OPERATING INSTRUCTIONS (Continued)

6. Function Selector Switch is then turned to the "Circuit Loss" position and the battery disconnect switch is pushed to release it. (See Illustration, Figure #4.) The serviceman's hand-set should be switched to the monitor position.

7. Listen to the tone and record the Circuit Loss Level on this pair. If multiple tones are sent from the Central Office, they can be heard through the hand-set amplified by 5 dB by an amplifier built into the Model 4. Listen to the sequence of the tones and then record the Circuit Loss Level at each different tone frequency.

8. The operator may want to send tones to someone at a test position at the Central Office for the purpose of checking the Circuit Loss in the pair in both directions. This is very easily done with the Model 4.
   A. Leaving the leads connected as they were for the previous testing, depress the battery disconnect Push-Button, and turn the Function Switch to the "Off" position. Switch the hand-set to the "Dial" position. Dial the access number to the test desk or test position. Tell the person at the test position that you are going to send him one or more tones.
   B. Switch the Function Selector Switch to the "Circuit Loss" position. Release the Push-Button switch. Switch the Send/Receive Switch to the "Send" position. (See Illustration, Figure #5.)
   C. Now switch the Tone Selector Switch to any tone position. Adjust the tone to the desired level by means of the tone level control. Transmit level is indicated on the meter CKT loss scale. That tone is being transmitted through the Transmission Test Leads to the Central Office. You will be able to monitor the outgoing tone through your hand-set. You can send several tones if you desire to.

Loop-Around Testing For Circuit Loss With The Model 4
1. Adjust Tone Level to 0 dB by setting switches to CKT LOSS, SEND, and TONE to any frequency. Adjust Tone Level for 0 dB on meter.
2. Follow Steps 1 through 4 as listed under "Testing For Circuit Loss - Standard Procedure."
3. Determine the second pair of wires to be used for loop-around test and connect the Tone leads to them.
4. Dial the number of the cable pair that is connected to the Tone leads.
5. When ringing is heard through hand set turn FUNCTION switch to CKT LOSS, Push-Push switch to ON, and hand set to monitor.
6. Select desired frequency on TONE switch which should be heard from hand set.
7. Record circuit loss as indicated on meter. Note that the loss is the combined loss of both cable pairs. If the acceptable loss in one pair is 8 dB then the loss in two pairs should be less than 16 dB.
8. The operator has the ability to send as many as seventeen tones by rotating the Tone Selector Switch and read them with the same tester. The oscillator will transmit all tones at zero dB level once one of the tones has been set at zero without further need for adjustment. Usually, these tones are adequate to check across the entire voice frequency range.
9. If the leads are reversed and the Transmission Test Leads are first connected to the second pair, the operator can dial the number of the first pair and send the same tone or tones checking the Circuit Loss in the opposite direction.
10. If a reading lower than minus 16 dB is shown, use a third pair to identify which of the first two is the bad one.

Testing For Circuit Noise — Standard Procedure
1. Refer to the Circuit Loss Testing — Standard Procedure Section. Setting up the Model 4 to test for Circuit Noise is exactly the same as Steps 1 through 4 of those Instructions. (See Illustration, Figure #4, Pg. 14.)
2. Instead of dialing the access number of a tone source, the operator should dial the access number of a “Quiet Termination.”
3. When the operator hears the line go “Quiet” he should then turn the Function Selector Switch to the “Circuit Noise” position. (See Illustration, Figure #4.)
4. The pointer on the meter will now be indicating the circuit noise level in that pair from the Central Office to the point of test. You are measuring the noise metallic with “C” message weighing between the tip and ring of the subscriber loop.
5. Record the noise level indicated on the meter and listen through the hand-set to the “monitor” mode to identify what may be the source of that noise. Even low level noise should be audible because of the 5 dB amplification in the tester.

DIALING INSTRUCTIONS (Fig. 4)
The BATTERY DISCONNECT switch is a Push-Push type switch which disconnects the 9 volt batteries when depressed and also switches the TALK SET terminals from the dialing to listening mode.
The following procedure should be followed when dialing and operating in any of the loop measurement positions.

