Wilcom

# MODEL T136BSBZW
# CIRCUIT TEST SET

## Operating Instructions

T136BSB Current Test Set 811-230-007
Operating Instructions February 2007

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# Introduction

Model T136BSBZW is portable, compact combination level and noise measuring set designed to facilitate circuit and noise measurements by installers and repair persons without using elaborate or expensive equipment. It is designed to measure loop current, circuit loss, noise metalic and noise to ground, each over a range which exceeds normally acceptable limits. Meter scale colors indicate normally acceptable, marginal and unacceptable divisions of measurements.

LOOP mA (DC loop current) measurement indicates the dc current drawn by a resistance of approximately 430 Ω connected across the line.

Provisions have been made for dialing and holding a remote line. In the DIAL & BATT TEST position of the FUNCTION switch, the line connectors are switched through to a pair of square terminal posts for connecting a dial telephone hand set. In all other positions of the FUNCTION switch, a hold coil is connected across the line. The hold circuitry has a dc resistance of approximately 430Ω with ac impedance high enough to have no significant effect on measurements.

The FUNCTION switch position called CKT LOSS provides terminated level measurement of a tone from -15 dBm to +1 dBm. Measurement response characteristics are flat from 300 Hz to 15 kHz; 60 Hz is attenuated more than 25 dB as input impedance is 600 Ω.

The FUNCTION switch position designated CKT NOISE provides additional sensitivity and frequency weighting for measuring noise metallic on a C-Message basis as input impedance is 600 Ω.

# Introduction

The FUNCTION switch position designated PWR INFL (Power Influence) measures noise voltages between a circuit and ground on a C-Message weighted basis. The input circuit in this position has an impedance of 100,000 Ω between either input terminal and ground.

In most conventional measuring sets, the reference level for noise-to-ground measurement is 40 dB above the 600 Ω dBrn reference voltage. The PWR INFL scale of the T136BSBZW is calibrated to give a direct reading in dBrnC (600 Ω voltage equivalent) so that balance measurements can be made directly with no need for the conventional 40 dB correction.

# Introduction

The T136BSBZW has four separate meter scales:

**LOOP mA**

Range: 0 to 100 mA

Color Segments:

| | |
|---|---|
| Red | below 23 mA |
| Green | 23 mA to 100 mA |

**CKT LOSS**

Range: +1 dBm full scale, calibrated in 1 dB increments to -15 dBm

Color Segments:

| | |
|---|---|
| Red | below -10 dBm |
| Yellow | -10 dBm to -8 dBm |
| Green | -8 dBm to 0 dBm |
| Yellow | 0 dBm to +1 dBm |

**CKT NOISE (Noise Metallic)**

Range: +33 dBrnC full scale, calibrated in 1 dB increments to 15 dBrnC

Color Segments:

| | |
|---|---|
| Green | below 20 dBrnC |
| Yellow | 20 dBrnC to 30 dBrnC |
| Red | 30 dBrnC to 33 dBrnC |

**PWR INFL (Noise-to-Ground)**

Range: +93 dBrnC (600 Ω voltage equivalent) full scale; calibrated in 1 dB increments to 75 dBrnC

Color Segments:

| | |
|---|---|
| Green | below 80 dBrnC |
| Yellow | 80 dBrnC to 90 dBrnC |
| Red | 90 dBrnC to 93 dBrnC |

# Introduction

The 136BSBZW has two momentary push button RANGE EXTENDER switches, arranged so that the PUSH TO MEAS button and one RANGE EXTENDER button can be operated together with one finger. The RANGE EXTENDER button above the PUSH TO MEAS button on the panel extends the measuring range by 10 dB. It is designated - 10 dB because its use requires that 10 dB be added to the meter scale reading. Similarly, use of the RANGE EXTENDER button below the PUSH TO MEAS button (+10 dB) requires that 10 dB be added to the meter reading.

When the FUNCTION switch is in any measure position, the DIAL posts enable the tester to listen to the signals being measured without interfering with the measurements.

Three 4 ft. long leads equipped with clips and colored green for TIP, red for RING and yellow for GROUND are permanently attached to the set.

A non-locking push button 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 reading. Consequently, the useful life of the batteries can approach shelf life because the ON period is usually very short.

