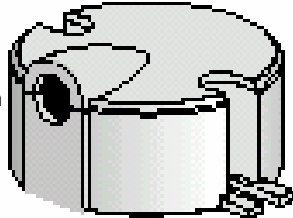# EXTECH INSTRUMENTS

INSTRUCTION MANUAL

Model 405000
Universal two-wire Transmitter

- J/K thermocouple or RTD inputs
- Configurable INPUT and RANGE
- 4 - 20mA two-wire output connection
- Eliminates the need for compensation & extension wire
- ABS plastic rugged construction

1. INTRODUCTION

Congratulations on your purchase of Extech's 405000 Universal Two-wire Transmitter. This professional device, with proper care, will provide years of safe reliable service. The Model 405000 is a configurable 2-wire 4-20 mA output temperature transmitter for mounting in thermocouple or RTD connection heads or on its own (indoor use only).

2. SPECIFICATIONS

Input	J , K thermocouples, Pt 100Ω RTD (Section 8)
Output	4-20mA two-wire
Input impedance	1 Mohm
Excitation current	0.23mA
Circuit break protect	Upscale >30mA
Power supply	12 to 45VDC (polarity protected)
Load capability	600 ohms max. at 24V
Accuracy J or K thermocouple	0.1% full scale
Accuracy RTD	0.1 to 0.25% full scale
Linearity	0.06% full scale
Calibration	Zero and Span potentiometer adjustments
Zero drift	± 0.02% / ^{o}C
Voltage supply effect	± 0.002% / V
Cold junction compensation	32 to 122°F (0 to 50°C)
Operating temperature	-4 to 158°F (-20 to 70°C)
RFI immunity	CE certified
Housing and rating	ABS plastic with protective cover, Nema 2 (IP-42)
Dimensions	1.7" (43mm) dia., 1" (26mm) high
Mounting holes	1.3" (33mm) to 1.9" (49mm)
Weight	0.8oz. (25g)

3. DESCRIPTION

1. Protective Cover
2. Mounting hole
3. Zero/Span Potentiometers
4. Wire connections
5. Range solder bridges
6. Circuit removal screw
7. LED (increases intensity as transmitter output increases)
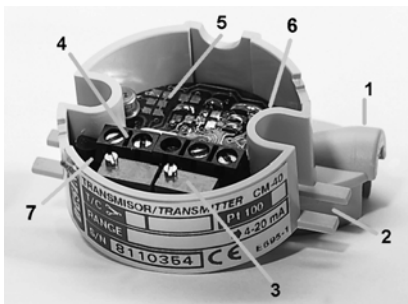
4. MOUNTING

The 405000 can be mounted in connection heads with a distance between holes of 1.30 to 1.81 in. (33 mm to 46 mm.) #6 (M4) screws with a maximum head diameter of 0.27 in (6.8 mm) should be used
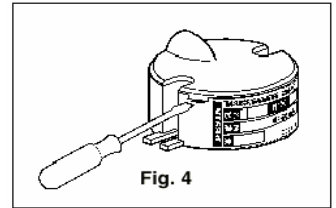

Fig. 4

5. INSTALLATION

A) Check that the temperature probe's measurement range matches the range for which the 405000 is configured. To reconfigure see Sections 7 and 8.
B) The mounting head must have a distance of 1.30 in (33 mm.) min. between holes. The internal diameter of the housing must be at least 1.69 in (43 mm).
C) For heads with 1.69 in. (43 mm) diameter housings, cut the screw slots. For bigger heads, cutting is not necessary. (**Fig. 3**).
D) Mount the 405000 so that the wires easily fit through the base and so that the signal cable can fit through the opening between the lid and the body.
E) Assure the polarity of the sensor wires and of the signal line and check that the screws of the terminal block are tight.

CAUTIONS: Avoid loose wires that could touch the solder jumpers. Replace the protective cover before closing the connection head. Avoid corrosive steam, leaks or direct moisture, use at least IP-54 heads (NEMA 3). Avoid temperatures over 125 °F (50 °C). Avoid vibrations and protect from electro-magnetic radiation, radio frequencies, microwaves, high voltage, etc.
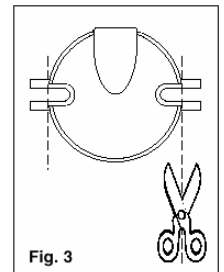

Fig. 3

6. WIRING

VERY IMPORTANT: Check that the temperature probe's measurement range matches the range for which the 405000 is configured. In the event that reconfiguration is necessary see Sections 7 and 8. Open the 405000 by removing the lid (**Fig. 4**) to access the terminal block. Refer to **Fig. 5** and the text below for terminal connection information.

Fig. 5

RTD Pt 100 sensors:
   3-wire: Connect RTD to terminals 1, 2 and 3 (RTD common wires connect to 1 and 3))
   4-wire: Leave one wire unconnected and connect as a 3-wire sensor described above.
   2-wire: Connect RTD to terminals 2 and 3 (short terminals 1 and 3).
THERMOCOUPLE Sensors:
   Connect thermocouples to terminal 1 (-) and terminal 2 (+)
IMPORTANT: Connect the thermocouple wire directly to the 405000 terminals or use thermocouple extension wire for the given type of thermocouple if necessary.
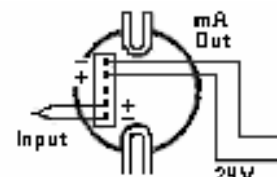**NOTE:** Do not ground the temperature sensor and the power supply. Ground only one or the other to avoid ground loop errors.

