

WILCOM T-136B CIRCUIT TEST SET DESCRIPTION AND OPERATION

1. GENERAL

1.01 This practice provides the description of and operating procedures for the Wilcom T-136B Circuit Test Set.

1.02 The T-136B circuit test set measures circuit loss (dbm), transmitter current (ma), power influence (dbrnC) [equivalent to **noise to ground**] and circuit noise (dbrnC) [equivalent to **noise metallic**]. This compact, portable test set is capable of measuring the significant transmission characteristics of a subscriber loop.

1.03 The test set has a color coded scale which facilitates **go, no-go** testing and decision making.

1.04 The input impedance (terminating) is $735\ \Omega$, which is the geometric mean between 600 and $900\ \Omega$. The set indicates correctly on either 600 or $900\ \Omega$ circuits.

2. DESCRIPTION

2.01 The operation of the test set is controlled by a single function switch located in the center of the front panel. See Figure 1.

a. A dialing and hold arrangement makes it possible to dial a remote test line when the function switch is in the DIAL & LINE MA position, and to hold the connection in all measurement positions of the function switch. Square posts are provided for connecting a dial telephone handset to the test set. The hold coil provides a DC resistance of about $225\ \Omega$ with an AC impedance high enough to have no significant effect on the measurements.

b. The type of measurement is selected by the function switch. The DC line current may be measured when the function switch is in the DIAL & LINE MA position. The meter includes a scale calibrated from 0 to 100 ma in 5 ma increments.

c. The next position is CKT LOSS which provides a means for measuring (on a terminated basis) the level of a tone received from a 1 mw reference tone source over a level range of -15 dbm to +3 dbm on a color segmented meter scale. Measurements may be made at frequencies other than 1 kHz as the CKT LOSS response characteristic is flat from 300 Hz to 15 kHz; 60 Hz is attenuated more than 30 db.

d. The next position of the function switch is designated CKT NOISE which provides additional sensitivity for measuring noise metallic on a C-message weighted basis. The color segmented meter scale for this measurement extends from 33 dbrnC to 15 dbrnC.

e. The third position of the function switch is designated PWR INFL (power influence) which provides a means for measuring noise voltages between a circuit and ground on a C-message weighted basis. The input circuit in this position has an impedance of about $200,000\ \Omega$ between the input terminals and over $100,000\ \Omega$ between either input terminal and ground. The noise to ground level is measured on the same color segmented scale as CKT NOISE, but the range of measured noise is now arranged for the normal range of power influence measurements. The scale extends from 93 dbrnC to 75 dbrnC.

f. In most conventional noise measuring sets, 40 db is added to the noise to ground measurements to take into account the difference between noise metallic and noise to ground measurement circuits. The PWR INFL scale on the meter is calibrated to provide the absolute value; therefore, it is not necessary to add 40 db to the measurement.

g. A nonlocking pushbutton switch is provided to add 20 db attenuation to the input signal, if the signal level is sufficient to cause the meter to read off scale. In most cases, operation of the switch will bring the meter pointer back on scale; consequently, the T-136B test set has a range of measurement of about 35 db.

h. A phone jack is provided to enable the tester to listen to the signals being measured without interfering with the measurements. The jack accepts the standard 310 type plug, the normal termination of the 723A receiver, and W2FS cord.

i. Three 4-foot leads, equipped with clips and colored green for tip, red for ring, and yellow for ground, are permanently attached to the set.

j. A nonlocking pushbutton switch is used to supply power to the measuring circuits from two small 9-volt batteries. No current is supplied by the batteries until the switch is depressed to take a

