

# USERS MANUAL

## TT-1 Transducer Test Set

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ELECTRONIC DEVICES INC.

P.O. BOX 15037, CHESAPEAKE, VA 23328 • PHONE (757) 421-2968 • FAX (757) 421-0518

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## TT-1 TRANSDUCER TEST SET

The TT-1 transducer test set will identify leaky transducers, indicate the degree of activity of the element, and will aid in the identification of the operating frequency of the transducer. In addition, it can be used to provide an accurate "signature" of a newly installed transducer to which the technician can later refer to help determine if any degradation of the transducer has occurred such as moisture leakage, surface damage or barnacle encrustation.

Basically, the TT-1 is a R-C bridge combined with a very sensitive phase detector as shown in **Figure 1**. The two upper knobs control the amount of resistance and capacitance on one side of the bridge circuit. A fixed internal resistor along with the transducer element and associated cable capacitance form the other leg.

Referring to **Figure 2**, it can be seen that the actual impedance of the transducer is in parallel with the cable and element capacitances,  $C_c$  and  $C_e$ . These are usually fairly large (up to .01 uf) and tend to swamp out the changes in impedance that occur at resonance due to the motional element impedance  $Z_m$ . As  $C_c$  and  $C_e$  are fixed values, they can be nulled out with the RES and CAP controls. The motional impedance varies when the element actually vibrates or is in motion. This variation in the motional impedance causes a small change in the overall value of capacitance as seen at the end of the transducer cable. The highly sensitive phase detector used in the TT-1 responds to these phase changes by turning the phase lamp on or off.

Due to the physical characteristics of transducers, they will usually resonate at 3 or more frequencies which will not necessarily be harmonically related. This causes the difficulty in positively determining the operating frequency of an unfamiliar transducer.

Generally the correct frequency will be the highest at which a phase change can be detected and, in addition, the frequency over which the change occurs is broader as the transducer will be coupling energy to the water, therefore lowering its Q.

### OPERATION OF TT-1 TRANSDUCER TEST SET

Connect the transducer to be tested to the XDUCER jack on the TT-1 using the supplied cable. Turn the TT-1 on and select CAP range 1 using the upper left knob. If the leakage light comes on, this indicates that the resistance is less than 1.8 Meg ohms and the transducer should be replaced.

Set the frequency knob to the lowest range by turning it maximum ccw. At this point, the phase light may be on or off. This has NO significance as the light only responds to a CHANGE of phase which is indicated by a TRANSITION from off to on or vice-versa.

To null out the cable and element capacitance, rotate the RES knob throughout its

range and locate the point at which a change in the phase indicator occurs. If the phase indicator will not change states throughout the range of the RES control or the transition

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point is near the end points of the RES Control, select the next value of CAP with the upper left control.

Again, rotate the RES Control until a change of state is noted in the phase light. If necessary repeat the above for CAP range 3. Leave the RES control at the transition point and sweep through the frequency range with the FREQ knob, noting the points at which the Phase indicator changes.

Reduce the sensitivity by rotating the RES Control a half division above or below the transition point and again sweep through the frequency range. Note that the number of phase changes have been reduced.

Keep reducing the sensitivity, as in the above paragraph, until the minimum number of phase transitions occur. The operating frequency of the transducer will usually be indicated by the highest or broadest frequency transition point.

#### ACTIVITY TESTS OF TRANSDUCERS

If a frequency counter is connected to the COUNTER jack at the lower left corner of the TT-I, an accurate record of the resonance points vs. frequency can be made for later comparison.

The setting of the RES and CAP controls must also be recorded at this time. This will give a "signature" for the particular installation and will be very helpful in diagnosing any later problems with the sonar system.

The high degree of sensitivity of the TT-I to transducer loading may be easily shown by setting the frequency at the edge of a phase transition point and then pushing firmly on the face of the transducer with the palm of your hand. This will cause the phase lamp to change states as you vary the pressure of your hand.

The frequency at which the transducer shows the greatest sensitivity to hand pressure is another aid to finding the proper operating frequency as it indicates energy transfer is taking place.

For repair, please enclose a note describing the problem and ship to:

ATTN: Service Department  
Electronic Devices, Inc.  
3140 Bunch Walnuts Road  
Chesapeake, VA 23322

