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COMMON SYSTEMS
AUTOMATIC TRUNK TEST CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSEBAR NO. 1 OR PANEL

CHANGES

A. Changed and Added Functions

A.01 Provision is made to provide connection to the maintenance data transmitter circuit for the progression test control and connector feature for the No. 1 crossbar ATA system.

B. Changes In Apparatus

B.01 Added (In FS26 for added function Item A.01)

CA Diode 533K, App Fig. 4, Option XT

CA Network 185A, App Fig. 4, Option XT

CA6 Relay 1/2AK37, App Fig. 10, Option XT

CA6 Network 185A, App Fig. 10, Option XT

ECA Relay 1/2AK4, App Fig. 10, Option XT

RATA Jack 246AM, App Fig. 11, Option XT

RATA Lamp GE48D1, App Fig. 11, Option XT

RATA Plug 329A, App Fig. 11, Option XT

RATA Relay 1/2AK4, App Fig. 10, Option XT

B.02 Superseded Superseded By

(All) Lamps, M1 (All) Lamps, GE48D1

D. Description of Changes

D.01 Provision is made to permit the No. 1 crossbar Maintenance Data Transmitter (MDT) to automatically read test displays and progress or call advance this or other test circuits. This is addition to sending the existing trouble indications to the Automatic Trouble Analysis (ATA) System. The new feature utilizes spare MDT capacity in

conjunction with the addition of the Progression Test Control and Connector (PTCC) feature to the MDT, together with the addition of various scan and control features to the Automatic Trunk Test (ATT) circuit.

D.02 The scan points added to the ATT represent those connections to existing lamp displays which light during a test failure. These lamps are read normally by the craft person to determine the meaning of the test failure, to record the display and determine the cause, and then call advance the circuit manually. The ground side of the switchboard lamps are connected to similarly designated leads per option XT wiring to the MDT. The leads S0-9 SW0-3, H0-9, XCO-4, TP, TMD, and ABZ are collected from lamps, or grounds, in FS1-3, FS13, FS33, and FS41. These leads are shown terminated to scan points in the MDT on FS26 on sheet B17. One special (SPL) scan point is added in FS26 for Telco use also.

D.03 The FS26 which contains the end of test and manual call advance features of ATT, is changed in include automatic call advance features that are controlled from the PTTC feature of the MDT. The sequence of the ATT/OIT call advance is included in SC7 and begins when the test circuit times out and blocks. This operates a ST- and then a G- relay in the PTCC, then the ATA scans and records the data in about 200 milliseconds. The ATA then applies a distribute release ground for 96 to 194 milliseconds to the CA lead. The RATA plug must be in the RATA jack before the call advance can become effective. The RATA relay operated by the plugged up RATA jack closes the control leads from the ATT to the MDT to permit relays CA and CA6 to operate together. Relay CA duplicates the action of a manual call advance which would have normally occurred from a CA key operation in the Output Identifier Test (OIT) circuit. The CA6 relay functions to maintain a steady ground on the Start (ST) lead to the MDT for an added period equal to its held operated and subsequent slow-release time. If option 2D is provided in the ATT, CA6 also functions

to ground the OK relay so the call can advance, even though the trunk under test has not released as indicated by the SL relay being in an operated condition.

D.04 If the MDT is down for any reason, the AOK lead may not be grounded and the RATA lamp will not be lighted as relay RATA operates. Should this be the case, and if the CA key in the OIT is inadvertently operated, the CA diode prevents the CA6 from operating through the RATA operated make contacts.

D.05 The purpose of the ECA relay is to provide auxiliary contacts for the End of Cycle (EC) relay. The ECA relay operated uses a break contact on the ST lead to prevent a false start to the MDT at the end of cycle.

D.06 The test progression features are documented by changes in Circuit Notes 102 and 104 and are reflected in SC7, SC10, and SC18 changes. Minor changes are made to CADs 1, 8, 10, and 23 and CAD 24 is added.

D.07 Drafting corrections are made on sheet B9A, FS13, to delete contacts 2M CS1 of Fig. 14 and 8M XBPl of Fig 12. These changes agree with WE drawings and therefore made on a no-record basis.

