

THE PROGRESSIVE ELECTRONICS, INC.
MODEL 210 RESISTANCE FAULT METER

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1. GENERAL

1.01 PURPOSE

(A) This section provides information on the description and operation of the Progressive Electronics, Model 210, Resistance Fault Meter (Figure 1).

(B) The Model 210 is a resistance fault meter that digitally displays distance to a fault or strap. It is designed for use on telephone cable and service wire by installation, maintenance, loop, and cable repair technicians. The Model 210's simple operation allows even inexperienced telephone trouble shooters to be successful in locating high resistance shorts, grounds, and

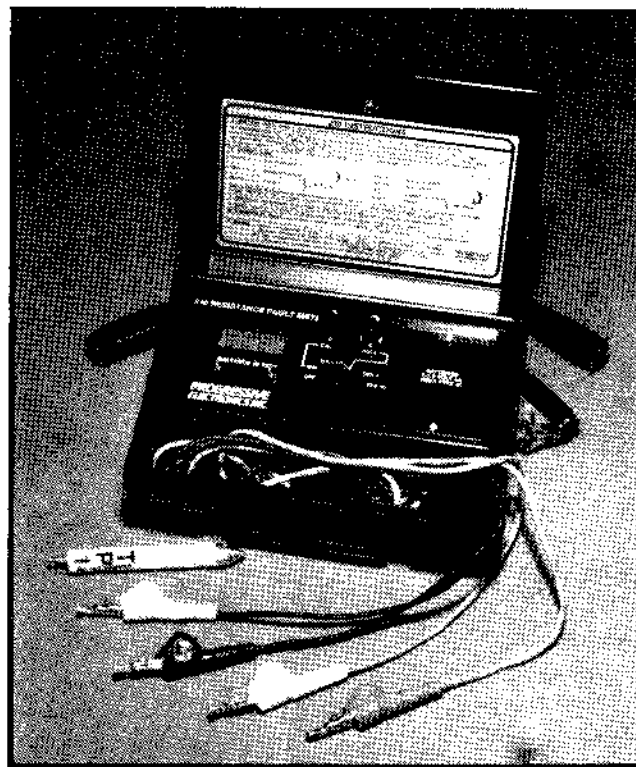


Figure 1 Model 210 Resistance Fault Meter

crosses while in the presence of foreign voltages.

(C) The Model 210 is internally preset to a standard temperature value. For more precise readings, the temperature probe (included) should be used.

2. DESCRIPTION

2.01 The Progressive Electronics Model 210 is powered by eight (8) "AA" cells with a battery life of approximately 100 hours. The unit is housed in a durable case measuring 7½" x 3½" x 10" and weighs 2 lbs. 14 oz.

2.02 The temperature probe, TP-1 measures 5½" in length and 5/8" in diameter and weighs less than 2 oz. The tip is constructed of aluminum for thermal conductivity, the body is made of high impact plastic and the two posts are stainless steel. The red and white test leads are connected to the posts during the calibration procedure.

3. OPERATION

3.01 BATTERY TEST

- (A) Replacement of the eight (8) 1.5 volt AA cells is only necessary when the symbol "BAT" appears on the meter (see MAINTENANCE, Field).

3.02 CALIBRATION

- (A) The Model 210 is calibrated to any given gauge at 68 degrees fahrenheit by connecting the red and white test leads to the two posts located under the LCD display meter (Polarity is not a factor).
- (B) For precise readings, the temperature probe (TP-1) should be used. Connect the red and white test leads to the two probe posts (Polarity is not a factor). Place the probe in the ground as close to the cable depth as possible or in aerial applications, let the TP-1 adjust to the ambient temperature for a few minutes.
- (C) If the cable is in the sun, wrap the temperature probe with black tape to allow for the increased temperature inside the cable. The temperature probe allows the 210 to be calibrated to a known gauge at a known temperature.
- (D) Turn the control knob to the DSx1 position, then rotate the calibrate (CAL) knob to the corresponding value assigned to the gauge of wire as follows:

GAUGE	VALUE
• 19	1566
• 22	787
• 24	493
• 26	308

- (E) With the Model 210 calibrated to the correct temperature and gauge, disconnect the red and white test leads from the posts of the temperature probe and connect all the clips to the conductors under test as shown in Figures 2 and 3.

