

INCOMING AND FINAL SELECTOR TEST SET SD-20050-01

DESCRIPTION

BATTERY CUTOFF RELAY PANEL OFFICES

1. GENERAL

1.01 The incoming and final selector test set SD-20050-01 (J24710A) is a manually operated wagon type test set and is used for testing incoming and final circuits in battery cutoff relay panel offices. It is arranged to test all final circuits in these offices and incoming circuits from panel local or tandem offices, from key indicator manual offices and from key pulsing and key indicator toll offices. No provision is made in this test set for testing office circuits.

1.02 This section has been reissued to cover additional features which have been added to the test set. These features are the increased number of compensating resistance keys to provide a more flexible resistance arrangement, the provision for applying full ringing voltage to the J-type relays in toll incoming circuits and the facilities for testing final circuits to particular terminals. Information regarding the testing of key pulsing toll incoming circuits, the test for tone to the intercepting operator on calls placed over toll incomings and the testing of final circuits is included in this issue. The operation of final circuits arranged to return a busy-back indication on telltale conditions is also included.

2. EQUIPMENT FEATURES

2.01 The apparatus of the test circuit is mounted in a wagon of the usual type. The keys and lamps used for controlling the tests are mounted in the keyshelf. The jacks used to connect the test set to the circuit under test are located in one end of the wagon and a set of telephone jacks is located in the other end.

2.02 The incoming and final selector test set is designed to be used at the selector frames where the circuits under test are located and, therefore, access to the circuits to be tested is obtained by means of cords and jacks.

2.03 For testing incoming circuits, except circuits from key pulsing or key indicator toll offices, two cords are required, one for the battery and ground supply and the other to connect to the circuit to be tested. Another cord is required at the incoming frame jack panel for bell ringing tests to connect the bell ringing test line to the bell set. When testing incoming circuits from key pulsing

or key indicator toll offices an additional cord is required to connect to the ringing current supply jack on the incoming frame.

2.04 For testing final circuits a total of five cords is required. Two of these cords are used for the battery and ground supply, one for connecting to the circuit under test and one for connecting either to the test line or to the ringing current supply. The fifth cord is used in making particular final terminal tests for connection to one of the jacks associated with a test final circuit.

2.05 When testing final circuits, the final test lines provided for the final selector test frame are used. The test lines are equipped with cutoff jacks so that the test set will not interfere with the operation of the test frame, provided the test frame is not testing circuits on the frame to which the test set is connected.

2.06 The test circuit is divided into two major parts, one for testing incoming circuits and the other for testing final circuits. Associated with each part is a 206 type selector, which is employed in connection with the controlling of the test.

2.07 The lamps and keys provided in the test circuit and their use is as follows:

Keys Used for Testing Incoming Circuits

INC	Incoming circuit
MS	Mechanical selector
KI	Key indicator local
KLD	Key pulsing or key indicator long distance
+	Ringing (full voltage)
R _t	Resistance ringing
ICR-100	Incoming compensating resistance
ICR-200	Incoming compensating resistance
ICR-300	Incoming compensating resistance
ICR-600	Incoming compensating resistance
ICR-800	Incoming compensating resistance
CAP	Capacity
INC-COM	Incoming commutator
LG-TRK	Long trunk
TC _t	Trunk closure ringing
TO	Time out
IBC	Incoming brush continuity
NO-L	Non-operate of L relay

Keys Used for Testing Final Circuits

FIN	Final circuit
DIR-ID	Direct line idle
HTG-ID	Hunt idle line
DIR-Bi	Direct line busy
HTG-BY	Hunt busy line
NT	No-test
TT	Telltale
ER	Early release
T-RY	T relay (not used)
FIN-COM	Final commutator
FBC	Final brush continuity
PLI	Particular line idle
PLB	Particular line busy
TMD	Time measure disconnect

Common Keys

ST	Start
DISC	Disconnect
TBL	Trouble disconnect
STP	Step-by-step
REP	Repeat
TH, H, U	Numerical keys for setting up the thousands, hundreds, tens and units for directing the incoming and final selectors

Lamps for Use in Testing Incoming Circuits

INC	Incoming circuit
NOL	Non-operate of L relay
NOL-TBL	Non-operate of L relay-trouble
TT	Telltale
OFL	Overflow
SUPV	Supervisory

Lamps for Use in Testing Final Circuits

FIN	Final circuit
OK	O.K.
TMR	Time measure release
BB	Busy-back
IO	Intercepting operator

Common Lamp

BC	Brush continuity
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3. OPERATIONIncoming Circuit Tests

3.01 The INC key is operated for tests of all incoming circuits. In addition, another key is operated for testing a particular type of incoming. This key is the MS key for incomings from panel offices, the KI key for incomings from key indicator manual offices or the KLD key for incomings from key pulsing or key indicator toll offices.