F. Changes in CD Sections

F.01 In SECTION II, under 16. SPECIAL FEATURES, add the following:

NO. 1 CROSSBAR ATA WITH PTCC FEATURE - OPTION XT

16.17 This operation is covered in SC7. The No. 1 crossbar automatic trouble analysis (ATA) with the Progression Test Control and Connector (PTCC) feature is included as part of FS26, the end of test call advance circuit. While the manual call advance feature (see 16.07 and 16.08) is under control of the CA key or RC jack, the ATA with PTCC automatically controls the call advance after each scan cycle of the connecting leads to MDT. The operation with the MDT is permitted only when the RATA plug is inserted into the RATA jack of the automatic trunk test circuit.

16.18 The RATA plug in the RATA jack operates relay RATA. The recording of trouble indications for ATA can begin only is the RATA lamp lights, indicating that ATA has not been canceled by the MDT. When the test circuit blocks the relay BLK operates, a start signal is transmitted to the MDT. In initiates a scan of the various

leads connected to lamps or other pertinent points in the circuit. When the MDT has completed its scan, it grounds the call advance lead to the trunk test circuit, operating the CA relay to call advance the circuit as described earlier in 16.17. The CA relay operates the auxiliary CA6 relay which functions to hold the OK relay operated, or operate it if relay SL is operated with option ZD, and to maintain a steady ground on the start lead. The MDT removes ground on the CA lead and the circuit acts just as if the CA key were released. The XC- relay that was locked to CA2 releases and the test circuit advances to the next trunk.

END OF CYCLE WITH OPTION XT

16.19 This operation is covered on SC9 and SC18 and varies from the regular end of cycle operation only in a minor way. The EC relay operates auxiliary relay ECA which prevents a false start to the MDT at an end of cycle. Refer to 1.13 also.

F.02 In SECTION III under 2. FUNCTIONAL DESIGNATIONS, add the following to 2.01:

<u>Designation</u>	<u>Meaning</u>
CA6	Call Advance by MDT
ECA	End of Cycle Auxiliary
RATA	Record by Automatic Trouble Analysis

F.03 In SECTION III under 2. FUNCTIONAL DESIGNATIONS add the following to 2.03:

<u>Designation</u>	<u>Meaning</u>
RATA	Recording by Automatic Trouble Analysis

F.04 In SECTION III add the following at the end of 2. FUNCTIONAL DESIGNATIONS:

2.05 Jacks

<u>Designation</u>	<u>Meaning</u>
RATA	Initiate Recording by Automatic Trouble Analysis

F.05 In SECTION III, 3. FUNCTIONS, add 3.32 as follows:

3.32 With option XT, in No. 1 crossbar offices, to automatically record trouble and progress the advancement of test calls through the various trunks utilizing the ATA system via the MDT.

F.06 In SECTION III under 4. CONNECTING
CIRCUITS, add the following to 4.01:

(v) Maintenance Data Transmitter Circuit -
SD-28110-01.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5242-DAJ

WECO DEPT 45830-WCR-WEA-PLS

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COMMON SYSTEMS
AUTOMATIC TRUNK TEST CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1 OR PANEL

CHANGES

A. Changed and Added Functions

A.1 Provision is made to test for the presence of the RV resistor in No. 1 crossbar outgoing trunks per SD-26209-01.

B. Changes in ApparatusB.1 Added

RVR AJ69 Relay - Option XR,
App Fig. 9 - FS13

RVRK AJ49 Relay - Option XR,
App Fig. 9 - FS11

RVRK 19RM Resistor - Option XR,
App Fig. 9, FS11

B.2 Superseded

(ALL) 2Y Lamps

Superseded By

(ALL) M1 Lamps

D. Description of Changes

D.1 An opening of an RV resistor in a No. 1 crossbar outgoing ANI trunk, SD-26209-01, can cause an ANI failure. Option XR is added on an after-date Standard basis for No. 1 crossbar to provide a test of the continuity of the trunk RV resistor.

D.2 The RV resistor is checked by a current flow test of the RV relay secondary winding and its shunting RV resistor when the RV relay is operated on its primary winding. This is accomplished by the addition of the RVRK relay and resistor in the circuit path of the CT1 lead to the CT1 relay on FS11, sheet B7. This CT1 lead is controlled by the RVR relay, added to FS13 on sheet B9A.

D.3 Circuit Notes 102 and 104 are changed, Note 124 is added, SC11 on sheet E4 is changed, and CAD 1 on sheet G1 is changed, all to reflect changes in D1 and D2.