3.03 SINGLE PAIR HOOKUP

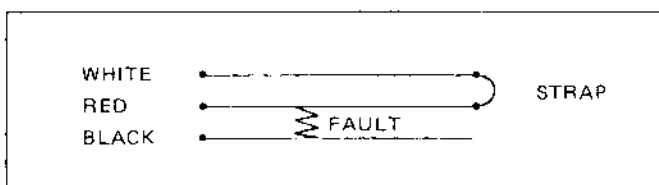


Figure 2 — With One Good Conductor

3.04 TWO PAIR HOOKUP

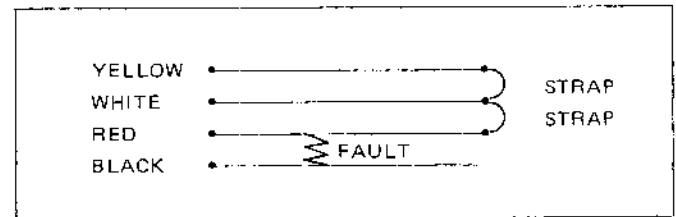


Figure 3 — With Spare Pair

3.05 DISTANCE TO STRAP

- (A) Once the test leads are connected to the conductors under test and the strap is in place, the distance to strap reading will be displayed in feet. If a one (1) appears in the left side of the meter, place the function switch in the DSx10 position. The new reading should be multiplied by 10. If a one (1) reappears, the distance to strap cannot be read (over 19999 feet). If you know that the distance to the strap is less than 19999 feet and a one (1) is displayed, there is a bad connection at the strap or at the red and white test leads.

NOTE: Distance to Fault measurement can still be read accurately up to 19999 feet even if Distance to Strap is over-ranged (19999) but is known to be under 100000 feet.

3.06 NULL

- (A) After reading the Distance to Strap, place the function switch in the "NULL" position. Adjust the nulling knob so that the display reads 001 then slowly back to 000. (Clockwise adjustments give positive readings and counter-clockwise adjustments give negative readings.) If the meter will not null (000), the resistance is too high to read.
- (B) High resistance faults (over one mega-ohm) can be made readable by adding battery in series with the black clip. When measuring a ground fault, connect a 45-90 volt battery negative to the black clip, and battery positive to ground. When measuring a short, connect battery negative to the black clip and battery positive to the other side of the pair. The added battery will make the resistance fault appear heavier to the 210. If the set nulls, the fault can be measured.

3.07 DISTANCE TO FAULT

- (A) Place the function switch in the DFx1 position and the display will indicate the distance to fault. Again, if a one (1) appears, change the function switch to the DFx10 position. The new reading should be multiplied by 10. If a one (1) reappears, the distance to fault is out of range (over 19999 feet).

NOTE: Because of the accuracy and the Model 210's ability to read through battery and high resistance trouble, it is not necessary to include a strap to fault reading. To get this measurement, simply subtract the distance to fault from the distance to strap.

4. SPECIAL APPLICATIONS

4.01 TEMPERATURE CONVERSION

- (A) If it is impracticable to use the Temperature Probe (TP-1) and the temperature of the cable is known, calibrate the Model 210 by using the Conversion Chart (upper right).
- (B) Connect the red and white leads to the two posts located under the LCD display and dial the CAL knob to the corresponding value obtained from the chart.

CONVERSION CHART

TEMPERATURE (°F)	GAUGE			
	26 GA.	24 GA.	22 GA.	19 GA.
30	336	538	858	1709
35	333	537	848	1689
40	329	526	838	1669
45	325	520	828	1650
50	321	514	819	1631
55	318	508	810	1612
60	314	502	801	1594
65	310	496	792	1577
68	308	493	787	1566
70	307	491	783	1560
75	303	486	775	1543
80	300	481	766	1527
85	297	476	758	1511
90	294	471	750	1495
95	291	466	742	1479
100	288	461	735	1464
105	285	456	727	1449
110	283	452	720	1435
115	280	447	713	1420
120	277	443	707	1406
125	275	439	700	1393
130	272	435	693	1380
135	269	431	687	1367
140	266	426	680	1354

- (C) The temperature chart will allow the operator to program in a known gauge at a known temperature for extremely accurate measurements.

4.02 TROUBLE CONDITIONS

- (A) The following diagrams (Figures 4 thru 9), indicate a variety of "trouble conditions" that may be encountered, and how to properly connect the test leads.