1. The Push-Push battery disconnect switch should be in the depressed position and the Function Switch in the Off/Dial position when dialing.
2. After the connection is completed to the number dialed, the Function Switch is turned to the CKT Loss, CKT Noise or function to be measured.
3. The Push-Push Switch is then depressed and released, powering up the measurement circuits and switching the Talk Set to the listening mode.
4. Measurements are then made following the procedure in the manual.
NOTE — If the Push-Push Switch is released to the out position before the Function Switch is turned to one of the loop function positions the connection will be lost.
5. If it is desired to reconnect the Talk Set to the line depress the battery disconnect switch and then turn the Function Switch to the DIAL-OFF position.

Performing Tests With The Model 4
Testing For Circuit Loss — Standard Procedure
1. Plug the Transmission Test Leads into the Line Jack. (See Illustration, Figure #4.)
2. Connect your hand-set to the Talk Set Terminals before you have connected the Transmission Test Leads to the pair of wires being tested. Switch your hand-set to the “Dial” position.
3. Check the two Rotary Selector Switches and make sure that they are turned to the off position. Check the Send/Receive Toggle Switch to make sure it is in the “Receive” position.
4. Connect the three Transmission Test Leads to the pair being tested; Tip to Tip, Ring to Ring, and Gnd to Ground. If this is a live pair, the operator will hear a dial tone through his hand-set.
5. For Circuit Loss Testing following the Standard Procedure, the operator now dials the correct access number at the Central Office to receive a single 1004 Hz tone or an access number that will get three or more tones. Listen for the tone or tones.
TAking A Circuit Loss Measurement
Standard Procedure And Dialing

Preparing To Make Loop-Around Tests

Fig. 4

Fig. 6

14

19
1. Open the cover assembly and detach it from the tester case.
2. Remove from the cover compartment one or both sets of test leads and the operator's manual if needed.
3. Press and release battery disconnect switch.
4. Turn the Function Selector Switch to the "Battery Check" position. If the pointer moves to the far right hand area of the meter, over some part of the battery check arrow, the two nine volt cells that power the transmission test functions and the multi-tone oscillator are OK. Although these batteries are long-lived, they will fail in normal operation much sooner than the other batteries in the Model 4 and that is why we have supplied a convenient battery test for them.
5. Plug the red and black leads into the "V-O" jacks. Connect the alligator clips together shorting the leads. Turn the Function Selector Switch to the "Rx1" Ohms position and observe if the pointer moves to the zero mark on the Ohms scale. If it doesn't, use the Ohms Adjustment Knob to bring the pointer to zero. If you can "Zero" the pointer, the 11/2 volt "C" cell is OK.
6. With the leads connected as in step four above, turn the Function Selector Switch to the "Rx10k" position. Follow the same procedure as in step four. If you can "Zero" the pointer this time, the two 22½ volt cells are OK.
7. Check the mechanical zero by allowing the meter pointer to return to zero with both Rotary Selector Switches turned to "OFF." If the pointer is slightly off, it can be adjusted to zero by rotating the center adjustment screw to the right or left.
8. Care should be taken to not touch the exposed metal parts of the Western Electric style alligator clips as the operator is connecting them to the pair of wires to be tested. Care should also be taken not to touch the Talk Set Terminals or the exposed metal parts of the alligator clips attaching the serviceman's hand-set to those terminals. The reason to take care is that the voltage present in the pair of wires being tested has not been determined yet and it could be at a dangerous level.

IT IS THEREFORE RECOMMENDED THAT THE TALK SET BE CONNECTED TO TALK SET TERMINALS BEFORE INPUT TEST LEADS ARE CONNECTED TO TELEPHONE LINES UNDER TEST.
VOLT-OHMETER AND TONE OUTPUT LEADS

There are two of these leads. Each is a single conductor test lead wire with a shrouded male banana plug at one end and a Western Electric style alligator clip at the other. One lead is red and the other is black. Usually, the red lead should be plugged into the plus jack and the black lead into the minus.

If the operator is performing DC Voltage or Ohms tests, he can reverse the polarity of the tester without needing to disconnect and reconnect the leads by simply moving the +/- Toggle Switch to the other position from where it was.

If these test leads are being used to supply tones, polarity is no problem because the tone generator supplies an alternating or AC signal.

If care is taken in coiling the test leads properly and the five alligator clips are layed flat on top of the operator's manual in the cover assembly, the inner door of the cover assembly can be closed easily.

