T-PAC

WARRANTY STATEMENT

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T-PAC MANUAL

Introduction
The T-PAC monitors up and down pulses generated by a TPZ transmitter and increments or decrements a user defined level count accordingly. The level count may be monitored by reading a 4 to 20mA output signal or through a Modbus communication protocol. The 4-20mA output has 12 bit resolution making the output capable of proving 4095 different levels. The Modbus protocol can use either the RS232 or RS485 communication standard. Using RS485 allows multiple T-PAC units to be connected together on one communication bus. A single RS232 only line is also provided to key a modem or radio when data is to be transmitted.

Installation
The T-PAC was designed to work in –40deg C to +60deg C in a NON-hazardous area. If the T-PAC is to be mounted in an outside environment the T-PAC will need to be mounted in a NEMA 4 enclosure with the capability of having the T-PAC case mounted on the Phoenix Contact NS-15 Din Rail. Below indicates the function of the pin number as well as a representation of the case pin numbering scheme.

Pin	*Function*
1)	Empty
2)	4-20mA –
3)	4-20mA +
4)	GND
5)	RX (RS232) / TX (RS485)
6)	TX (RS232) / TX (RS485)
7)	+ 12Vdc To 24Vdc IN
8)	GND
9)	Radio Key (RS232)
10)	Pulse Up IP
11)	Pulse Down IP
12)	GND

10	7					4	1
11	8		◎	◎ ◎ ◎		5	2
12	9					6	3
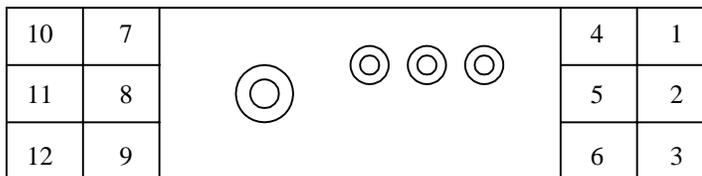
Operation
When power is applied to the T-PAC the unit will not operate unless the power supply voltage exceeds 11Volts D.C. If the power does not reach this voltage the RUN LED will turn on solid and not flash. After reaching 11 Volts the unit will start flashing the RUN LED, output the current level, and start monitoring the TPZ pulse inputs and communications.

TPZ Inputs
An internal counter will increment or decrement, depending which up or down TPZ input is being pulsed, on the falling edge of the pulse. These inputs are pulled high with a 2.2Kohm resistor and require the TPZ unit to pull these signal lines to ground.

Communications
J1 and J2 determine whether Modbus communications is achieved through either a RS232 or RS485 driver.

J1,J2   "A" POSITION =RS232
         "B" POSITION = RS485

RS485 is to be used when multiple T-PAC's are connected up to the same communication bus. A single RS232 only output for radio keying is provided for keying radio's or modems. This signal is conditioned so that multiple T-PAC's may have their keying signals attached together and control a single radio or modem. This signal requires that the two farthest T-PACS are no more then 20ft apart. The keying line goes high whenever the T_PAC is transmitting data. Two different baud rates may be achieved with the T-PAC and may be set with J7.

J7   IN   = 1200 Baud
         OUT   = 9600 Baud

The T-PAC uses Modbus Protocol uses Function 3 to read register values and function 16 to write register values. The registers are all 16 bit and are indicated below.

Register 0 = Current Level Count
Register 1 = 4 mA Level Count
Register 2 = 20mA Level Count

The 4mA to 20mA output is scaled using these three register values. Registers 1 and 2 are immediately backed up to EEPROM when values are written to these registers in case of power failure Each T-PAC has to have its own unique card address when multiple cards are on the communication bus. This is determined by J3 to J6.

Addr.	J3	J4	J5	J6
1	IN	OUT	OUT	OUT
2	OUT	IN	OUT	OUT
3	IN	IN	OUT	OUT
4	OUT	OUT	IN	OUT
5	IN	OUT	IN	OUT
6	OUT	IN	IN	OUT
7	IN	IN	IN	OUT
8	OUT	OUT	OUT	IN
9	IN	OUT	OUT	IN
10	OUT	IN	OUT	IN

A Tx (transmit) and Rx (receive) LED are provided to monitor communications.

4-20mA Output
A 12bit 4mA to 20mA signal is generated to represent the current tank level. This output level is calculatedand updated 10 times a second. The 4mA to 20mA output is sourcing only. This means that the T-PAC provides current for the positive analog input and requires a return or common back to the T-PAC negative terminal. The 4mA to 20mA level is scaled as follows.

Conversion of Actual Level to Milliamps

LH=High Level 20mA
LL=Low Level 4mA
LC=Current Level (Actual Level in Tank)
MO=Milliamps Out

$$\frac{16mA}{LH-LL} \times (LC-LL) + 4mA = \text{Milliamps out from T-Pac}$$

Conversion of Milliamps to Actual Level

$$(MO - 4mA) \times \frac{LH - LL}{16mA} + LL = (actual) \text{ Level in Tank}$$

Manual Count Switch

A manual count switch is provided so the operator can adjust the current level without having to set up the communication interface. This two position switch will either increment or decrement once a second depending the direction the switch is toggled. Because it may be desirable to substantially change the value the counts will be incremented or decremented 10 counts a second after 10 seconds.

Power Fail mode

The T-PAC goes into a power fail mode when the power supply voltage drops below 10VDC. The current level count to immediately saved to EEPROM and the RUN LED will turn on solid. The microprocessor will then wait until power has been restored above the 11VDC level until resuming operations. Any pulses generated by the TPZ will be ignored in the Power Fail mode.

SPECIFICATIONS / FEATURES

Power:	11VDC to 28VDC, internally fused at 250mA
Ambient Temperature:	-40 deg. C to +60 deg. C
Humidity:	5% to 95% non-condensing
Communication Protocol:	Modbus
Communication Drivers:	RS232, RS485
Baud Rates:	1200,N,8,1 or 9800,N,8,1
4mA-20mA Output:	Sourcing, 12 bit resolution, updated 10 times a second
	Accuracy = +/-0.1%
Led Indicators:	RUN, Tx Data, Rx Data
Case Size:	4 ½" x 3 7/8" x 11/16"