4-20mA Output: Available on terminals 5 (--) and 4 (+).

Status LED: As the input to the transmitter increases so does the intensity of the red LED.

Typical Application:
   Wiring for a typical temperature transmitter application.

7. CONFIGURATION

The INPUT and RANGE of the 405000 transmitter can be reconfigured by opening or soldering internal jumpers **(Fig. 6)**. J-type thermocouples (Fe-Const) have 4 ranges, K-type thermocouples (NiCr-NiAl) have 3 ranges, and Pt 100 RTDs have 40 ranges. See Table of ranges in next section.

Select Thermocouple or RTD input

1) Remove the 405000 cover (**Fig. 4**), to access the printed circuit.
2) Remove the printed circuit from the housing by connecting two wires to terminals 4 & 5, removing the circuit board removal screw, and pulling the two wires to free the circuit.
3) Select RTD or Thermocouple via Jumper No. 2 **(Fig. 6)**, located between the terminals. For **RTD (Pt 100)** inputs**,** open Jumper No.2 and for **Thermocouple (T/C)** inputs close Jumper No.2.
4) For specific range configurations and Jumper locations, refer to the Table in the next section noting which jumpers are to be opened or soldered. A black dot indicates that that jumper must be soldered (refer to **Fig. 6** below for Jumper locations).

8. CALIBRATION

1) Apply the minimum input for the desired range to the appropriate input terminals (depending upon the input type). Adjust the ZERO potentiometer until 4.00 mA appears on output terminals 4 and 5.
2) Apply the maximum input for the desired range to the appropriate input terminals (depending upon the input type). Adjust the SPAN potentiometer until 20.00 mA appears on output terminals 4 and 5.
3) Repeat steps 1 & 2 until readings are within the desired accuracy.
4) Apply intermediate range values to check linearity.
5) Mark the transmitter's label with the sensor type, range and the configuration date.

Measurement Range \ Solder Bridge Table

°F , °C	RTD Pt 100 ohms													
	1	2	3	5	7	8	9	10	11	12	13	14	15	16
-150/-60, -100/-50	•						•	•	•		•	•	•	•
-150/32, -100/0	•						•	•	•			•	•	•
-150/120, -100/50	•						•	•	•	•		•	•	•
-150/210, -100/100	•						•	•	•		•		•	•
-150/300, -100/150	•						•	•	•				•	•
-150/390, -100/200	•						•	•	•		•	•		•
-150/480, -100/250	•						•	•	•	•		•		•
-150/570, -100/300	•						•	•	•	•	•			•
°F , °C	1	2	3	5	7	8	9	10	11	12	13	14	15	16
-60/32, -50/0	•								•		•	•	•	•
-60/120, -50/50	•								•			•	•	•
-60/210, -50/100	•								•	•	•		•	•
-60/300, -50/150	•								•		•		•	•
-60/390, -50/200	•								•				•	•
-60/480, -50/250	•								•		•	•		•
-60/570, -50/300	•								•	•		•		•
-60/660, -50/350	•								•	•	•			•
°F , °C	1	2	3	5	7	8	9	10	11	12	13	14	15	16
32/120, 0/50	•							•			•	•	•	•
32/210, 0/100	•							•				•	•	•
32/300, 0/150	•							•		•	•		•	•
32/390, 0/200	•							•			•		•	•
32/480, 0/250	•							•					•	•
32/570, 0/300	•							•			•	•		•
32/660, 0/350	•							•		•		•		•
32/750, 0/400	•							•		•	•			•
°F , °C	1	2	3	5	7	8	9	10	11	12	13	14	15	16
210/300, 100/150	•						•				•	•	•	•
210/390, 100/200	•						•			•		•	•	•
210/480, 100/250	•						•			•	•		•	•
210/570, 100/300	•						•				•		•	•
210/660, 100/350	•						•						•	•
210/750, 100/400	•						•				•	•		•
210/840, 100/450	•						•			•		•		•
210/930, 100/500	•						•			•	•			•

°F , °C	Type-J Thermocouple													
	1	2	3	5	7	8	9	10	11	12	13	14	15	16
32/390, 0/200	•		•	•	•							•	•	
32/750, 0/400	•		•	•	•								•	
32/1110, 0/600	•		•	•	•							•		
32/1470, 0/800	•		•	•	•									

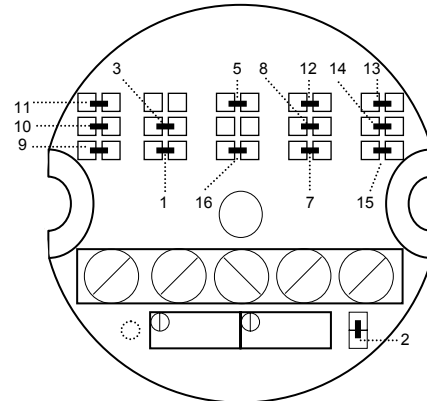| °F , °C	Type-K Thermocouple													
	1	2	3	5	7	8	9	10	11	12	13	14	15	16
32/1110, 0/600	•	•	•	•	•					•	•	•		
32/1470, 0/800	•	•	•	•	•						•			
32/2190, 0/1200	•	•	•	•	•									

Fig. 6

9. CALIBRATION / REPAIR SERVICES

Extech offers complete repair and calibration services for all of the products we sell. For periodic calibration, NIST certification or repair of any Extech product, call customer service for details on services available. Extech recommends that calibration be performed on an annual basis to insure calibration integrity.

10. WARRANTY

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies on sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 for authorization. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit.

This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product.

The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.