3.02 In making tests of incoming circuits the test set, with all ICR keys normal, is arranged to provide maximum resistance in the fundamental circuit for selections. If compensating resistance is connected in the incoming circuit it is necessary to reduce the resistance in the test set by the same amount. This is done by

operating the ICR keys to correspond to the resistance connected in the incoming circuit.

3.03 Non-operate tests of incoming L relays can be made by operating the NO-L key.

3.04 The LG-TRK key is operated when testing incoming circuits equipped with L relays of the N type.

3.05 Toll incoming circuits are advanced out of the ringing and talking position during a test, when required, by the operation of the R₊ key. This key is also used to advance key pulsing toll incomings out of the trunk closure position with the TC₊ key operated.

3.06 The ability of key pulsing toll incoming circuits to accept trunk closure from ringing current is checked by operating the TC₊ key. With this key operated the operate test of the A relay is omitted and it is necessary to advance the incoming out of the trunk closure position by operating the R₊ ringing key.

3.07 Test Line Tests: In order to test the trip and supervisory relay features of the incoming circuits the test call is directed to the final multiple test lines which are located on the final frame. On tests to the final multiple test lines, the test set checks the selection features of the incoming circuits after which the final multiple test lines apply the usual marginal tests to the trip and supervisory relays. As the tests of the trip relay are being made, a check for ringing induction can be made by means of a telephone set. This telephone set can also be used for listening to tones from the final multiple test lines. The continuity of one brush is checked on this test. As the tests are applied to the supervisory relay, the SUPV lamp on the test set flashes. At the conclusion of the test a tick-tock tone is heard in the telephone set receiver. The operation of the DISC key applies a release test to the incoming A relay. As the relay releases the incoming circuit and the test set should restore to normal.

3.08 Brush Continuity Test: To make this test the IBC key is operated and the incoming selector is directed to a working group of trunks. The test set completes incoming brush and group selections and final brush selection. During tens selection the final selector is driven to telltale. The incoming advances to the ringing or to the ringing and talking position and the final selector advances to the busy-back position. The BC lamp lights and the SUPV lamp flashes as an indication of a satisfactory test. If the final circuit is not arranged to return a busy-back indication on telltale conditions the SUPV lamp lights only on toll incomings but does not flash.

3.09 Commutator Resistance Test: Tests for excessive commutator resistance

can be made by operating the INC-COM key when making test line or brush continuity tests. This key splits the regular fundamental circuit during incoming selections and connects the stepping relay and a low resistance to ground to the fundamental tip. Ground through the overflow relay is connected to the fundamental ring. The regular fundamental circuit is restored for final selections.

3.10 Capacity Test: To simulate maximum trunk loop conditions in order to test the incoming L relay for overstepping, the CAP key is operated when making test line or brush continuity tests. During this test capacity is added to the fundamental circuit on incoming and final selections. With the CAP key normal the L relay is checked for understepping.

3.11 Timing Out Test: The operation of the TO key and directing the incoming selector to a working trunk group checks the ability of the incoming circuit to time out of the selection beyond position in case final selections are not completed within a certain interval. The continuity of the brush selected also is checked. During final tens selection the test set opens the fundamental circuit and the incoming circuit is advanced under control of the TO interrupter. The BC lamp lights as an indication of a satisfactory test. When testing toll incoming circuits the SUPV lamp also lights.

3.12 Telltale Test: This test is for the purpose of testing the ability of the incoming circuit to advance under control of the X commutator in those cases where the incoming selector goes to telltale on incoming selections. The test can also be used to detect any chatter of multiple brushes by observing the tripped brush during the up-drive. In making this test the test set numerical keys are depressed to make incoming brush selection only. During incoming group selection the incoming selector is driven to telltale and the X commutator should advance the incoming circuit. A satisfactory test is indicated by the lighting of the TT lamp. When testing incomings from key indicator manual offices or incomings from key pulsing or key indicator toll offices, the incoming circuit advances to the overflow position and the SUPV lamp flashes in addition to the lighting of the TT lamp.

3.13 Bell Ringing Tests: This test is used to make rapid ringing tests and to check the ringing on party lines. In four-party offices, two bell ringing test lines are provided, one for each of final choices 0-499 and 500-999 or equivalent, to check for the two ringing choices. In offices having individual, two-party selective or four-party semi-selective ringing only one subset is provided for use with the test lines. For offices equipped for four-party selective ringing, two subsets

are associated with the test lines, the subsets being equipped with gongs of different tones. To make this test the bell ringing test line jack and the bell set jack on the incoming frame are connected by a patching cord and the number of the bell ringing test line associated with the ringing choice to be tested is set up on the numerical keys of the test set. The ringing of the test line bell should be in accordance with the ringing choice being checked. In the case of incoming circuits from key pulsing or key indicator toll offices the ringing key must be operated to start ringing.