BATTERY DISCONNECT SWITCH

This is a PUSH-PUSH type switch to perform two functions.
1. When depressed, either manually or by closing the tester cover, the batteries are disconnected to prevent unnecessary battery drain in case the TONE and FUNCTION switch are left ON. Pushing and releasing this switch enables the power supply so that tests can be made.
2. The second function of the switch is to connect the TALK SET STUDS to the line jack for dialing. Dialing is performed with the switch depressed. For more information see DIALING INSTRUCTIONS.

SENSITIVITY SWITCH

The Sensitivity Switch allows the user to alter the standard sensitivity of the Model 4 by either +10dB or -10dB. The sensitivity is normal when the switch is in its detented center position. The switch is spring loaded so that it will return to the center position unless it is held in the +10dB or -10dB position by the user.

This switch only functions in the CKT LOSS, CKT NOISE, PWR INF, and TONE modes.

When the switch is held in the +10dB position, the user must add 10dB to the reading seen on the meter dial. This will allow the user to measure signals which are 10dB higher than the top end of the meter scale. For instance, if the user is in the CKT LOSS mode and the needle reads above the top of the meter scale, and upon pressing the Sensitivity Switch to is +10dB position, the needle comes downscale to rest on +1dB, the user can ascertain that the measured signal level is +11dB (+1dB +10dB = +11dB).

In similar fashion, pressing the switch to the -10dB position requires the user to subtract 10dB from the meter reading. This is helpful when measuring signals which are close to the bottom of the scale. For instance, if a signal is reading somewhere between -20dB and -40dB on the CKT LOSS scale, and the user presses the Sensitivity Switch to its -10dB position, and the meter needle is seen to move upscale and come to rest at -15dB, the user can ascertain that the measured signal level is -25dB (-15dB -10dB = -25dB).

LOOP-AROUND TESTING FOR CIRCUIT NOISE

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Fig. 8
Loop-Around Testing For Circuit Noise
1. Follow Steps 1 through 4 as listed under "Testing For Circuit Loss - Standard Procedure."
2. Connect Tone leads to second pair of wires and dial the number of this pair.
3. When ringing is heard through hand set turn FUNCTION Switch to CKT Noise, Push-Push switch to ON, and hand set to monitor.
4. With TONE switch OFF a quiet termination is provided to the Tone leads. Record noise level indicated on meter.
5. If a high level is read, use a third pair to determine which of the first two has excessive noise.

Testing For Power Influence — Standard Procedure
This is exactly the same procedure as with Circuit Noise testing. The one exception is that the Function Selector Switch is turned to the Power Influence position after a quiet termination is dialed. (See Illustration, Figure #4, Pg. 14.)

Loop-Around Testing For Power Influence
Loop-Around testing for Circuit Noise is exactly the same as for Power Influence with the one exception that when the loop has been established that the Function Switch is turned to the Power Influence position. Record the level and listen to the noise for possible identification or location. (See Illustration, Figures #6 and #8, pages 19 and 21.)

Line Or Loop Current (Milliams) Testing - Standard Procedure
This test is also performed the same as Circuit Noise Standard Procedure testing. There are two exceptions in this test. (See Illustration, Figure #4).
1. When the quiet termination has been dialed, the Function Selector Switch is turned to the ± MA position.
2. Because polarity is a factor in testing for milliams, there is a + MA and a - MA position on that switch. If the meter pointer moves in the wrong direction, switch to the opposite position.

Loop-Around Testing Of The Loop Current (Milliams)
Loop-Around testing for Loop Current is the same for Circuit Noise and Power Influence with the same two exceptions as listed above. (See Illustration, Figures #6 and #8.)
FUNCTION OF CONTROLS, JACKS, TERMINALS AND LEADS
See Figure #3, Page 9

FUNCTION SELECTION SWITCH
I. Selects desired measurement functions —
   A. Line Transmission Measurements
      1. Circuit Loss
      2. Circuit Noise
      3. Power Influence
      4. Loop Current
   B. Volt-Ohmmeter
      1. AC Voltages
      2. DC Voltages
      3. Ohms
II. Off position directly connects Talk-Set terminals to the pair of wires being tested. Read dialing instructions.
III. Battery Check — indicates condition of 9 volt batteries.

TONE SELECTION SWITCH
I. Selects desired tone frequency output.
II. Off position connects a quiet termination across output jacks.

POLARITY REVERSING SWITCH
Allows the reversal of polarity of leads during DC Voltage and Ohms measurements.