# Introduction

**Figure 1. The T136BSBZW Circuit Test Set**

# Specifications

**Measuring Ranges**

| | |
|---|---|
| DC current (LOOP mA): | 0 to 100 mA, through 430 Ω and diode bridge. Measurements may be made with either polarity DC on the line. |
| Signal level (CKT LOSS): | Scale with log graduation, -15 dBm to +1 dBm with 1 dB divisions. |
| Noise Metallic (CKT NOISE): | Scale graduated from 15 to 33 dBrnC with 1 dB divisions. |
| Noise-to-Ground (PWR INFL): | Scale graduated from 75 dBrnC (600 Ω voltage equivalent) to 93 dBrnC with 1 dB divisions. |
| Range Extension: | Add 10 dB and 10 dB push button switches. Range extension applies to all level and noise measurements. |

**Input Circuits**

*Impedance*

| | |
|---|---|
| CKT LOSS and CKT NOISE meas: | 600 Ω AC; 430 Ω DC. |
| PWR INFL measurement: | 100 kΩ tip/ring to ground. |
| Frequency Response: | CKT LOSS measurement, range from 300 Hz to 15 kHz. Attenuation at 60 Hz is more than 25 dB. CKT NOISE and PWR INFL measurements, C-MSG weighting. Refer to Figure 2. |

*Hold Impedance*

| | |
|---|---|
| DC Resistance: | 430 Ω over a range of 0 - 120 mA |

# Specifications

**Controls and Connections**

| | |
|---|---|
| Switches: | Multi-position FUNCTION switch.<br>Push button PUSH TO MEAS switch.<br>Push button +10 dB range extender.<br>Push button -10 dB range extender. |
| Connections: | DIAL terminals: square clip-on type.<br>LEADS: three 4 foot leads with test clips and colored: Green for Tip, Red for Ring, and Yellow for Ground |

**Power**

| | |
|---|---|
| Battery Type: | Battery operation, two 9 volt batteries, Eveready 216 or equivalent NEDA No. 1604. |

**Physical**

| | |
|---|---|
| Height: | 5 7/8 in. (15.0 cm) |
| Width: | 4 3/8 in. (11.2 cm) |
| Length: | 6 3/8 in. (16.2 cm) |
| Weight (with batteries): | 3 lbs. 4 oz. (1.47 kg) |

