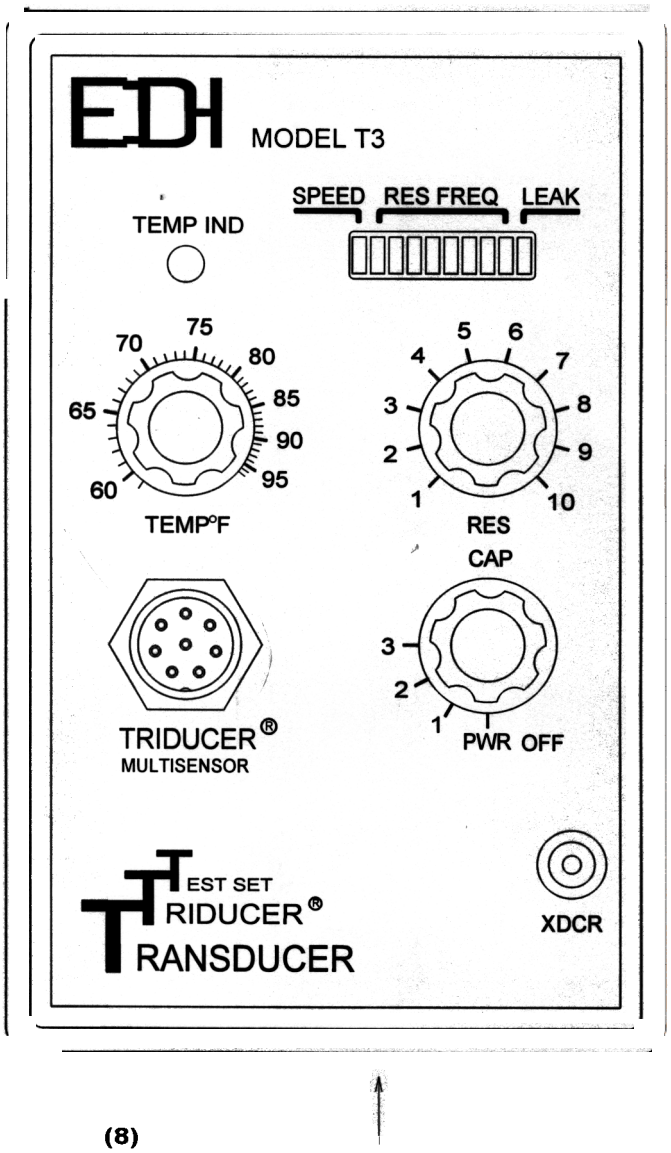
T3 USERS MANUAL



(1)
TEMPERATURE LED

(2)
TEMPERATURE READOUT

(3)
MULTIFUNCTION TRANSDUCER CONNECTOR

LED BARGRAPH DISPLAY

(5)
TRANSDUCER RESONANCE RESISTANCE CONTROL

(6)
TRANSDUCER RESONANCE CAPACITANCE SELECTOR

STANDARD TRANSDUCER CONNECTOR

(8)
BATTERY COMPARTMENT REVERSE SIDE

1.0 CONTROL FUNCTIONS

Refer to the cover figure for the location of the controls on the Model T3.

1.1 (1) TEMPERATURE LED.

The Temperature LED will light whenever the power switch (5) is on. If a multi-sensor transducer is not connected to the 8-pin multi-sensor transducer connector (3), the led will be green. When a multi-sensor transducer with a functioning temperature sensor is connected, the LED will change color from green to red when the temperature readout is rotated about the sensor's ambient temperature.

1.2 (2) TEMPERATURE READOUT.

The Temperature Readout indicates the temperature of the sensor in a multi-sensor transducer. As this knob is rotated, the Temperature LED (1) will change color. A green LED indicates that the multi-sensor transducer temperature is lower than indicated, and a red LED indicates that the multi-sensor transducer temperature is higher than indicated. The temperature is read at the point where the LED changes color.

1.3 (3) MULTIFUNCTION TRANSDUCER CONNECTOR.

The 8-pin connector is used for testing transducers with speed, temperature, and depth functions or combinations thereof. This connector is specifically wired for the standard AIRMAR® TRIDUCER® Multi-sensor #91-002. Please refer to Figure 3 for the pin-out diagram.

1.4 (4) LED BAR-GRAPH DISPLAY.

The Bar-graph Display is divided into 10 sections. The left most LED tests the speed sensor in multi-sensor transducers, and the right most LED illuminates if any galvanic leakage path exists in a transducer or its associated cabling.

