PROGRESSIVE ELECTRONICS, INC.
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Issue 7, September 1996

MODEL 230 OPEN FAULT METER

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1. GENERAL

1.01 This section provides information on the description and operation of the Progressive Electronics, Model 230, Open Fault Meter.

1.02 The 230 is designed for use by installation, maintenance, loop and cable repair technicians. The 230's simple operation allows even inexperienced telephone trouble shooters to be successful in locating opens or series faults in shielded or unshielded telephone cable or drop wire. The 230 can be used for shield to conductor or conductor to conductor measurements up to 20,000 feet in length.

1.03 Foreign AC or DC voltages, as well as resistive faults to other conductors or ground, can be tuned out allowing accurate open measurements with the 230 under these conditions.

1.04 The 230 will locate opens resulting from physical damage, parted conductors due to stretching, manufacture, splicing problems and electrolytic action.

1.05 The 230 is field calibrated each time it is used with one fast simple procedure that eliminates the need for lab calibration.

2 DESCRIPTION

2.01 The Progressive Electronics Model 230 is a small, light weight test set powered by 8 "AA" cells. The battery life is approx. 100 hours. The batteries are located under a small cover on the right side of the panel. Housed in a durable case the 230 measures only 7½"x 3½"x 10" and weights 2 pounds.

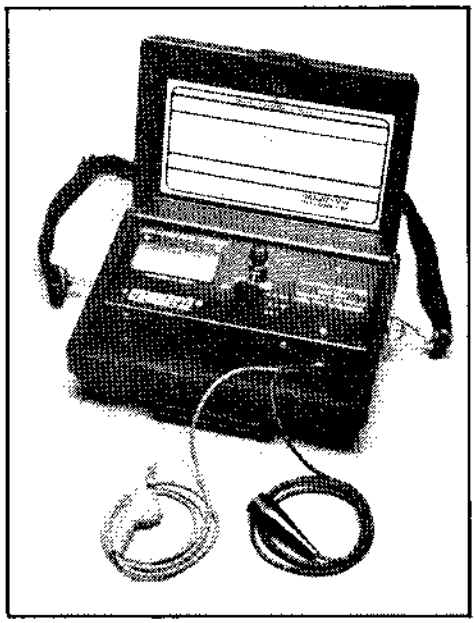

Figure 1 — Model 230 Open Fault Meter

2.02 METER AND CONTROL FUNCTIONS: The meter is used in the battery test, calibrate, line test and range control functions.

(a) Battery Test - The meter will read 140 or above for good battery condition.
(b) Calibrate - The meter is set to the approximate cable capacitance using the calibrate knob.
(c) Line Test - The meter will indicate the presence of a fault or foreign voltage if it varies from the setting obtained in the calibrate position.
(d) The meter will indicate length when a control function of DX-1, DX-10 or DX-100 is selected and the meter reading is multiplied by the appropriate number.

3. OPERATION

3.01 OFF Position. Select this position when transporting the meter or when the meter is not in use.

3.02 Adjusting the meter to true zero (0). In the OFF position, use a small slot screw driver to rotate the adjustment screw located directly below the meter

pointer, to move the meter pointer to the zero position.

3.03 Testing the batteries.
(a) Set selector knob to **Battery Test.**
(b) Meter reading of 140 or above indicates batteries are OK.
(c) If the meter does not read 140 or above, replace batteries, (8 AA Cells) located under cover on right side of panel.

3.04 Calibrating meter to proper cable capacitance.
(a) Set selector knob to **Calibrate.**
(b) Set meter, using calibrate knob, to the proper cable capacitance. (See Figure 2).

3.05 LINE TEST
(a) Set selector knob to **Line Test.**
(b) Connect test leads to cable or wire to be tested.
(c) Meter variation from the setting obtained in the calibrate mode indicates a fault is present. The effects of the fault can be tuned out by turning the calibrate knob to achieve the same setting as in the calibrate mode. If readjustment is not obtainable, the open cannot be accurately located. Opens over 2,000 feet will cause the meter to deflect slightly from the calibrate position setting. Do not adjust these slight variations when the cable length is over 2,000 feet in length.

3.06 Measuring the distance to the open.
(a) Set selector knob to the desired range DX-1 for 0-200 feet, DX-10 for 0-2,000 feet and DX-100 for 0-20,000 feet.
(b) Read the meter and multiply the reading by the proper multiplication factor.

DX-1 read directly from meter 0-200 feet.
DX-10 multiply meter reading by 10.
DX 100 multiply meter reading by 100.

3.07 Analyzing the open.
(a) Sheath to conductor measurements.
Before you start, make sure the sheath is properly bonded to earth ground.

Using the correct conductor to sheath calibration setting, connect the black lead to the sheath and the red lead to the conductor to be measured, measure both the tip and ring. Take measurements from both ends of the cable or dropwire section under test. Always use the shortest reading which will result from testing from the end closest to the fault. This reading will be the most accurate.

If both the tip and the ring are the same length, the pair is balanced and they are open at the same point.

If they do not measure equally, take the shorter of the two readings, this conductor is the first open.

NOTE: An open sheath between the measuring point and the open will cause inaccurate readings.