# Specifications

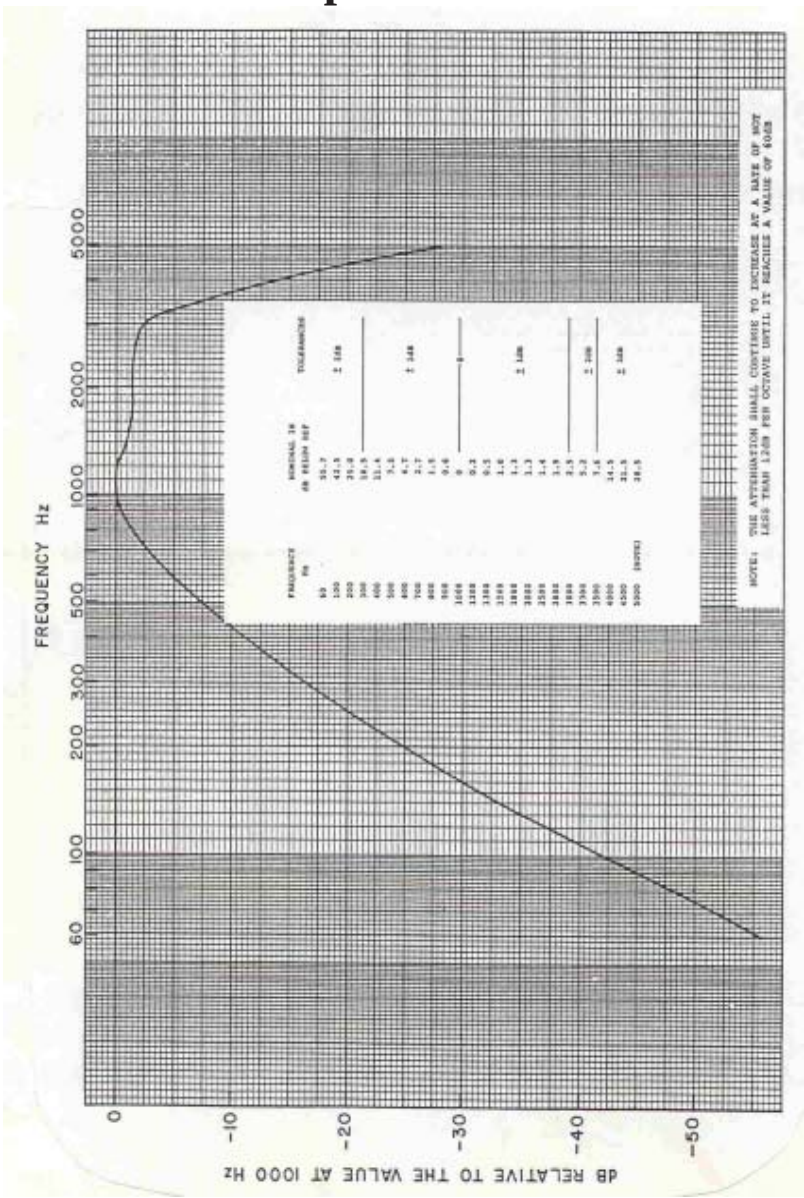


**Figure 2. C-message Weighting Characteristic**

# Circuit Description

The Model T136BSBZW is a basic transmission measurement set providing loop testing in accordance with industry standards. The following subsections of this manual describe the T136BSBZW measurement operation.

**Input Circuit**

The input switching circuit connects the input leads to the selected measurement circuitry.

a. In DIAL & BATT TEST, the T and R leads are connected to the square DIAL terminals.
b. In LOOP mA, the T and R leads are connected through a combined impedance of 430 Ω.
c. In both CKT LOSS and CKT NOISE the line is connected through dc blocking capacitors to the terminating resistance and input circuity, while the 430 Ω hold impedance is shunted across the line to draw dc holding current.
d. In PWR INFL, each side of the line is connected through a series 100 kΩ resistor to a blocking capacitor to ground. This provides the longitudinal path with proper attenuation for noise-to-ground measurement.

**Measuring Circuit Input Section**

The function of the measuring circuit input section is to provide isolation and line impedance matching.

The Measuring Circuit DC input consists of a series/parallel circuit

switched through additional poles of the FUNCTION switch to a shunt capacitor, series resistor and the meter itself. The PUSH TO MEAS switch need not be used for DC measurements.

The CKT LOSS and CKT NOISE input is DC blocked for 100 volts. The DC shunt effect of the 430 Ω impedance prevents the voltage across the line from ever exceeding this value, even when loop extenders are used. Following the DC blocking, the line is connected to a 600 Ω precision impedance.

**Circuit Measurements**

All measurements taken using the T136BSBZW are referenced to 600 Ω, 1 mW. In the CKT LOSS mode this means a tone at .775 volts will result in a 0 dBm response. All other readings are scaled to this according to the following formula:

$$dB = 20 \log Vmes/.775$$

where Vmes = the amplitude of the signal measured in volts.

NOISE MEASUREMENTS are referenced to 600 Ω, -90 dBm which is equivalent to 0 dBrn and then weighted via the C-Message curve (see Figure 2). A signal of .775 mV will produce a meter reading of 30 dBrnC. All readings are referenced to the formula:

$$dBm = 90 - 20 \log Vmes/.775$$

POWER INFLUENCE levels are calculated in the same manner as CKT NOISE, except voltages between tip and ring to ground are measured. The preceding formula applies.

# Circuit Description

**Batteries and PUSH TO MEAS Switch**

The measuring set is powered by a pair of 9-volt batteries. Since the batteries supply power only while the PUSH TO MEAS switch is held, battery life approaches shelf life.

Battery voltage is connected to the positive and negative supply busses of the measuring set through transistors which are normally cut off. Pressing the PUSH TO MEAS switch turns on both transistors, supplying positive and negative voltages simultaneously.

With the **FUNCTION** switch in ***BATT TEST*** position, pushing the **PUSH TO MEAS** switch supplies power to the measuring circuits to load the batteries. At the same time it connects positive and negative voltages through to the meter to test for satisfactory battery voltage.

# Operation

Connections to the circuit to be tested are made with the clip leads on the end of the red, green and yellow leads which represent ring, tip and ground, respectively.

**CAUTION:** GROUND should be connected first.

A lineman's dial telephone set is connected by clipping to the terminals marked DIAL.

**Operating Procedure**

Place the **FUNCTION** switch in the ***DIAL*** position. Dial tone should be heard in the lineman's handset. Dial the numbert of a milliwatt generator in the C.O. After the connection is established, the line current may be checked in **LOOP ma**.

Turn the **FUNCTION** switch to the ***CKT LOSS*** position and press the **PUSH TO MEAS** button. This turns the set on; it must be held in place until the measurement has been made. Readings are made on the **CKT LOSS** scale of the meter.