The 8 LED's in the center of the display indicate the resonant frequency points of the transducer's element. The frequency ranges from 10 to 500 KHz, increasing from left to right.

1.5 (5) TRANSDUCER RESONANCE RESISTANCE CONTROL.

This control is used to find transducer element resonant points. It is a 1000 ohm potentiometer that forms part of an RC bridge circuit in conjunction with the Transducer Resonance Capacitance Selector (6). Figure 3 illustrates this concept. In use, this control is rotated until only one or two of the resonant frequency LEDs illuminate, indicating a good transducer element.

1.6 (6) TRANSDUCER RESONANCE CAPACITANCE SELECTOR.

This control is the power switch and also selects the amount of capacitance used in the RC bridge circuit (refer to Figure 3). The setting of this switch is dependent on the capacitance, and therefore, the size of the transducer. It is used in conjunction with the Transducer Resonance Resistance Control (5). In use this control is sequentially placed in positions 1 through 3 while the Resistance Control (5) is varied throughout its range to indicate transducer resonance points.

1.7 (7) STANDARD TRANSDUCER CONNECTOR

This is used to connect to standard transducers. Use the supplied test cable to connect to the transducer's wires.

1.8 (8) BATTERY COMPARTMENT.

The 9V battery is located in the lower back side of the case under a sliding cover. An alkaline type is recommended for long service life.

2.0 OPERATING THE MODEL T3

2.0.1 OPERATION WITH A STANDARD TRANSDUCER.

Turn CAP (5) knob to position 1. The Temperature LED (1) should show a green light. Plug the transducer into the Standard Transducer Connector. If necessary, make up an adapter cable to mate with the RCA pin jack.

2.0.2 LEAKAGE CHECK

Check the LEAK indicator on the far right side of the LED Bar-graph Display (4). If it is on, the transducer or cable is damaged and should be replaced.

2.0.3 RESONANCE CHECK

Rotate the RES (5) knob throughout the range while observing the RES FREQ LEDs on the bar-graph. There should be a point where one or two LED's will brightly light. If this point can't be found, advance the CAP (6) knob to position 2 and again rotate the RES (5) knob slowly throughout its range. If a resonant condition can't be found, then try the above with the CAP (6) knob on range 3. If no resonant point is found, then the transducer element or the associated cabling is defective and must be replaced.

For most transducers, CAP range 2 will be the range used. Very small transducers will use range 1, while large multi element low-frequency transducers may use range 3. Refer to figure 4 for typical resonance displays.

2.1.0 OPERATION WITH MULTIFUNCTION TRANSDUCERS.

Turn CAP (5) knob to position 1. The Temperature LED (1) should show a green light. Plug the multi-sensor transducer into the 8-pin multi-sensor transducer connector on the T3.

2.1.1 LEAKAGE CHECK

Check the LEAK indicator on the far right side of the LED Bar-graph Display (4). If it is on, the transducer or cable is damaged and should be replaced.

2.1.2 TEMPERATURE MEASUREMENT.

Rotate the Temperature Readout (2) to the point where the Temperature LED changes color, and read the temperature at that point. If the LED will not change color, the transducer's temperature sensor is either defective, or its temperature is outside of the measurement range. A green LED indicates that the sensor is open or too cold, and a red LED indicates that the sensor is too hot or shorted.

2.1.3 SPEED TEST

Spin the speed pickup paddle on the multi-sensor transducer and observe the SPEED LED on the leftmost side of the bar-graph display (4). The LED should flash on and off as the paddle rotates. If the LED stays on, the speed pickup switch is shorted, and if the LED stays off, the speed pickup or associated cabling is open.

2.1.4 RESONANCE CHECK

Testing the transducer element for resonance is done in the same manner as described above under section 1.2.