3.14 Busy Line Test: This test checks the operation of the incoming on a busy line condition. No marginal tests are made on the trip and supervisory relays. In this test the number of the permanently busy final terminal is set up on the numerical keys. The busy-back condition in the final circuit causes the SUPV lamp to flash as an indication of a satisfactory test.

3.15 Chatter Test of Ring-Up Relay in Toll Incomings: This test is used to check the ring-up (R2) relay for chatter conditions by applying full ringing voltage to the relay. In making this test the number of a bell ringing test line is set up and a test receiver is connected to the associated test line jack on the incoming frame jack panel. The \pm ringing key is operated and released several times to connect full ringing voltage to the ring-up relay. The application of ringing current to the test line is observed by means of the receiver in order to detect any clicks which would indicate a chatter condition.

3.16 Test for Tone to Intercepting Operator on Toll Incomings: This test is for the purpose of checking the feature in toll incoming circuits which provides a distinctive tone on calls answered by the intercepting operator in areas where the DSA switchboards are arranged for completion of intercepted calls. In this test the numerical keys are set to correspond to the number of a final terminal which is connected to an intercepting trunk. The ringing key is operated as the incoming advances to the ringing and talking position. The progress of the call is observed by means of the telephone set receiver. As the intercepting operator answers on the connection the incoming furnishes tone to the operator. This tone is not heard in the receiver and as the operator challenges it is necessary to ask her whether the tone was received.

3.17 Repeat Tests: The REP key can be used to make a series of repeat tests. However, when making a repeat test on test line tests of incoming circuits from key pulsing or key indicator toll offices and on telltale and bell ringing

tests of all types of incoming circuits the start key only is used.

Final Circuit Tests

3.18 The FIN key is operated for all tests of final circuits.

3.19 In making test line tests and no-test and time measure release tests the final selector is directed to test lines which are connected to two final terminals (terminals Nos. 98 and 99 in the bottom bank) of each final frame. Terminal No. 98 is arranged as a permanently busy terminal hunting test line. Terminal No. 99 is connected to the test set during tests by means of a patching cord. When the plug is removed from the jack this test line is connected to an intercepting trunk through the final selector test frame.

3.20 Idle Line Test with Capacity: On idle line tests the DIR-ID key is operated. This applies an idle line condition to the test line sleeve and arranges the test set to simulate maximum trunk loop conditions. During the test the operation of the final circuit is checked and the selection features are tested for overstepping. The OK lamp lights indicating a satisfactory test. At the conclusion of the test, the operation of the DISC key applies a hold test followed by a release test to the C relay. As the relay releases the final circuit and the test set should restore to normal. Brush continuity also is checked during this test.

3.21 Commutator Resistance Test: This test can be made by operating the FIN-COM key when making an idle line test. In this case a change is made in the fundamental circuit which consists of opening the capacity circuit to ground and in decreasing the series resistance to a lower value.

3.22 Hunt Idle Line Test: The purpose of this test is to check the terminal hunting arrangement of the final circuit, as well as its operation on encountering an idle line condition. The HTG-ID key is operated for this test, which is the same as the idle line test except that the final selector is directed to the first test line and terminal hunts to the second test line.

3.23 Busy Line Test: To make this test the DIR-BY key is operated. This causes the test set to apply a busy line condition to the second test line and to direct the final selector to this test line. A non-operate test is applied to the final S relay. Upon reaching the busy line the final circuit functions to restore the brush rod to normal and to send a busy-back indication to the test set. These pulses cause the BB lamp to flash.

3.24 Hunt Busy Line Test: The HTG-BY key is operated for this test. This test

is the same as the busy line test except that the final selector is directed to the first test line and terminal hunts to the second test line.

3.25 Check of No-Test Feature: This test checks the ability of the final selector to stop on a busy line on calls placed over no-test incoming circuits. To make this test the NT key is operated. This causes the final selector to be directed to the last terminal of the test line group. This terminal is made busy by the test set. An operate test is applied to the S relay. The test of the test line sleeve is omitted by the final circuit and the final selector stops on the busy line. The final circuit advances to the talking position and the OK lamp lights. At the conclusion of this test the operation of the DISC key causes the test set to maintain a receiver-off-the-switchhook condition on the tip and ring of the test line and to check that the final circuit restores to normal without timing out of the awaiting called subscriber disconnect position.

3.26 Time Measure Release Test: This test checks the time measure disconnect feature of the final circuit. This feature functions in service to cause the final circuit to time out and restore to normal in case the called subscriber does not hang up within a certain interval after the calling subscriber has disconnected. To make this test an idle line test is made and after the OK lamp lights the TMD key is operated. The TO interrupter then functions to advance the final circuit. A hold test is applied to the C relay. After the timed interval is completed the final circuit restores to normal.