4.03 RING GROUND, Other Good Conductors

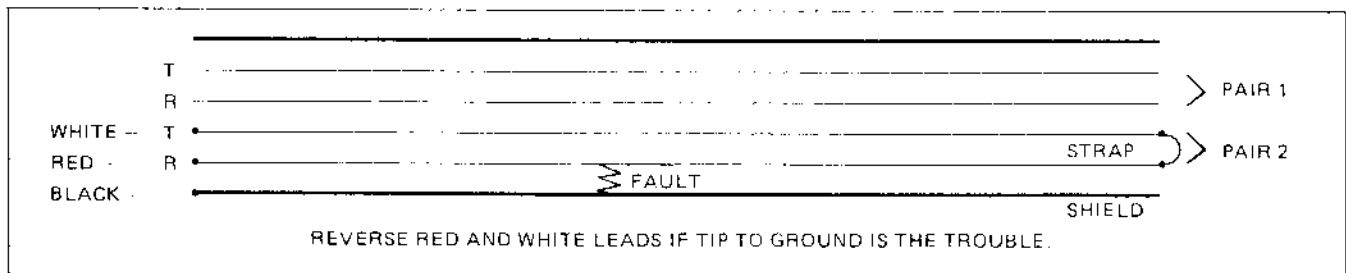


Figure 4 - Ring Ground with Other Good Conductors in the Same Cable

4.04 SHORT, Other Good Conductors

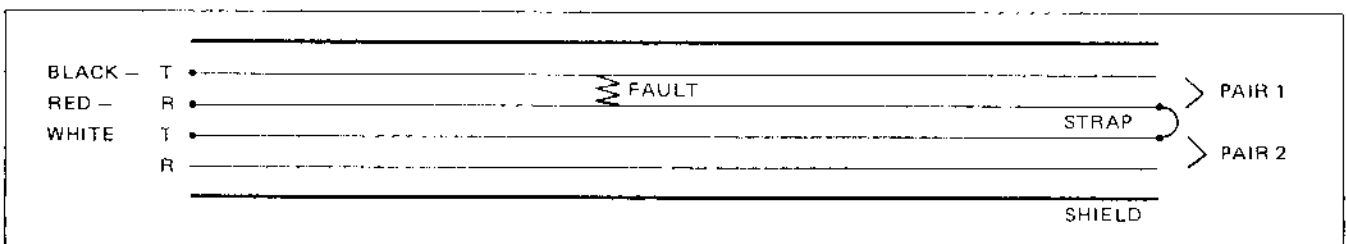


Figure 5 - Short with Other Good Conductors in the Same Cable

4.05 CROSS, Other Good Conductors in the Same Cable

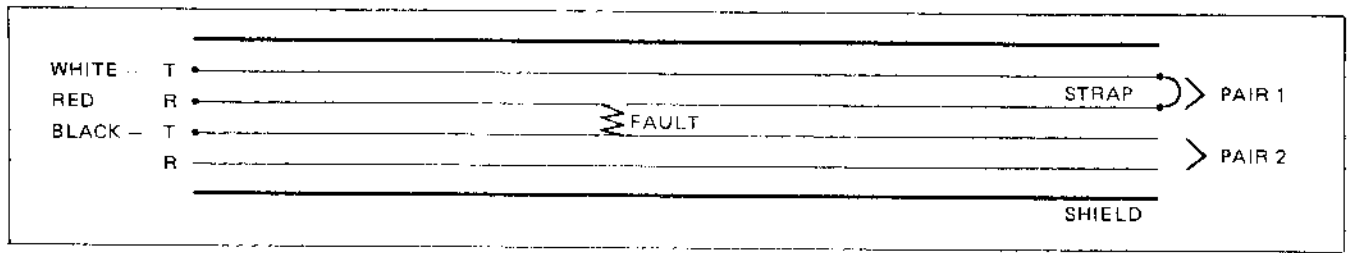


Figure 6 — Cross with Other Good Conductors in the Same Cable

4.06 RING GROUND, All Pairs in Trouble

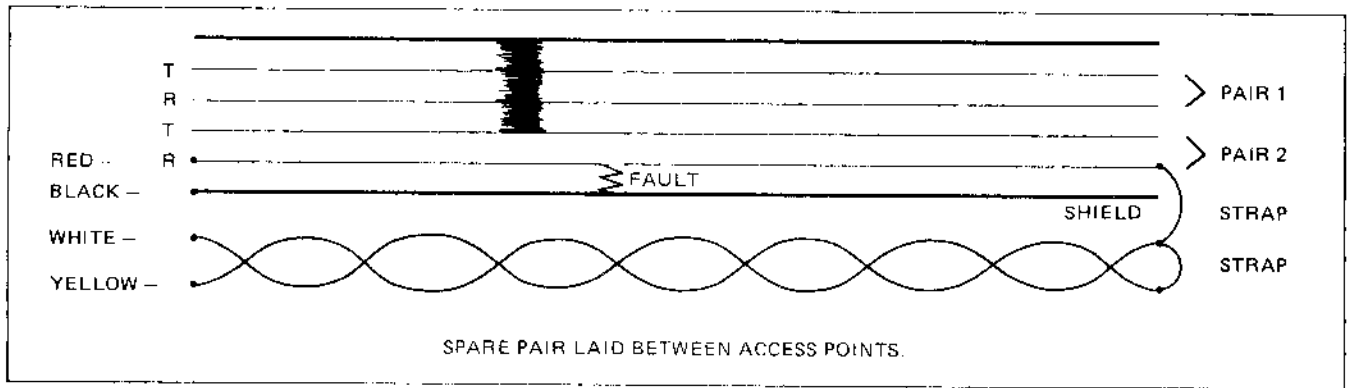


Figure 7 -- All Pairs in Trouble with Ring Ground

4.07 SHORT, All Pairs in Trouble

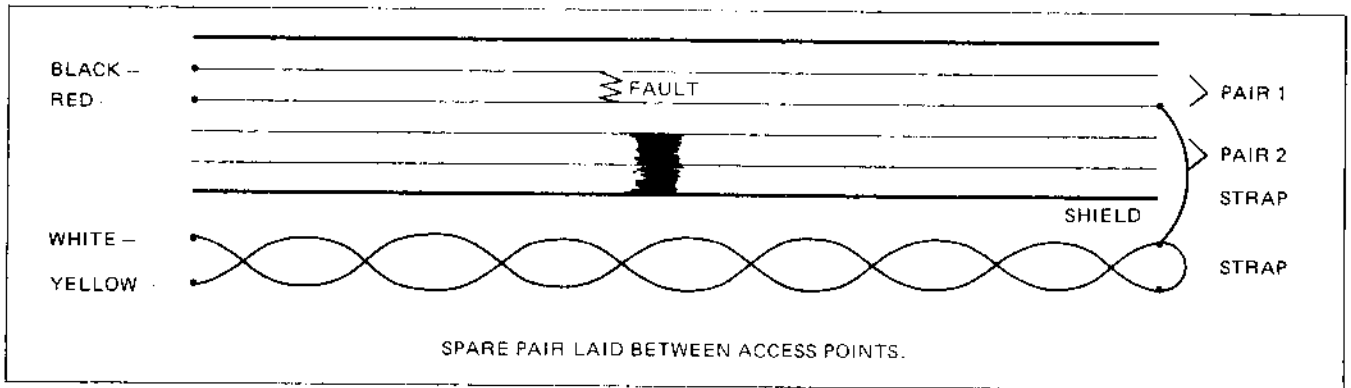