3.0 THEORY OF OPERATION

BRIDGE CIRCUIT

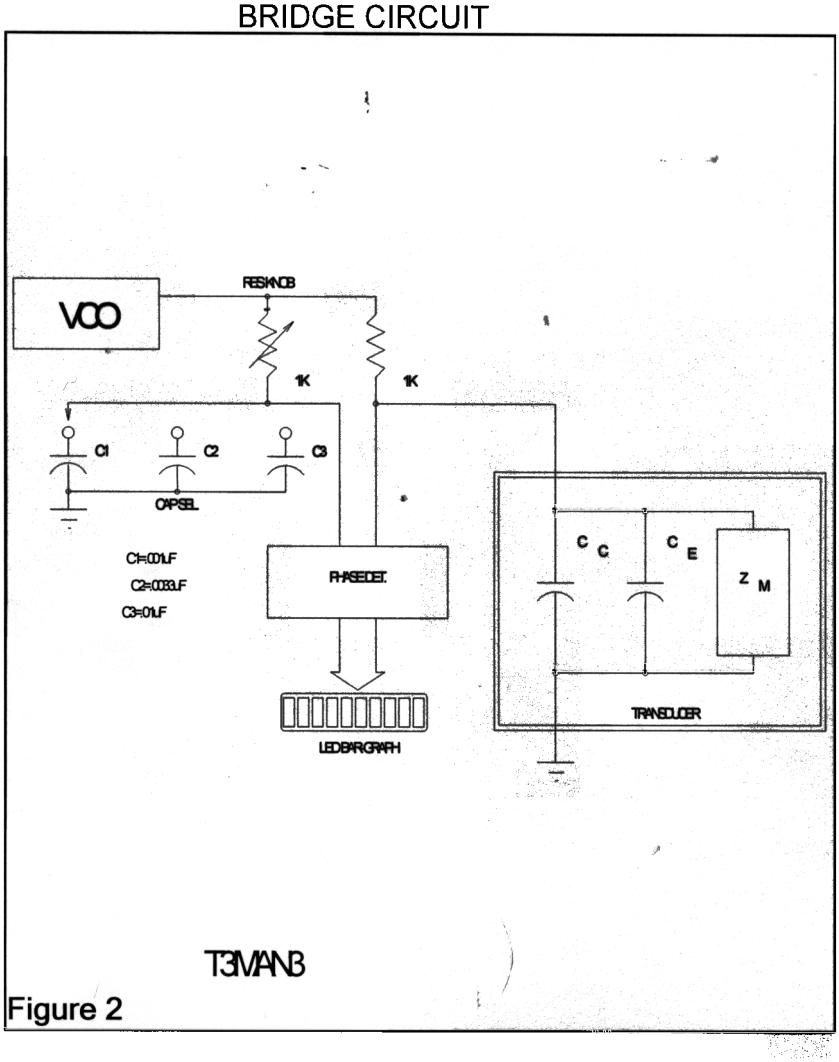


Figure 2

The T3 utilizes a modified Wheatstone bridge with a sensitive phase detector used in place of the usual amplitude detector. The VCO drives the top of the bridge through the RES control and the fixed 1k resistor. The lower left leg connects to the CAP switch and allows three values of capacitance to be selected. The lower right side of the bridge connects to the transducer. The transducer is mainly capacitive due to the cable capacitance, C_C, and the element capacitance, C_E. The function of the CAP switch is to closely match the sum of C_C and C_E so that they will cancel. This leaves the motional impedance Z_M, which results from the physical movement of the element. The phase detector samples the phase of the VCO across the CAP switch and the transducer. If Z_M is not present, the phase difference at the detector will either lead or lag across the entire frequency range of the VCO. However, when the element vibrates, a counter EMF is generated which will momentarily reverse the lead-lag of the phase across the detector near the point of resonance. This momentary reversal of the phase is recognized by the phase detector and flashes the LED corresponding to that frequency, thus indicating that the transducer is working.

4.0 CONNECTOR PIN-OUT

The wiring diagram of the 8-pin multi-sensor transducer connector is shown in the accompanying figure.