3.27 Telltale Test: This test checks the ability of the final circuit to advance under control of the X commutator in those cases where the final selector goes to telltale on final selections. The test can also be used to detect any chatter of multiple brushes by observing the tripped brush during the up-drive. To make this test operate the TT key. During units selection the final selector is driven to telltale and the X commutator should advance the final circuit to the awaiting TK relay position. After the final reaches the talking position the X commutator advances the circuit to the busy-back position. The final selector remains at telltale. The OK lamp lights and the BB lamp flashes to indicate a satisfactory test. If the final circuit is not arranged to return busy-back pulses on telltale conditions the final will remain in the talking position and the OK lamp only will light.

3.28 Early Release Test: During this test a check is made of the ability of the final circuit to advance under control of the Y commutator in those cases where a premature disconnect condition occurs during brush or tens selection. The ER key is

operated for this test. After final brush selection is completed the test set simulates a disconnect condition by the calling subscriber by removing ground from the sleeve. The final circuit advances to the awaiting sender position and the final selector down drives to normal. The Y commutator should advance the final to the awaiting TK relay position and the final circuit restores to normal.

3.29 Brush Continuity Test: This test is made by operating the FBC key and directing the final selector to the terminals of a working line. The line used must provide a bridge across tip and ring conductors which will pass ringing current. This bridge is not provided on two-party lines and lines arranged for semi-selective ringing where one side of the line has no station connected, or on a terminal hunting line having the ring-up relay connected from one side of the line to ground or on desk or plant lines not arranged for ring-up operation. The final selector stops on the line selected, if idle, and the final circuit advances to the talking position. The test set connects a low voltage ringing current circuit having a ring-up relay in series, to the tip and ring conductors. This relay will operate through the impedance of the subscriber station equipment but not through the impedance of the incoming frame multiple alone. The bell at the subscriber station is not tapped during this test. The OK lamp lights and the final restores to normal as an indication of a satisfactory test. The BB lamp flashes and the final selector restores if the final selector encounters a busy line. In this case a continuity test is not made. The IO lamp lights if an intercepting operator answers on the connection.

3.30 Particular Line Test: This test provides a method of testing final circuits to particular terminals in connection with "don't answer" and "wrong number" reports. The test set can be arranged to test the final circuits for an idle line and for a busy line condition. For an idle line condition the FBC and PLI keys are operated. A test final circuit which has access to the particular number to be used in the test is made busy, the selector rod is then manually raised to the proper terminal and the brush is tripped. Connections are made between the test set and the D jack of the test final. The selector of the final circuit to be tested is directed to the final terminal. The final selector remains on the line and causes the buzzer in the test set to operate as an indication of the satisfactory operation of the final circuit. The low voltage ringing current circuit used in the brush continuity test is also connected on this test and if the line provides a ringing bridge, the OK lamp

lights. At the conclusion of the test it is necessary to operate the TBL key to disconnect.

3.31 For a busy line condition the FBC and PLB keys are operated. The test final is used to enable the test set to connect a busy condition to the sleeve of the final terminal. As the final selector reaches the busy terminal it should restore to normal and the final circuit should advance to the busy-back position. The BB lamp then flashes, indicating a satisfactory test. At the conclusion of the test it is necessary to operate the TBL key to disconnect.

3.32 Repeat Tests: To make a series of repeat tests, operate the REP key before operating the start key. The test is repeated until the REP key is restored. The repeat key is ineffective on brush continuity and particular line tests. On these tests the start key should be operated momentarily for each repeat test. In the case of the time measure release test either the repeat or start key can be used but during each test the TMR key must be operated momentarily.

Special Features

3.33 Trouble Restore: The TBL key is used to restore the test set to normal after it has blocked on a trouble condition and the disconnect key is ineffective. It is also used to restore the test set on particular line tests of final circuits.

3.34 Step-by-Step Advance: The operation of the STP key cancels the automatic advance of the test set after each of certain selections have been completed. The test set is advanced under this condition by momentarily operating the start key.

3.35 Remote Control: By inserting the plug of a No. 32A test set into the EX-K jack of the selector test set, the operation of the selector test set can be controlled while observing the functioning of the circuit under test. The WH button corresponds to the start key and the RED key corresponds to the trouble key of the selector test set.

4. CIRCUIT AND CIRCUIT DESCRIPTIONS

4.01 Drawing SD-20050-01 shows the circuit arrangement of the test set. The test line circuits from final multiple for testing incoming circuits having a-c.-d-c. ringing is covered in SD-21319-01 and for circuits having four-party selective ringing on SD-21319-02. Detailed circuit descriptions will be found in the associated CD sheets.