions, incorporate the following formula:

$$\text{New C.F.} = \frac{\text{Actual Quantity}}{\text{Displayed Quantity}} \times \text{Present C.F.} \quad \text{Formula \#4}$$

Example #8: Actual = 50
 Displayed = 52
 C.F. = .4000
 New C.F. = 50/52 x .4000
 = .9615 x .4000
 = .3846

On the factoring P.C.B.:
 Set S2@3, S3@8, S4@4, S5@6

In the above example, .9615 denotes that the meter is operating 4% fast. Multiplying by the present C.F. (.4000) by the Actual : Displayed Ratio (.9615) effectively reduces the error by decreasing the C.F. 4%.

Example #9: Actual = 52
 Displayed = 50
 C.F. = .4000

 New C.F. = 52/50 x .4000
 = 1.04 x .4000
 = .4160

On the Factoring P.C.B.:
 Set S2@4, S3@1, S4@6, S5@0

In the above example, 1.04 denotes that the meter is operating 4% slow. Multiplying the present C.F. (.4000) by the Actual : Displayed Ratio (1.04) effectively reduces the error by increasing the C.F. 4%.

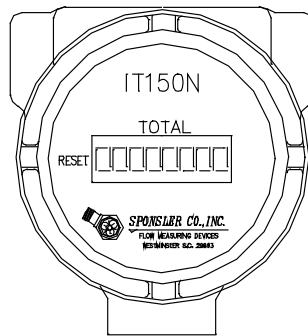
FUNCTION SELECTION

Reset Function

Reset is incorporated to set the Display to 00000000.

Reset is initiated externally by placing a magnet in the proximity of reset S7 located on the Display P.C.B. and indicated on the enclosure label as 'RESET'.

FIGURE 4

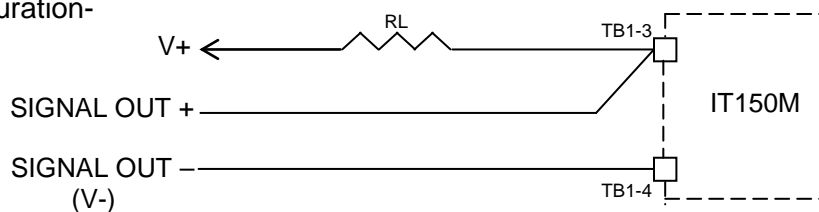


MISCELLANEOUS

Factored Digital Pulse Output

This signal is an open drain configuration which can sink 1A continuously. The maximum drain voltage should not exceed 150VDC (V+). A pull-up resistor must be in series with V+ and TB1-3. The output is a 2ms negative pulse for each increment of the totalizer; i.e. 1 pulse for each count on the LCD.

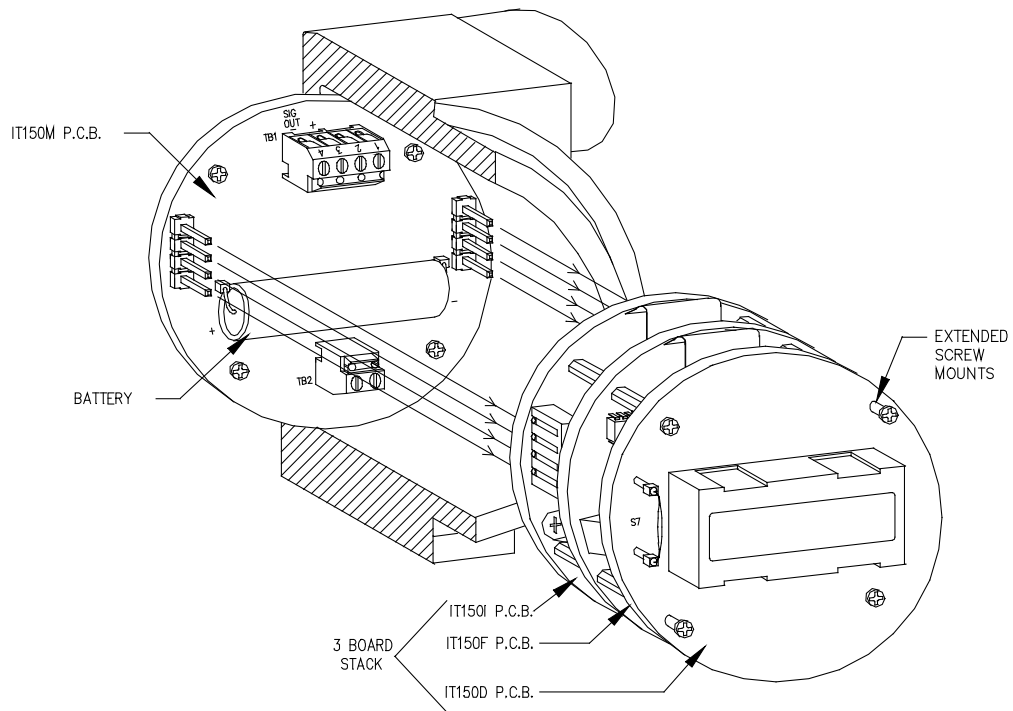
Typical Configuration-



Battery Replacement

The battery is located on the Mounting P.C.B. and inserts into 2 sockets. When installing the battery, it is imperative to OBSERVE POLARITY. Simply pull the 3-board stack (See Figure #5) out of the enclosure, install the battery and reinsert the board stack. The display will be all zeros.

FIGURE 5



This figure illustrates the removal of the 3 board stack from the conduit. Note that the mounting board is not removed.

CAUTION: Do not use the LCD model or S7 as grip points to remove the board stack. Use the extended screw mounts provided.

To put the 3 board stack back in the conduit, align as illustrated and push down.

Dimensional Information

FIGURE 6