SEND/RECEIVE SWITCH
SEND POSITION —
In this position and with the function switch turned to CKT Loss or Tone the output level of the tone generator is indicated on the meter if the tone generator is turned on.
Adjustment of the tone level is made using these switch settings and tone level adjustment knob.
The tone output termination is also switched to the line jack in the send position.
Tones may be sent out the line jack in this position.

RECEIVE POSITION —
In the receive position the meter measuring circuits monitor incoming signals at the line jack when the function switch is set at CKT Loss, CKT Noise, PWR INF, MA and Tone.

TIME SAVING TECHNIQUES TESTING WITH THE MODEL 4
If you have practiced performing each of the Transmission Tests, both Standard Procedure and the Loop-Around Procedure, you will have noticed many repetitions of exactly the same steps. The operator can perform all four Standard Procedure Tests rapidly together. He can perform the four Loop-Around Tests equally as fast.

Grouping The Four Transmission Tests - Standard Procedure
1. Set up to test, referring to the first five steps of the Circuit Loss — Standard Procedure Section. (See Illustration, Figure #4.)
2. Follow Steps 6 and 7 to complete the Circuit Loss test.
3. Return the function selector switch to the “Off” position and dial the access number of quiet termination.
4. Turn the function selector switch to the “Circuit Noise” position and take a reading then listen.
5. Don’t return the dial to “Off.” Turn the function selector switch to the “Power Influence” position. Take a reading then listen.
6. Don’t return the dial to “Off.” Turn the function selector switch to the “Line Current” positions and take a reading.
   • Note that the last three tests were performed while connected to the same quiet termination without need to break that connection or to dial.
   • Note that all four tests were performed without the need to change any connections of the test leads. Tones could have been sent to the Central Office without changing the lead connections also. (Refer to Step 8 of the Circuit Loss — Standard Procedure.) (See Illustration, Figure #4.)

Grouping The Four Loop-Around Transmission Tests
1. Set up to test, referring to the first three steps of the Loop-Around Circuit Loss Test. (See Illustration, Figure #6.)
2. Follow steps 4 through 8 to complete your Circuit Loss test. (See Illustration, Figure #7, Pg. 20.)
3. Turn the function switch to the “Circuit Noise” position and the Tone switch to “Off” for a quiet termination. Record the Circuit Noise Level and listen. (See Illustration, Figure #8.)
4. Turn the function selector switch to the “Power Influence” position. Record the reading and listen.
5. Turn the function selector switch to the Line Current position, plus or minus, and take a reading.
(17 TONE OSCILLATOR)

The Tone Generator portion of the Model 4 Loop Tester is in the same case as the Transmission Tester and Volt-Ohmmeter functions. However, electronically, the Tone Generator is a completely separate circuit. It can be used in conjunction with the Transmission Tester function as in the Loop-Around Transmission Tests. It can be used separately for many purposes where one or more tones are needed or to supply a quiet termination.

Additional Tone Generator Uses

1. Sending tones to the Central Office for testing Circuit Loss in the opposite direction. (See the Circuit Loss Testing — Standard Procedure Section, Step 8.) (See Illustration, Figure #4, Pg. 14.)
2. Supplying a tone for pair sorting. (See Illustration, Figure #9.)
3. Supplying a tone for cable tracing. (See Illustration, Figure #9.)
4. Supplying a tone for continuity checking. (See Illustration, Figure #9.)
5. Some of the fifteen tones built into the tester can be used for special applications. An example is the 2713 Hz tone. This tone can be used to trip relays in "T" Carrier Equipment and Data Equipment to allow for continuity tests of those lines. The Loop-Around capability of the Model 4 lends itself perfectly for this purpose.
6. There are two optional tone positions on the Tone Selector Switch. The use of these two tones are as varied as the variety of tones available.
7. If desired the value of the resistors required to generate a given frequency may be calculated from the equation

\[ R = \frac{1}{2\pi CF} - 69. \]

R = Value of unknown resistors (2 required)
C = .01 μF
f = Frequency desired

Two sockets are provided on the Tone Generator for insertion of these resistors.
Position 17 on the switch uses R320 and R317.
Position 18 on the switch uses R318 and R319.
Refer to the Tone Generator schematic and component layout (Bd 300) for the correct positions to insert the resistors in the sockets.
GENERAL INFORMATION

The input resistance of the transmission quality measurement circuit is 430 ohms as is specified in the Subscriber Loop Transmission Test Set Publication 55020.