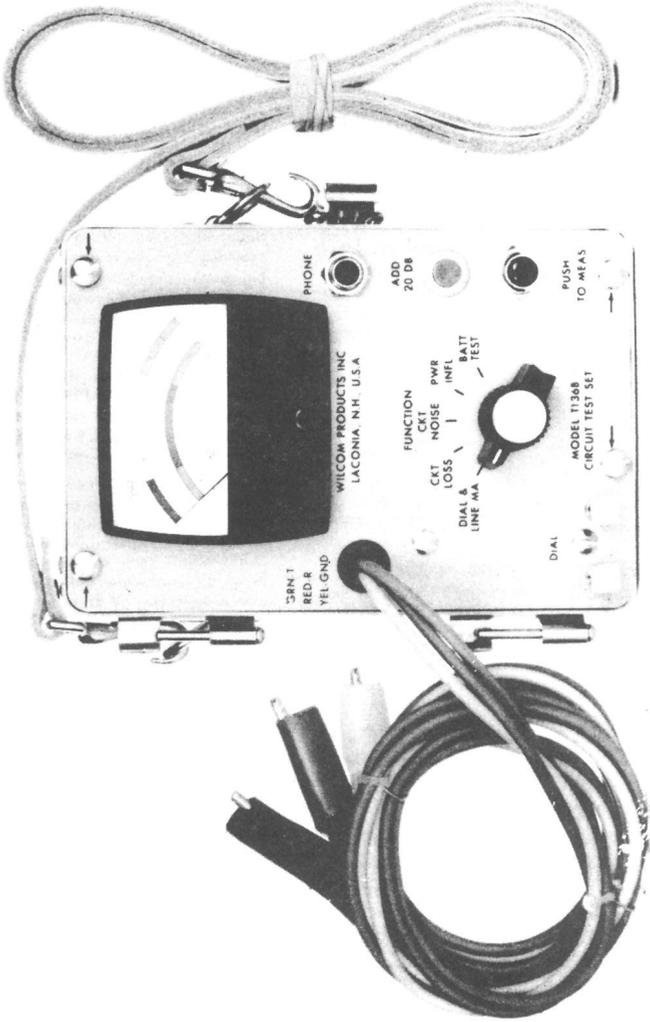


FIGURE 1.

reading. Therefore, the useful life of the batteries approaches shelf life as the ON period is usually very short. The set cannot be left ON inadvertently.

k. The physical dimensions of the test set are 4-3/8 inches wide by 6-3/8 inches long by 4-7/8 inches high. The weight is 3 pounds.

3. CHARACTERISTICS

3.01 The response of the T-136B test set in the CKT LOSS function is flat from 300 Hz to 15,000 Hz; 60 Hz is attenuated more than 30 db.

3.02 When measuring PWR INFL or CKT NOISE, the test set exhibits the C-message weighting characteristic.

3.03 Figure 2 shows a block diagram of the T-136B test set.

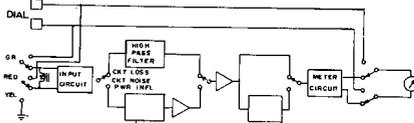


FIGURE 2. Block Diagram

3.04 A schematic of the input circuit for the three modes of the test set are shown in Figures 3, 4, and 5.

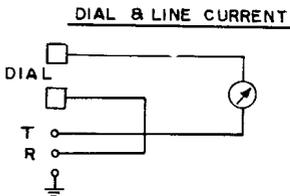


FIGURE 3. Input Circuit

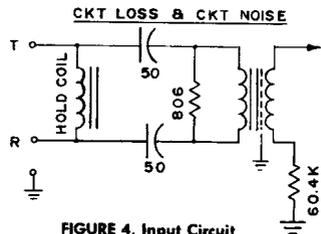


FIGURE 4. Input Circuit

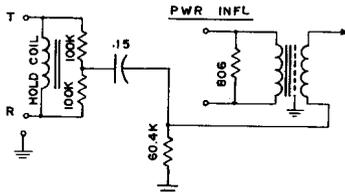


FIGURE 5.

3.05 A schematic of the T-136B test set is shown in Figure 6 (fold-out).

4. TEST SET OPERATION

4.01 The measurement ranges of the T-136B test set are designed to be within the normally acceptable limits of circuit loss, noise metallic, and noise to ground. The colored segments of the meter scale indicate the degree of performance acceptability when direct readings are made on the meter, i.e., when it is not necessary to press the ADD 20 DB pushbutton switch. The significance of each color is:

- a. **Green:** Acceptable performance.
- b. **Yellow:** Marginal performance; investigation should be made.
- c. **Red:** Unacceptable performance; corrective action required.

4.02 The T-136B test set terminates the circuit in the proper impedance when it is across the line during a measurement. The green, red, and yellow leads of the set are connected to the tip, ring and ground, respectively. A low resistance ground is not required. When available, an earth ground is preferred.

4.03 After connecting the test set to the circuit to be tested, proceed as follows:

- a. Place the function switch in the DIAL & LINE MA position. Line current may be measured on the MA scale before dialing.

b. Dial the number of the milliwatt generator in the central office. When connection is established, the line current may be checked again. Turn the function switch to the CKT LOSS position and press the PUSH TO MEAS button. This turns on the set and must be held in place until the measurement has been made. Readings are made on the CKT LOSS scale of the meter which is calibrated from 0 to -10 dbm in divisions of 1 db. The -15 dbm point is the last marking on the scale.

