

20 CYCLE, 135 CYCLE AND 1000 CYCLE LINE SIGNALING EQUIPMENT

TEST PANEL

(TEST CIRCUIT SD-61085-01)

DESCRIPTION

1. GENERAL

- 1.01 This section describes the test circuit per drawing SD-61085-01 used in maintaining signaling equipment for 20-cycle, 135-cycle and 1000-cycle signaling circuits.
- 1.02 The detailed methods of using this equipment are given in the sections dealing with testing and adjusting line signaling equipment.
- 1.03 The "Standard" and "Special" current values for the No. 196 type relays, and "Standard" current values for the No. 218 type and No. 215 type relays in signaling circuits are described in sections of Division 040 applying to the particular relay, and in the circuit requirement tables of the test circuit and signaling circuit drawings.
- 1.04 "Special" current values are intended to be used only when the more sensitive ("Special") adjustment is required for the No. 196 type relay. Where "Special" operate values are used, "Special" non-operate values should also be used.

2. EQUIPMENT FEATURES

- 2.01 The equipment of the test circuit is assembled on a panel and consists of jacks, keys, frequency meter, milliammeters, potentiometers, connecting blocks for No. 215 and No. 218 type relays, signal lamps, and relays, all of which are provided for making overall tests of the signaling circuits and for applying test and adjust current to the various relays involved. This panel is arranged for relay rack mounting.
- 2.02 Where 1000-cycle signaling circuits are not installed, certain of the equipment shown on Drawing SD-61085-01 for testing circuits of this type is not provided.
- 2.03 A trunk is provided which terminates in a jack with an associated lamp for the No. 11 switchboards, or in a call circuit with an associated lamp for the No. 3 switchboards.
- 2.04 A trunk is also provided to the toll test board in order that the tester and test board attendant may communicate with

each other when the location of the test panel is not convenient to the toll test board.

- 2.05 In order to control the application of ringing current when testing and adjusting the signaling circuits, a control test set is provided. By means of this set the test circuit may be arranged for testing 20-cycle, 135-cycle, or 1000-cycle signaling circuits as desired, and for applying either an operate or a non-operate test or for applying operate current for predetermined time intervals by means of a dial.
- 2.06 The test circuit is arranged so that 1000-cycle signaling circuits of either the two-tube or single tube type may be maintained, but a key on the test panel must be operated before single tube circuits can be tested. When 1000-cycle circuits are equipped with directional selection equipment to avoid interference from echo currents, they must be tested from the relay rack. However, in the case of some of the older type circuits not equipped with directional selection equipment they must be tested from the switchboard.
- 2.07 At an inward toll switchboard position from which all the toll line circuits are available, a cord and plug are provided for making connection to the jack of the toll line circuit to be tested. In case all circuits are not available from one or two positions, the test circuit is terminated in a jack of the multiple and connection is made to the toll line circuit by means of a patching cord.
- 2.08 Two jacks in the toll multiple designated T and TL are provided for making connection to the control test set. These jacks are also multiplied through the test circuit panel and the bays at the relay rack where the signaling circuits are located, and at these points are designated A and AL, respectively. A third jack designated TA is also multiplied through the 1000-cycle signaling circuit relay rack bays for making connections to signaling circuits equipped with directional selection equipment. The tip and ring of this jack is multiplied to the tip and ring of the test circuit cord or jack at the toll switchboard

and the sleeve is connected through a resistance of 84 ohms to the sleeve of the test circuit cord or jack.