The Model 4 is totally battery powered. Normal field operation of several months should be experienced before any of the batteries need replacing. Please refer to the Battery Specifications. For extended battery life, the tester should be turned off when not in use. For longest battery life, Alkaline or Mercury batteries are recommended. For the 9 volt size — Mallory MN 1604, NEDA 1604A or equivalent. For the 22½ volt size — Eveready 412 or NEDA 215. For the 1½ volt “C” cell — any major brand will do.

The Talk set “Ring” and Test Cable “Ring” are connected together.

Batteries and fuse are located at the top rear side of the tester. Access to the battery compartment is achieved by loosening one screw in the upper center of the back panel. When the screw has been disengaged, lift the cover up and out. See Figures #1 and #2.

The cover of the Model 4 is a container for the two types of test leads and the Operator’s Manual. It serves a third purpose. When the leads are placed in the cover compartment properly and the cover’s inner door is closed, closing the cover on the tester automatically presses a battery disconnect switch in the front control panel.

BATTERY COVER REMOVAL

Figure 1

USING THE MODEL 4 FOR SENDING TONES INTO A PAIR

Fig. 9

Normal Generator Operation

1. Plug the Tone Output Leads into the Tone Output Jacks.
2. Connect those two leads to any pair of wires desired.
3. Switch the Tone Selector Switch to the tone to be transmitted. (See Illustration, Figure #9.)
4. Switch the Function Selector Switch to the Circuit Loss position. The tone is now being transmitted into the pair of wires.
5. Switch the Send/Receive Toggle Switch to the Send position. This allows you to see the dB level of the tone being transmitted and adjust to zero dB output.
6. Several tones, up to 17, can be transmitted by rotating the Tone Selector Switch.
7. If you had to adjust the tone output to the zero dB level in Step 4, you can see that turning the Tone Level Adjustment to the right or left lowers or raises the tone output level. This adjustment can be used to transmit tones at a minus 50 dB to over a plus 10 dB. The +10 dB and -10 dB Toggle Switch can also be used to facilitate accurate adjustment of the tone output beyond the ends of the meter scale. The tone output level is read on the Circuit Loss Scale on the meter.
8. When the Tone Selector Switch is turned to the 204 Hz position and the Level Control turned completely CCW for Zero output...
Test Leads for convenience and speed, he should do the following:
A. Turn the Function Selector Switch to the "Circuit Loss" position.
B. Turn the Tone Selector Switch to any tone.
C. Switch the Send/Receive Toggle Switch to the "Send" position.
   This is actually the same as normal operation but the Transmission Leads are connected to the pair to which the tone or tones are being sent. (See Illustration, Figure #5, Pg. 17.)
2. Loop-Around Transmission Testing (Refer to the Loop-Around Circuit Loss Testing Section). Both sets of leads are used and the Send/Receive Toggle Switch is switched finally to the Receive position to take "Loss" readings. (See Illustrations, Figures #6 and #7, pages 19 and 20.)

**VOLT-OHMметр OPERАTION**

The same jacks and leads are used for Volt-Ohm testing as the operator used for Tone Output. The V-O Jacks are located near the lower right corner of the control face plate. Two leads with Western Electric style alligator clips attached are supplied. The red lead is plugged into the plus jack and the black lead into the minus jack. The Volt-Ohm functions are located on the Function Selector Switch. AC voltage, DC voltage and Ohms or resistance can be measured.
1. Plug the leads into the V-O jacks.
2. Connect the leads to the pair of wires or equipment being tested.
3. The Tone Selector Switch should be turned to the "Off" position.
4. Turn the Function Selector Switch to the kind of measurement desired and the correct range.
5. If you are measuring Ohms or resistance, you should connect the two alligator clips together shorting the leads. Adjust the pointer to zero on the Ohms scale of the meter. Now reconnect the leads to the equipment being tested and make an accurate Ohms measurement. This zeroing process should be followed for each range of Ohms measurement when they are used.

The very high Ohms ranges of Rx10k and Rx100k allows the operator to take resistance measurements up to 100 million Ohms. The meter is easily read to 5 million Ohms. This capability plus the AC and DC measurements enables the Model 4 to be used for additional tests, normally performed by the 8455 type tester.
1. Insulation Resistance Measurements
2. Tests for Grounds.