Figure 8 -- All Pairs in Trouble with a Short

4.08 CROSS, All Pairs in Trouble

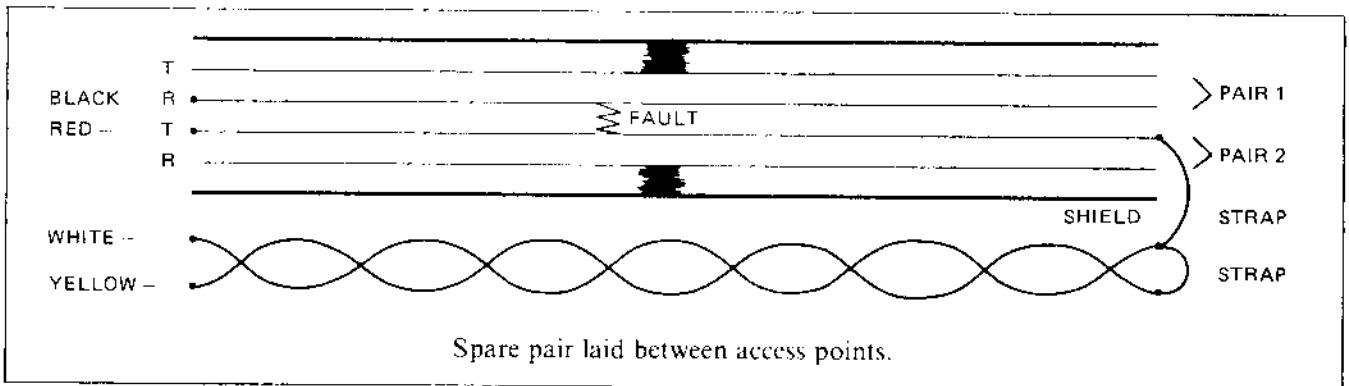


Figure 9 — All Pairs in Trouble with Cross

4.09 BRIDGE TAPS AND LATERALS

(A) If a bridge tap is present between the Model 210 and the strap, and the fault is somewhere on the lateral, the set will measure to the bridge tap splice point (see Figure 10).

(B) To locate the fault, disconnect the strap across the main pair and re-strap across the end of the lateral pair (Figure 11). Repeat the fault locating routine. The measurement will be the true location of the fault between the bridge tap splice and the end of the lateral.