3. OPERATING FEATURES

- 3.01 The key designated TALK, when operated to its LINE position, connects the operator's telephone set circuit to the toll line to which the test cord is connected. When the key is operated to its SWBD position, the operator's telephone set circuit is connected to a jack at the No. 11 toll switchboard position and the lamp associated therewith is lighted, or, the telephone set circuit is connected to an inward call circuit at the No. 3 toll switchboard position and a lamp associated with the call circuit is lighted. By means of this circuit, the tester may request that the test circuit be connected to any toll line circuit to be tested.
- 3.02 The key designated RING when operated to its LINE position connects battery to the tip of the test circuit and operates the ringing relay of any toll line circuit to which the test circuit may be connected, thus sending ringing current of the proper frequency over the toll line to signal the distant operator. This key is used when making tests with a distant office.
- 3.03 The key designated MON when operated to its LINE position, arranges the operator's telephone set circuit for monitoring on any toll line to which the test circuit may be connected.
- 3.04 The key designated FREQ is provided for making measurements of the frequency of 135-cycle current (nominal value) received from a distant office or sent out by the home office. In order that such measurements may be made, it is necessary that a No. 218 type relay be inserted into the 135-CYCLE ADJ connecting block. When the FREQ key is operated to the OFF position, relays are operated which cause the test circuit to send out 135-cycle current to the No. 218 type relay and frequency meter, thus enabling the frequency of the home office ringing current to be read. When this key is thrown to its LINE position, the cord and plug at the switchboard are connected directly to the No. 218 type relay and frequency meter, thus enabling the frequency of the distant office ringing current to be read.
- 3.05 The key designated SL CKT when operated to its OPEN SL position, opens the sleeve of the test circuit cord at the switchboard thus permitting the tester to monitor on the circuit and to check the operation of the signaling equipment at the home office under service conditions.
- 3.06 The key designated SW is provided to connect the cord, or, the jack of the test circuit to the 20-cycle, 135-cycle or 1000-cycle test condition, in the same manner as the 20-135-1000-(or 135-1000)-CYCLE key of the control test set. This key however is seldom used since the corresponding control test set key is in general employed when making tests on signaling circuits.
- 3.07 The key designated 20-CYCLE, when operated to its OPR position applies operate current of the value determined by the setting of the operate slider of the 20-CYCLE potentiometer to the 20-cycle signaling circuit. When operated to its NON OPR position it applies non-operate current of the value determined by the setting of the non-operate slider of the 20-CYCLE potentiometer.
- 3.08 The key designated 135-CYCLE, when operated to its TEST position applies operating current of a value determined by the setting of the test slider of the 135-CYCLE potentiometer to the 135-cycle signaling circuit. When this key is operated to its ADJ position, adjusting current of a value determined by the setting of the three point switch and the adjust slider of the 135-CYCLE potentiometer is applied to the No. 218 type relay inserted in the 135-CYCLE ADJ connecting block.
- 3.09 The key designated 1000-CYCLE, when operated to its ADJ position, applies 20-cycle current of a value determined by the setting of the adjust slider of the 1000-CYCLE potentiometer to the No. 215 type relay inserted in the 1000-CYCLE ADJ connecting block.
- 3.10 The key designated TT, is provided when specified in connection with a trunk between the testing circuit and the toll test board. When this key is operated to its RING position, ringing current is applied to the test board trunk thus signaling the test board attendant. When the key is operated to its TALK position, the operator's telephone set is connected to the trunk.
- 3.11 The key designated FA, when operated, introduces additional resistance in the leads from the source of 1000-cycle current, thus attenuating the current approximately 2 db in connection with the filament activity test.
- 3.12 The key designated 7.5 MIL and 1.5 MIL, is provided in connection with the M-4 millimeter provided for measuring the plate current of detector tubes used in