Noise measurements are made by placing the **FUNCTION** switch in the ***DIAL*** position (dial tone should be heard in the lineman's handset); and then dialing the number of the quiet (or balance) termination at the Central Office. When a connection has been established, 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, operate the RANGE EXTENDER switch to

bring the reading on scale. If the **RANGE EXTENDER** switch is used, the appropriate correction must be added to the meter reading.

PWR INFL, or noise to ground measurements, are made while connected to the quiet termination at the C.O; turn the **FUNCTION** switch to the ***PWR INFL*** position. The PWR INFL meter scale is calibrated to read the noise to ground directly in dBrnC (600 Ω voltage equivalent). If the meter should read off-scale, the range extender switch may be used as before.

It is possible to listen to the signal by connecting an earphone to the DIAL posts.

A battery test may be made by turning the **FUNCTION** switch to the ***BATT TEST*** position and pressing the **PUSH TO MEAS** button. If the meter does not read in the GOOD area, the batteries should be replaced in accordance with instructions in the Maintenance section.

**WARNING:** This test is **NOT** designed to be used with voltage in excess of ringing voltage.

# Applications

The following describes the applications for which the T136BSBZW Circuit Test Set is useful, including noise measurements at the subscriber and C.O. locations, and balance measurements.

### Performance Limits

The measurement ranges of the T136BSBZW has been 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 various degrees of performance acceptability when direct readings are made on the meter (i.e., when the range extender switch is not used). The significance of each color is as follows:

| | |
|---|---|
| **GREEN:** | **Acceptable performance.** |
| **YELLOW:** | **Marginal performance. Investigation of potential troubles should be initiated.** |
| **RED:** | **Unacceptable performance. Immediate corrective action required.** |

If reading is off-scale high, without using range extender switch, when measuring CKT NOISE or PWR INFL, unacceptable performance is indicated. An optional *data pad* (Wilcom part # 06800023) is available to record each measurement. See **Figure 3.**

### Measurements at the Subscriber's Location

Measurements may be made from the terminal block or protection block at the customer's premises. It is not necessary to disconnect the customer's equipment, but the equipment must be in the ON HOOK condition when measurements are made. The leads on the

# Applications

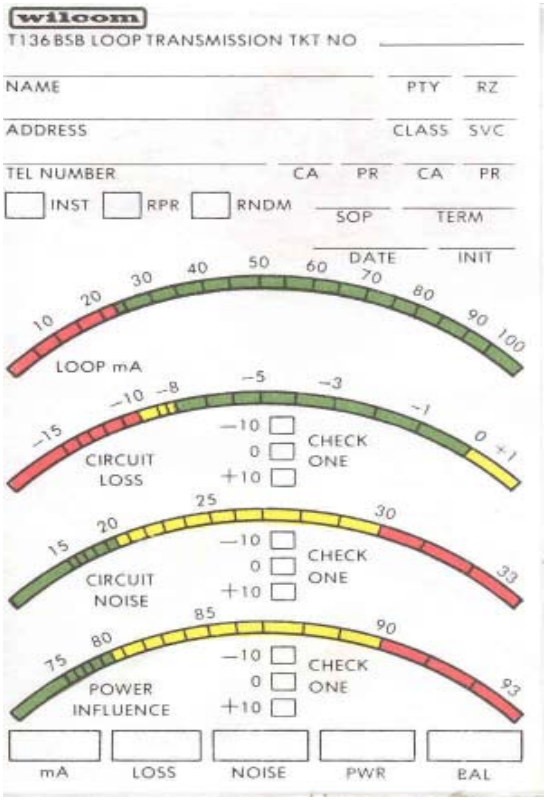


**Figure 3. T136BSB Data Pad**

# Applications

T136BSBZW are connected to Tip, Ring and Ground as outlined in the Operation section. A good ground, preferably the ground at the protector block, must be available to make power influence measurements.

**Measurements at the C.O. Main Frame**

Noise measurements may be made at the main frame in the C.O. toward the subscriber or toward the
office equipment.

*To Subscriber* — meaningful noise measurements can only be made toward the subscriber when there is a termination at the far end. The heat coils should be removed for the test. If a section of the subscriber's loop is to be measured, a termination should be connected at the far end of the section. Unterminated measurements will not provide useful data for analyzing noise problems; however, if a large number of unterminated loops aretested, useful statistical information can be compiled on the extent of noise problems on loops out of a C.O. A 900 Ω resistor in series with a 2 μF capacitor is a common termination used at the subscriber end.