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<td>Rx1k, 150 μA</td>
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<td>Rx10k, 450 μA</td>
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<tr>
<td>Rx100, 1.5 mA</td>
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<tr>
<td>Rx100k, 45 μA</td>
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<td>± 3% Arc</td>
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<td>1 Amp Fuse and 6 V Zener</td>
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**GENERAL**

- Size: 5½" W x 7½" H x 4 7/8" D with cover
- Weight: Approx.
- Operating Temperature: 0-50°C
- Storage Temperature: -40°C to 60°C
- Battery: 400 μA Suspension
- Batteries: 2 9 Volt Alkaline NEDA 1604 or 8.4 Volt Mercury NEDA 1604M
- Accessories: 1 1½ Volt C Cell
- 2 22½ Volt NEDA 215

**ACCESSORIES**

- Loop Test Leads: 310 Jack to Modular Plug
- Modular Receptacle to 3 Western Electric style alligator clips marked Tip, Ring, and Gnd.
- Shrouded Banana Plug to Western Electric style alligator clips
- Color — Red and Black
PERFORMANCE SPECIFICATIONS (Continued)

GENERATOR SECTION

Tone
Waveform
Sine Wave
Frequencies
204-304-404-575-750-1754-1804-
2004-2804-3004-3204-4804 Hz
Accuracy
+5% to -0%
Frequencies
804 and 1004 Hz
Accuracy
-0 to +0.5%
Frequency
2713 Hz
Accuracy
±5 Hz

Quiet Termination
600 Ohms supplied at tone output.
(See instructions on Tone Generator)

Output Amplitude
Variable approx. -40 dBm to +10 dB
Output Level Monitored by Meter
0 dB Level .775 V ±.2 dB

Output Impedance
600 Ohms ±5%
DC Holding
Current Sink, 20 to 30 mA
Output
Available at the V-O Jacks

VOLT-OHM Meter

DC Volts
Ranges
0-15, 60, 300 V
Sensitivity
2500 Ω/Volt
Accuracy
±2%

AC Volts True RMS
Ranges
0-60, 300 V
Sensitivity
8.32 K Ohms/Volt
Accuracy
±3%

REPLACEABLE PARTS Bd 100

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<td>C101, C102</td>
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COMPONENT LOCATION
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<tr>
<td>R224</td>
<td>Resistor, 200k Var.</td>
<td>16-389</td>
</tr>
<tr>
<td>U201</td>
<td>IC, LF442</td>
<td>126-145</td>
</tr>
<tr>
<td>U202</td>
<td>IC, 536 TRMS</td>
<td>126-112</td>
</tr>
<tr>
<td>U203</td>
<td>IC, 3140 MOSFET</td>
<td>126-70</td>
</tr>
<tr>
<td>CR201</td>
<td>Diode, Zener 6.8V</td>
<td>127-164</td>
</tr>
<tr>
<td>SW201</td>
<td>Switch, Function Select</td>
<td>22-770</td>
</tr>
</tbody>
</table>

**Circuit Noise**

- **Range**: 0 to 33 dBmrc
- **Reference Level**: Extended by ±10 dB Switch
- **Frequency Response**
  - **Accuracy**: Meets Bell Technical Reference 41.009
  - **Message Weighting**: "C" Message Curve
- **DC Holding**
  - **Input Impedance**: Current Sink, 20 to 30 mA
  - **Meter Scale Divided**: Into 3 Segments
  - **Power Influence (Noise to Gnd)**
    - **Range**: 60 to 93 dBmrc
      - **Reference Level**: Extended by ±10 dB Switch
      - **Frequency Response**
        - **Accuracy**: Meets Bell Technical Reference 41.009
        - **Message Weighting**: "C" Message Curve
      - **Input Impedance**: No DC Path Between Tip-Ring and Gnd
      - **Input Resistance**: Between Tip and/or Ring to Gnd
      - **Meter Scale Divided**: Greater than 50 K Ohms
      - **Line Current**
        - **Accuracy**: Plus or Minus Selected by Reversing Switch
        - **Input Resistance**: 430 Ohms ±1%
        - **Meter Scale Divided**: Into 2 Segments
        - **Input Resistance**: 18 mA and 20 mA Levels Marked

---

**COMPONENT LOCATION**

[Diagram of circuit board with component locations marked]
INTRODUCTION

The Model 4 Loop Circuit Test Set is a unique general purpose instrument designed primarily for use in local exchange and special service areas. The Model 4 can be used to perform most daily testing requirements in the standard manner but also in innovative new ways that will save the operator and his company many man-hours of labor.