NOTE: Release the central office connection.

c. Noise measurements are made by dialing the number of the quiet (or balance) termination in the central office. The function switch must be in the DIAL & LINE MA position. When a connection is made, turn the function switch to the CKT NOISE position and press the PUSH TO MEAS button. The reading on the CKT NOISE scale on the meter is the noise metallic on the line. If the meter should read off scale, press the ADD 20 DB pushbutton switch; this should bring the meter pointer within the measuring scale of the meter unless the noise is excessively high. If it is necessary to push the ADD 20 DB button, add 20 db to the meter reading to get the exact value of circuit noise (or noise metallic).

d. PWR INFL (or noise to ground measurements) are made while connected to the quiet termination at the central office by turning the function switch to the PWR INFL position and reading the top scale on the meter. The PWR INFL scale is calibrated to read the noise to ground directly; it takes into account the 40 db addition usually required for the attenuation in the input circuit in noise measuring sets. If the meter should read off scale, press the ADD 20 DB pushbutton switch; this should bring the meter pointer within the measuring scale of the meter unless the noise is excessively high. If it is necessary to push the ADD 20 DB button, add 20 db to the meter reading to get the exact value of power influence (or noise to ground).

e. Circuit balance can be determined from the CKT NOISE and PWR INFL measurements made with the T-136B test set.

$$\text{Balance (db)} = \text{PWR INFL} - \text{CKT NOISE}$$

The balance of a circuit will determine how susceptible it is to induced noise. The following values provide a guide for evaluating balance:

BALANCE	CONDITION
Over 70	Excellent
60—70	Good
50—60	Fair
Under 50 db	Poor

NOTE: Refer to Figure 7 for a graphic solution of the balance equation.

5. MAINTENANCE

5.01 The T-136B test set requires very little maintenance except for replacement of the battery. The battery is replaced by removing the screws identified by an arrow on the faceplate of the set. If maintenance is necessary, the unit should be sent to the local storeroom for return to the manufacturer: Wilcom Products Inc., Box 508, 109 Court St., Laconia, New Hampshire 03246.

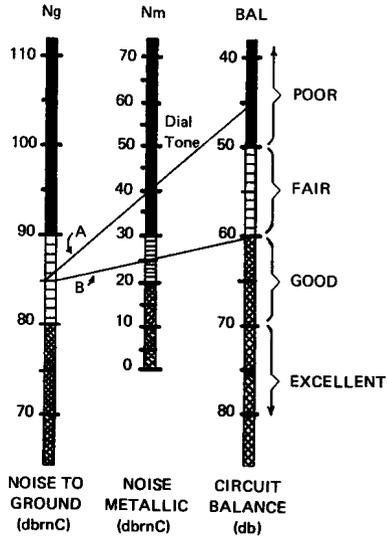
6. CALIBRATION

6.01 The calibration of the T-136B test set is checked by the manufacturer. However, a test line equipped with an attenuator and potentiometer will facilitate periodic checks of the test set at the -10 dbm CKT LOSS point and 20 ma transmitter current point. As these are the decision points for these parameters, the test set should be checked there. Test sets which do not indicate accurately at these points should have a calibration chart attached (inside the cover) to indicate the correction (+ or -). If the deviation is more than 5 ma or 1 db, the set should be returned to the manufacturer for maintenance. The PWR INFL and CKT NOISE scales are accurate (+ or -1/4 db).

NOMOGRAPH FOR SOLVING CIRCUIT BALANCE EQUATION
 (CIRCUIT BALANCE = NOISE TO GROUND - NOISE METALLIC)

EXAMPLE

	VERY NOISY CIRCUIT (A)	SAME CIRCUIT AFTER BALANCE IMPROVEMENT (B)
Ng	85	85
Nm	40	25
BAL	45	60



SUBSCRIBER LOOP ACCEPTABILITY CRITERIA:

-  ACCEPTABLE PERFORMANCE
-  MARGINAL PERFORMANCE; INVESTIGATION OF POTENTIAL TROUBLES SHOULD BE INITIATED
-  UNACCEPTABLE PERFORMANCE; CORRECTIVE ACTION REQUIRED

FIGURE 7.