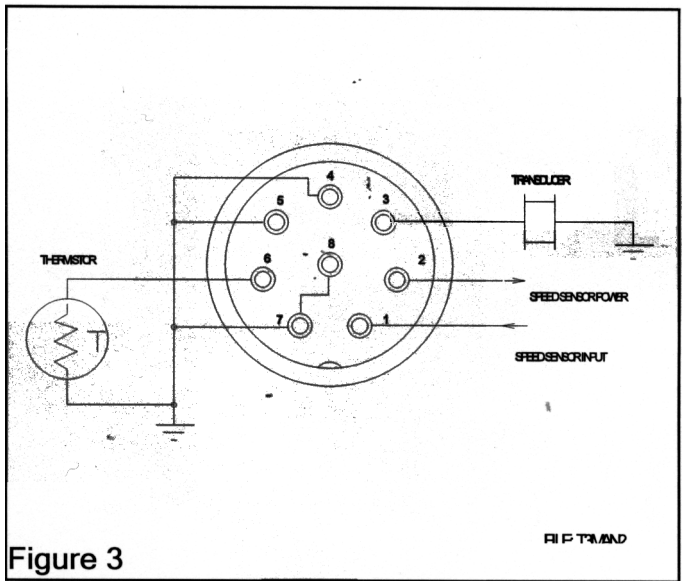


Figure 3

The temperature sensor (thermistor) is nominally 10k ohms at 77°F. A quick test of the T3's temperature calibration may be done by placing a 10k 1% resistor between pins 6 and 7. Pin 2 is the power supply for the Hall device speed sensor. Pin 1 is the speed input, and will light the speed LED when grounded. The transducer connects to pin 3. The LEAK LED may be tested by placing a 2 Meg ohm resistor from pin 3 to 4. The transducer (pin 3) also connects to the center pin of the Standard Transducer Connector (7).

5.0 LED BAR-GRAPH

This figure shows some typical results from checking transducer resonance as shown on the display.

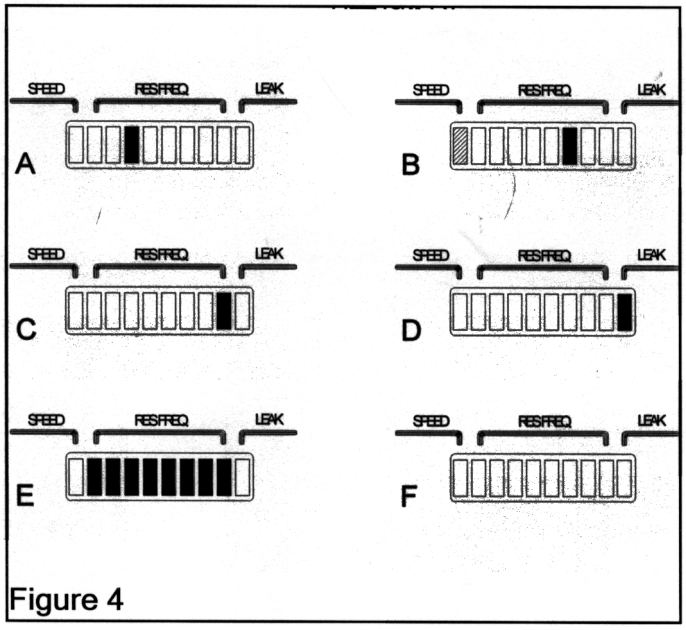


Figure 4

(A) Shows a good 50 KHz transducer.

(B) Shows a good 200 KHz multi-sensor transducer with the speed sensor flashing.

© Shows a good 455 KHz transducer.

(D) Shows a leaky transducer. This transducer may still work but it will certainly fail soon.

(E) Shows a bad transducer.

(F) Shows a bad transducer.

SPECIFICATIONS

T3 MULTIFUNCTION TRANSDUCER TESTER SPECIFICATIONS:

Transducer type:	Piezoelectric.
Frequency range:	10-500 KHz.
Leakage test:	LED on for less than 2 Meg Ohms.
Speed test:	LED on for < 1-2 VDC.
Temperature range:	59-97° Fahrenheit.
Accuracy:	5% at 77°F.
Power:	9 VDC @ 20 mA.
Battery:	9V transistor radio type (#216). Alkaline type recommended for longer life.

7.0 ACCESSORIES FOR THE MODEL T3

7.1 Test Lead

A 3 foot test lead with an RCA pin plug on one end and clip leads on the other end is available. Order part number T3-TL36.

7.2 Calibration Plug

A calibration plug for the temperature (77°F), speed, and leakage indicators is available. Order part number T3-CAL77.

8.0 WARRANTY.

Unit will be repaired free of charge for one year from date of purchase providing there is no water damage or other evidence of improper use or handling. Purchaser must ship unit prepaid to address below; EDI will pay the return freight same way. Please enclose a note describing the problem so we may expedite your repair.

For repair or calibration ship to:

Electronic Devices, Inc.
3140 Bunch Walnuts Road
Chesapeake, VA 23322
757-421-2968

I wish to thank you for purchasing our product. If you have any questions regarding the operation of this or any of our other products, please call me at (757) 421-2968 between 8:30 AM and 5 PM EST.

Sincerely,

Ray Kauffman
President
Electronic Devices Inc.
www.dsts.com