The instrument can replace more than 4 separate instruments normally used by the serviceman. They are the transmission test set, signal generator, volt and ohmmeter tester, and the 8455 type tester with its insulation and ballistic test features.

The tester utilizes a rugged suspension type meter with colored scales to give qualitative as well as quantitative measurement indications.

The unit is housed in a rugged plastic case with a removable cover compartment used to store the test leads and the operator's manual. The tester has an adjustable carrying strap so it can be carried without the use of hands.

PERFORMANCE SPECIFICATIONS

LINE MEASUREMENT SECTION

<table>
<thead>
<tr>
<th>Circuit Loss</th>
<th>-40 to +3 dBm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Extended by ±10 dB</td>
</tr>
<tr>
<td></td>
<td>Switch</td>
</tr>
<tr>
<td>0 dBm Reference</td>
<td>1 mW across 600 Ohms</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>50 Hz to 10 kHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>50 Hz to 200 Hz ± 1.0 dB</td>
</tr>
<tr>
<td></td>
<td>200 Hz to 5 kHz ± .3 dB</td>
</tr>
<tr>
<td>DC Holding</td>
<td>12 dB filter with cut-off</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>frequency at 10 kHz</td>
</tr>
<tr>
<td>Meter Scale Divided</td>
<td>Current Sink, 20 to 30 mA</td>
</tr>
<tr>
<td>Into 3 Segments</td>
<td></td>
</tr>
<tr>
<td>Tone Output</td>
<td>Tones may be transmitted out the loop leads by switching Send/Receive Sw, to Send.</td>
</tr>
</tbody>
</table>

REPLACEABLE PARTS Bd300

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD 300</td>
<td>PC BD, W/Comp. BDA300</td>
<td>87-653</td>
</tr>
<tr>
<td>C301</td>
<td>Cap. .01 μF 63 V 1%</td>
<td>43-505</td>
</tr>
<tr>
<td>C302</td>
<td>Cap. .01 μF 63 V 1%</td>
<td>43-505</td>
</tr>
<tr>
<td>R310</td>
<td>Network Res. 15 Res Custom</td>
<td>159-10</td>
</tr>
<tr>
<td>R311</td>
<td>Network Res. 15 Res Custom</td>
<td>159-10</td>
</tr>
<tr>
<td>R313</td>
<td>Res. 2 K Film 10% Var.</td>
<td>16-291</td>
</tr>
<tr>
<td>R314</td>
<td>Res. 2 K Film 10% Var.</td>
<td>16-291</td>
</tr>
<tr>
<td>R315</td>
<td>Res. 500 Film 10% Var.</td>
<td>16-404</td>
</tr>
<tr>
<td>U301</td>
<td>IC Quad Op-AMP TL064</td>
<td>126-424</td>
</tr>
<tr>
<td>CR301</td>
<td>Diode, Zener MZ4626 5.6V</td>
<td>127-146</td>
</tr>
<tr>
<td>CR302</td>
<td>Diode, Zener MZ4626 5.6V</td>
<td>127-146</td>
</tr>
<tr>
<td>SC301</td>
<td>Socket Singe-in-line 4 Pos</td>
<td>2455-776</td>
</tr>
<tr>
<td>SC302</td>
<td>Socket Singe-in-line 4 Pos</td>
<td>2455-776</td>
</tr>
<tr>
<td>SW301</td>
<td>Switch Rotary Tone Select.</td>
<td>22-738</td>
</tr>
</tbody>
</table>

COMPONENT LOCATION

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SAFETY RULES

Warning
This tester has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when lack of caution or poor safety practices are used.

Read The Manual
Read this Instruction Manual carefully and completely.
Voltages and currents within the capability of this test equipment can be hazardous. Follow the instructions in this manual for every measurement. Read and understand the general instructions before attempting to use this tester. Do not exceed the limits of the tester.

Safety Check
Double check the switch setting and lead connections before making measurements. Are you following all of the instructions?
Disconnect the tester or turn off the power before changing switch positions.
Do not connect to circuits with voltage present when switch is in any ohms or current position.
When replacing fuses use only specified type fuses and insert in correct fuse holder.

Don't Touch
Don't touch exposed wiring, connections or other "live" parts of an electrical circuit. If in doubt, check the circuit first for voltage before touching it.
Turn off the power to a circuit before connecting test probes to it. Be sure there is no voltage present before you touch the circuit.
Do not use cracked or broken test leads.