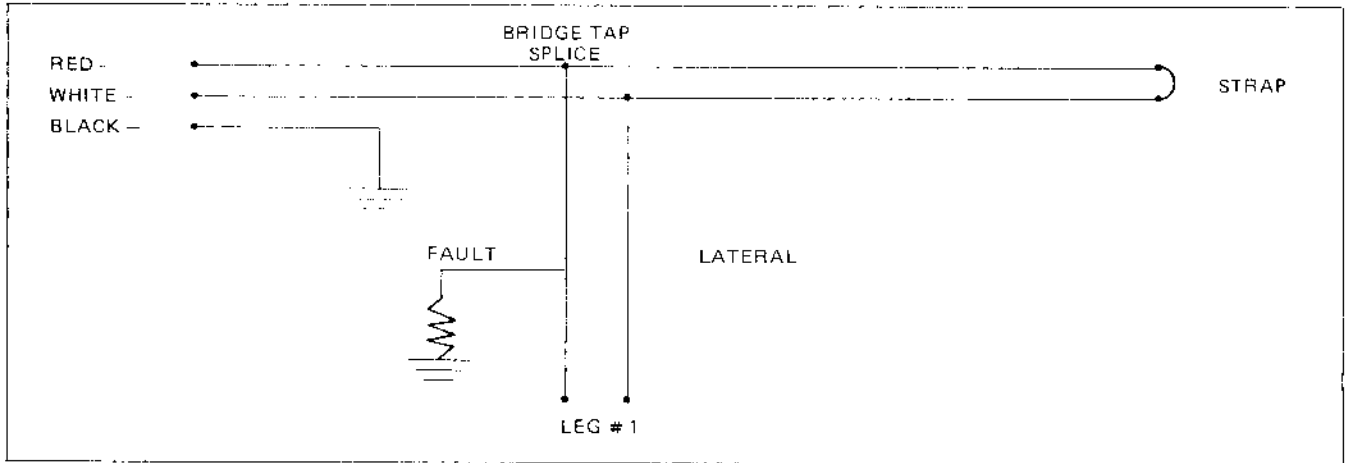


Figure 10 Bridge Tap Splice

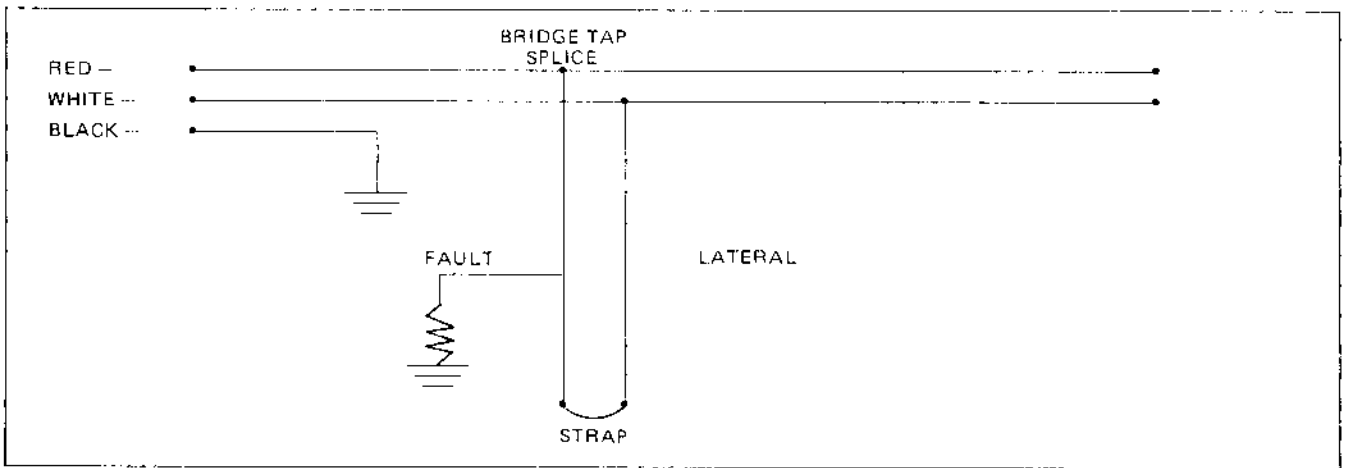


Figure 11 — Bridge Tap Splice

4.10 GAUGE CHANGE

(A) If a gauge change occurs in a section of cable under test and the fault is between the Model 210 and the splice, only the distance to fault measurement will be correct (Figure 12).

(B) If the measurement indicates that the fault is beyond the change point, reset the test set to the proper gauge for the far section. Proceed with the locate. The distance to strap minus the distance to fault is the distance from strap to fault ($DTS - D1F = STF$).

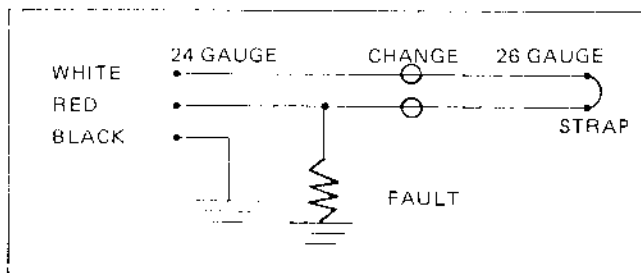


Figure 12

NOTE: The distance to strap and the distance to fault measurements in this example will not be accurate. However, the distance from strap to fault will be accurate.

- (C) For precise measurement of distance to fault, the Model 210 should be relocated at the far end section and the fault retested (Figure 13).

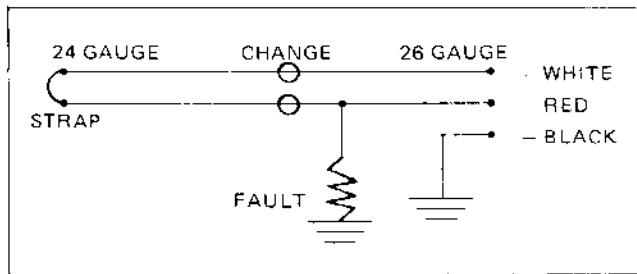


Figure 13

4.11 LOAD COILS

- (A) Load coils measure from approximately 3.6 to 4.2 ohms. For an approximate distance when measuring through a load coil, subtract:
- 95 feet when measuring in 26 gauge
 - 150 feet when measuring in 24 gauge
 - 250 feet when measuring in 22 gauge
 - 470 feet when measuring in 19 gauge
- (B) Because the resistance of load coils vary considerably, any allowances or conversion factors cannot be relied upon for precise measurements. The presence of load coils in the section of cable under test will cause the locator to give readings greater than the actual distance. To insure precise measurements, it is always best to isolate the cable between load coils.

5. MAINTENANCE

5.01 FIELD

- (A) The only field maintenance required is the periodic replacement of the eight (8) "AA" cells. Remove the two screws that secure the face plate located on the right side of the locator. Snap in fresh batteries and replace the face plate.

5.02 FACTORY

- (A) When it is necessary to return a unit for repair, return authorization is not required. The user must return the instrument to the address below:

Progressive Electronics, Inc.
325 South El Dorado
Mesa, Arizona 85202

1-800-528-8224 / (602) 966-2931
Fax (602) 967-8602

- (B) The user must also furnish information describing the trouble, name, address, and phone number of person to contact if necessary.
- (C) Repair turn-around time: Three days in factory.

6. WARRANTY

- 6.01 For a period of one full year, PEI will repair or replace any unit which proves defective in parts or workmanship, provided the unit is returned to the factory by the original purchaser.