*To C.O. Equipment* — it may be desirable to determine how much noise originates in the C.O. and the balance of the office equipment. Remove the heat coils and connect the Green and Red leads to the Tip and Ring terminals toward the office equipment — connect the Yellow lead to C.O. ground bus. Dial the quiet termination and make CKT NOISE and PWR INFL measurements.

# Applications

If the induced longitudinal voltage is low, it may not be possible to make power influence measurements. It is then necessary to introduce an external longitudinal voltage at a fixed frequency; any signal source between 500 Hz and 1000 Hz is satisfactory.

The Wilcom Model T279 is useful for providing a balanced terminating circuit to which a longitudinal voltage source can be connected.

**Balance Measurements**

Circuit balance can be determined from the CKT NOISE and PWR INFL measurements both made with the T136BSBZW.

Balance (dB) = PWR INFL - CKT NOISE

The balance of a circuit will determine how susceptible it is to the induction of noise. The following Balance values provide a guide for determining acceptable balance:

| BALANCE | CONDITION |
|---|---|
| Over 60 dB | Excellent |
| 50-60 dB | Good |
| 40-50 dB | Fair |
| Under 40 dB | Poor |

Usually any balance under 50 dB requires improvement, particularly when the power influence is high (i.e., over 75 dBrnC as measured on the T136BSBZW). If power influence is low, a greater degree of unbalance can be tolerated; however, if the power influence should increase, the practice is to get as high a balance as possible.

# Maintenance

The T136BSBZW should require little, if any, maintenance except for replacing the batteries. If any difficulties arise in the performance condition, please contact Wilcom Products, Inc. for further information.

**Battery Replacement**

The T136BSBZW only draws current when the PUSH TO MEAS switch is pressed; consequently, the batteries will have close to shelf life. The batteries should be checked periodically by placing the FUNCTION switch in the BATT TEST position and pressing the PUSH TO MEAS button. If the meter does not read in the GOOD segment, the batteries should be replaced.

If a battery replacement is indicated, rotate the four fasteners on the bottom of the case 1/4 turn counter clockwise and lift the panel from the case. Disconnect the batteries, pull the batteries out, insert new batteries and reconnect the terminals. Use Eveready No. 216 or equivalent; the NEDA No. is 1604. Replace the case hatch, press down and turn the screw fasteners 1/4 turn clockwise

**Repair**

Should the T136BSBZW require service, the unit may be sent to Wilcom at the address at the front of this manual, in accordance with the warranty instructions.

Should technical assistance be necessary, contact our Applications Engineers at the following number:
1-800-222-1898.

# Service and Repair

1. Call Wilcom Customer Service. Support personnel will determine if the equipment requires service, repair or calibration.

2. If the equipment must be returned to Wilcom for service, Wilcom Customer Service will issue a Return Material Authorization (RMA) number and the following address for return:

Wilcom
73 Daniel Webster Highway
Belmont, NH 03220
TEL (800) 222-1898 (USA only) or (603) 524-2622
FAX (603) 524-3735
www.wilcominc.com

# IMPORTANT

**Never send any equipment back to Wilcom without a Return Material Authorization (RMA) number.**

3. Pack the equipment in its original shipping material. Be sure to include a statement or report fully detailing the defect and conditions under which it was observed. Also be sure to include a contact name and telephone number.

4. Return the equipment, prepaid, to the above address. Be sure to write the RMA on the shipping slip. Wilcom will refuse and return any package that does not bear the RMA.

**Ordering Information**
Orders for any of the Wilcom products and any of their optional accessories should be directed to the address shown above.

# Warranty

All products are warranted against defects in materials and workmanship. This warranty applies for a period of two (2) years from date of delivery, except for Fiber Optic instrumentation and equipment which have a one (1) year warranty on parts and two (2) years on labor. (The only exception in the digital testing equipment is the D550 Shark, which has a warranty of one (1) year from date of delivery.) Wilcom's obligation under this warranty is limited to servicing or adjusting each instrument returned to its factory within the warranty period, and to replace any components found to be defective. If determined that the defective condition is a result of misuse or abnormal operation, repairs will be billed.

## LIMITATION OF WARRANTY

The foregoing warranties are the exclusive warranties provided by Wilcom. Wilcom will not be liable for any special, indirect, incidental or consequential damages whatsoever resulting from loss of use, loss of data or loss of profits arising out of or in connection with the use or performance of the product, even if Wilcom has been informed of the possibility of such damages in advance. All implied warranties, including without limitation warranties of merchantability and fitness for a particular purpose, as well as warranties arising from a course of dealing or usage of trade are expressly disclaimed.

## PROPRIETARY INFORMATION