High Voltage Is Dangerous
Always start with the power off. Be sure there is no voltage present before making connections to the circuit.
Don't touch the tester, its test leads, or any part of the circuit while it is on. Before disconnecting the tester, turn the circuit off and wait for the meter to return to "zero."

Distribution Circuits Pack A Punch
In high energy circuits such as distribution transformers and bus bars, dangerous arcs of explosive nature can occur if the circuit is shorted. If the tester is connected across a high energy circuit when set to a low resistance range, a current range, or any other low impedance range, the circuit is virtually shorted.
Special equipment designed for use with these circuits is available. Contact a qualified person for assistance before attempting to make measurements on any high energy circuit.

Safety Is No Accident

MISCELLANEOUS PARTS

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Resistor, 50k Var.</td>
<td>16-413</td>
</tr>
<tr>
<td>R2</td>
<td>Resistor, 2.5k Var.</td>
<td>16-343</td>
</tr>
<tr>
<td>SW1</td>
<td>Switch, Push Button</td>
<td>22-735</td>
</tr>
<tr>
<td>Knob (Tone-Selector)</td>
<td>34-196</td>
<td></td>
</tr>
<tr>
<td>Knob (Push Button)</td>
<td>34-271</td>
<td></td>
</tr>
<tr>
<td>Knob (Ohms-Tone) Control</td>
<td>34-198</td>
<td></td>
</tr>
<tr>
<td>Contact, Battery 1½V</td>
<td>46-204</td>
<td></td>
</tr>
<tr>
<td>Contact, Battery</td>
<td>46-205</td>
<td></td>
</tr>
<tr>
<td>Meter Assembly</td>
<td>52-8304</td>
<td></td>
</tr>
<tr>
<td>Socket, Banana Plug</td>
<td>2455-501</td>
<td></td>
</tr>
<tr>
<td>Fuse, 1 Amp</td>
<td>3207-43</td>
<td></td>
</tr>
<tr>
<td>Lead Package, Volt/Ohm</td>
<td>79-548</td>
<td></td>
</tr>
<tr>
<td>Lead Assembly, Phone Plug</td>
<td>79-493</td>
<td></td>
</tr>
<tr>
<td>Lead, WE310 Plug to Modular</td>
<td>79-519</td>
<td></td>
</tr>
<tr>
<td>Lead Assembly, Modular to Clip</td>
<td>79-537</td>
<td></td>
</tr>
<tr>
<td>Battery, 9V (NEDA 1604A)</td>
<td>37-48</td>
<td></td>
</tr>
<tr>
<td>Battery, 22.5V (NEDA 215)</td>
<td>37-50</td>
<td></td>
</tr>
<tr>
<td>Battery, 1.5V (NEDA 14F)</td>
<td>2426-2</td>
<td></td>
</tr>
</tbody>
</table>
to be free from defective material or factory workmanship and agrees to repair or replace such products which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge for parts and service. If we are unable to repair or replace the product, we will make a refund of the purchase price. Consult the Instruction Manual for instructions regarding the proper use and servicing of instruments and test equipment. Our obligation under this warranty is limited to repairing, replacing or making refund on any instrument or test equipment which proves to be defective within three years (one year guaranteed calibration) from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgment, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence or accident or which have had the serial numbers altered, defaced, or removed. Accessories, including batteries and fuses, not of our manufacture used with this product are not covered by this warranty.

To register a claim under the provisions of this warranty, return the instrument or test equipment to Triplet Corporation, Bluffton, Ohio 45817, transportation prepaid. Upon our inspection of the product, we will advise you as to the disposition of your claim.

ALL WARRANTIES IMPLIED BY LAW ARE HEREBY LIMITED TO A PERIOD OF THREE YEARS, AND THE PROVISIONS OF THE WARRANTY ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES EXPRESSED OR IMPLIED.

The purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the product by the purchaser, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability Triplet Corporation may have, including incidental or consequential damages.

Some states (USA only) do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. No representative of Triplet Corporation or any other person is authorized to extend the liability of Triplet Corporation in connection with the sale of its products beyond the terms hereof.

Triplet Corporation reserves the right to discontinue models at any time, or change specifications, price or design, without notice and without incurring any obligation.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

TRIPLETT CORPORATION
Bluffton, Ohio 45817

MODEL 4 TYPE 2 LOOP TESTER