Cable Capacitance and Type		Conductor To Sheath Measurements Connect Red Lead To Conductor Connect Black Lead To Sheath; Make sure sheath is bonded to earth ground.	Mutual Capacitance Measurements Connect Red Lead To Ring; Connect Black Lead To Tip.
Capacitance / Microfarad Per Mile	Type		
.1	Buried Drop Wire	141	106 Multiply reading by 2
092	Filled Cable	153	115 Multiply reading by 2
083	Air Core Cable	170	127 Multiply reading by 2
N/A	Aerial Drop Wire	N/A	92 Multiply reading by 2
N/A	IW (Inside Wire)	N/A	129 Multiply reading by 2

Figure 2

(b) Mutual capacitance measurements.
To measure the mutual capacitance of the pair (connect across the pair, black to tip and red to ring), set the meter to the correct capacitance for the cable under test. Test from both ends of the cable or drop wire under test. Use the shorter reading, this will be the most accurate reading.

4. SPECIAL APPLICATIONS

4.01 Calibrating the meter to a cable with an unknown capacitance rating.

(a) Determine the length of the cable section under test. This can be done by tracing the path of the cable and then using a distance measuring device to measure the cable, or by using a resistive type fault locator and measuring the distance of a strapped pair.

(b) Connect to a good conductor with the red test lead and to the sheath with the black lead. Make sure the sheath is bonded to earth ground.

(c) Select the correct range setting DX1 for 0-200 FT., DX10 for 0-2,000 FT., and DX100 for 0-20,000 FT.

(d) Adjust the calibration knob to set meter to proper footage reading for cable section under test. Example: Cable under test measured 1,000 Ft., meter range set to DX10 0-2,000 Ft., Calibrate knob adjusted so meter would read 1,000 Ft.

(e) Turn function switch to calibrate. Note reading. This calibration setting should be used when testing this cable section or type.

4.02 To calibrate for mutual capacitance.
Connect the Red lead to ring and the Black lead to tip side of the pair. Follow the instructions in Section 4.01 a, c, d, and e.

NOTE: In most cases you will have to calibrate the cable length to one half of the actual cable length when in the range setting mode. All readings taken from this setting will have to be multiplied by two.

4.03 Non-working cables
The Model 230 Open Meter has the calibration settings based on working cables. Non-working cables or cables with very few working pairs can be tested by setting the meter as described in section 4.01 or strap 12 pair of the binder group under test to sheath and ground.

4.04 Water in cables.
Water in the cable will change the capacitance rating. Use the method described in section 4.01 to adjust the meter to the cable under test.

4.05 Locating open shields.
Open shields can not be read directly from the meter. The following procedure must be used to accurately locate open shields:

(a) Disconnect the shield from earth ground at both ends.
(b) Find the length of the section under test. See Section 4.01 (a). This will = D.
(c) Connect the 230 with the Red lead to the shield and the Black lead to earth ground.
(d) Calibrate the meter for .083 cable capacitance for conductor to shield readings. Set control knob for proper range. Read footage. This is your A end measurement.
(e) Go to the opposite end of the cable section and repeat (c) and (d). This is your B end measurement.
(f) Use the formula below to find the distance to the open shield. See figure 3 page 4.

$\frac{A}{A+B}$ X D = Distance to open shield from end A.

$\frac{B}{A+B}$ X D = Distance to open shield from end B.

Example: Distance from A end read 75 feet.
Distance from B end read 25 feet.
D – Cable section under test. This measured 120 feet. The formula for distance to open shield from end B is as follows:

$\frac{25}{25+75}$ X 120 or $\frac{25}{100}$ X 120 = 30 ft. to open shield from end B.

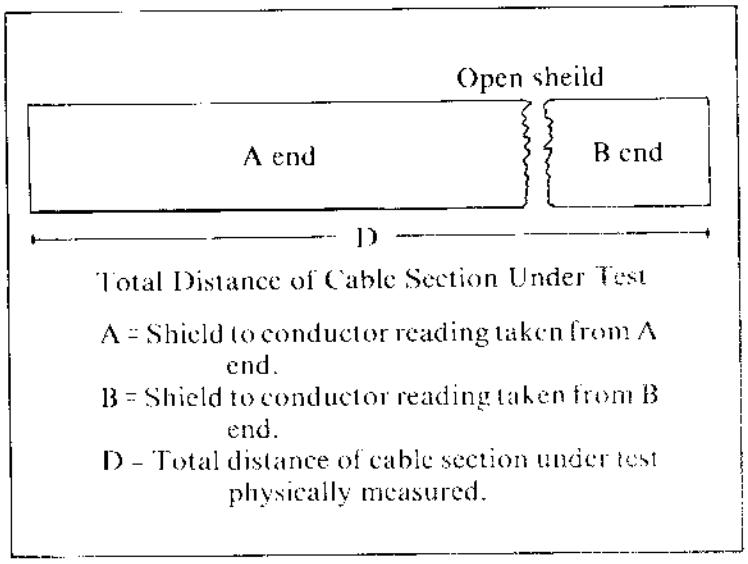

Figure 3.

5.01 Maintenance. The only maintenance required is adjusting the meter to "0"; see section 3.02 and replacing the batteries; see section 3.03. No other maintenance is required.