- 1000-cycle signaling circuits. With this key in its normal (unoperated) position the meter is connected through a resistance network of such a value that the current indicated by the meter will be one-fifth of the total current flowing in the plate circuit. With the key operated to the 1.5 MIL position the meter indicates the actual current flowing in the plate circuit of the detector tube.
- 3.13 The key designated NS, is provided only in offices having both two-tube and single tube signaling circuits. With the key in its normal (unoperated) position the test circuit is arranged for testing two-tube circuits. With the key operated to its SINGLE position the test circuit is arranged for testing single-tube circuits.
- 3.14 A switch with three contact points each designated 1/25, 1/50 and 1/100 respectively, is provided to obtain the best results for the electrical adjustment of the No. 218 type relay at various current values. Step 1/25 is used for current values between .001 and .00055 ampere, step 1/50 for current values between .00055 and .00025 ampere, and step 1/100 for current values between .00025 and .00005 ampere. Step 1/25 is seldom used since this current range is ordinarily not required in the adjustment of No. 218 type relays. Step 1/50 should be used where the 135 cycle ringing current is supplied from No. 156 type interrupters in order to minimize the current drain and voltage fluctuations on the interrupter, while step 1/100 should be used when the 135-cycle current is furnished by ringing generators.
- 3.15 The following meters are provided for reading the test and adjust current values, and the frequency of the 135-cycle current, when testing or adjusting signaling circuit relays:
- 3.16 Meter M1 is a 0-150 scale a-c. milammeter for reading the test and adjust current values for 20-cycle signaling circuits. These current values are regulated by the 20-CYCLE potentiometer.
- 3.17 Meter M2 is a 0.30 scale a-c. milammeter for reading the test and adjust current values for the No. 218 type relay and for the adjust current value of the No. 215 type relay in 135-cycle and 1000-cycle signaling circuits, respectively. These current values are regulated by the 135-CYCLE and the 1000-CYCLE potentiometers together with the three point switch.
- 3.18 Meter M3 is a 120-150 scale a-c. frequency meter for reading the frequency of the 13 cycle ringing current received at the test panel from the distant and home offices.
- 3.19 Meter M4 is a 0-1.5 scale d-c. milammeter for reading the plate circuit current in detector tubes of 1000-cycle signaling circuits. The meter and its associated 1.5 MIL and 7.5 MIL key is connected to the plate circuit by inserting a dummy plug into the PLT jack (associated with the signaling circuit), at the battery supply panel.
- 3.20 The following potentiometers are provided for regulating the test and adjust current values, when testing and adjusting signaling circuit relays, or when measuring the frequency of the 135-cycle ringing current from the home office:
- 3.21 The 20-CYCLE potentiometer is provided for regulating the test and adjust current values for the No. 196 type relay in 20-cycle signaling circuits.
- 3.22 The 135-CYCLE potentiometer is provided for regulating the test and adjust current values for the No. 218 type relay, and for measuring the frequency of the 135-cycle ringing current from the home office, of 135-cycle signaling circuits.
- 3.23 The 1000-CYCLE potentiometer is provided for regulating the adjust current values for the No. 215 type relays in 1000-cycle signaling circuits.
- 3.24 Two connecting blocks designated 135-CYCLE ADJ and 1000-CYCLE ADJ are provided for adjusting the No. 218 type and No. 215 type relays respectively, in 135-cycle and 1000-cycle signaling circuits. There is a third connecting block designated I which is used to mount a No. 218 type relay to furnish tone for the toll switchboard a-c. continuity test circuit.
- 3.25 A lamp designated L1 provided with a green lamp cap, indicates the proper operation of the No. 218 type relay being adjusted in the 135-CYCLE ADJ connecting block. Two other lamps designated LC and RC, provided with clear glass lamp caps, indicate the proper operation of the No. 215 type relay being adjusted in the 1000-CYCLE ADJ connecting block. When the LC and RC lamps light with approximately equal brilliancy, it indicates that the armature of the relay makes contact for equal lengths of time with both the left and right contacts, if the contacts are clean.
- 3.26 A control test set is provided for controlling the application of the test and adjust current either from the switchboard, the test panel or from the relay rack bays in which the signaling circuits are located.

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This test set consists of three keys, a dial, a lamp, and two jacks designated TA and TAL for making connection to the test circuit.

- 3.27 The key designated 20-135-1000 (or 135-1000) CYCLE is provided to control the application of either 20-cycle, 135-cycle, or 1000-cycle ringing current to the signaling circuits.
- 3.28 The key designated REL when depressed, increases the resistance between battery and the sleeve of the testing circuit from approximately 100 ohms to approximately 600 ohms, thus causing the signaling circuit to restore to normal and extinguish the lamp in the test set, after the signaling circuit has been operated by the test circuit.
- 3.29 The key designated NO OP when operated to its NO or OP positions, causes the test circuit to apply non-operate or operate current, respectively, to the signaling circuit under test. The application of operate current is also controlled by the dial, the current being applied to the signaling circuit for as many tenths of a second as the digit dialed.
- 3.30 The test set lamp indicates by its lighted or non-lighted condition, the proper functioning of the signaling circuits under test.

4. CIRCUIT DESCRIPTION

- 4.01 A detailed description of the circuit operations of the test circuit will be found in CD-61085-01.