D.4 Two drafting corrections are made on sheet B9A locations C4 and E5: Relay contact 5M of the ONH, option G, is added in the circuit between 1 of the CR and CC key contacts. Sheet note, "See Note 303," is removed from FS13. This information is now in agreement with WE drawing information.

D.5 A manufacturing change is made on the status of all switchboard 24 lamps to show that M1 lamps are authorized replacements at this time.

F. Changes in CD Sections

F.1 To Section II add 4.28.1.

4.28.1 When option XR is provided, with CL1 or CL2 relays operated, operation of the CSK relay operates the RVR relay and lights the RVR lamp in preparation for the RV resistor test which is made in selector position 7. The RVR locks the CSK relay up until the RVRK relay has checked the RV resistor in the trunk. During this sequence of the trunk relay operation, the RV resistor can be checked by a current flow test of the RV relay secondary winding and its shunting RV resistor combination since the RV relay is already operated on its primary winding. This is accomplished over the CT1 lead which is transferred to the primary 220 ohm winding of the RVRK relay (FS11). If the RV resistor is not open or missing or of not too high a value, the RVRK relay should operate and lock to the RVRK resistor through a path established by the RVR relay. If the CSK relay did not operate earlier in the sequence, this test is not made until CSK does operate. The RV resistor test will not affect the CS release test which follows on selector position 7.

F.2 To SECTION II add 4.29.1 and 4.29.2.

4.29.1 When option XR is provided, the RVR relay is operated, and if the trunk RV resistor is satisfactory, the RVRK relay is held operated by the RVR. If the RVRK did not operate, indicating a fault, CSK relay of FS13 is held operated. This normally indicates the trunk CS relay has failed and the test circuit times out, operating the BLK relay, the CSF lamp, also the RVR lamp.

4.29.2 With RVRK operated and CSK released, RVR relay releases extinguishing the RVR lamp.

F.3 In SECTION II, change 7.09 to read:

7.09 The IDY relay operates, connecting resistance battery to the S lead of the trunk in FS5 to simulate district cut-through. The trunk CT relay should operate, operating the trunk CT1 relay, and causing the outpulser connector to attach an outpulser. For a panel trunk, the PTY relay is also operated at this time. If an outpulser is not connected within a prescribed interval (varies from 2 up to 6.24 seconds), the trunk circuit grounds the TTO lead of the test circuit. The TTO relay operates, causing the test circuit to block and light a TTO lamp.

F.4 In SECTION II, 15.13, second sentence, change to read:

.....After a prescribed (varies from 2 - 6.24 seconds depending upon job conditions) timed interval, the trunk releases to restore to normal.

F.5 In SECTION III, 2. FUNCTIONAL DESIGNATIONS, under 2.01 and 2.04 add:

2.01 Relays

<u>Designations</u>	<u>Meaning</u>
RVR	Trunk RV Resistor Test (Crossbar MF)
RVRK	Trunk RV Resistor Check (Crossbar MF)

2.04 Trouble Lamps

<u>Designations</u>	<u>Meaning</u>
RVR	RV Resistor Failure (Crossbar MF Trunk)

F.6 To SECTION III, 3. FUNCTIONS, add 3.31.

3.31 With option XR, to check for the presence of a RV resistor in shunt combination with the secondary winding of the RV relay in crossbar MF trunks.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25120-WCR-WEA-VK

CIRCUIT DESCRIPTION

CD-95889-01
ISSUE 8A
APPENDIX 2AR
DWG ISSUE 21AR
DISTN CODE 1N99

COMMON SYSTEMS
AUTOMATIC TRUNK TEST CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
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CHANGES

D. Description of Changes

D.1 When a panel office is equipped with both coin and noncoin outgoing ANI trunks and when the test circuit is testing the automatic return of initial coin deposit (ARID) feature, the noncoin trunks would operate the ARID relay falsely (option YI). The problem is correct by the addition of 12M of the CL13 and CL14 class relays for panel coin type trunk testing in the option YK operate path of the ARID relay in the FS41 on sheet B26.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5245-GFC

WE DEPT 25120-WCR-WEA-VK

CIRCUIT DESCRIPTION

CD-95889-01
ISSUE 8A
APPENDIX 1B
DWG ISSUE 20B

COMMON SYSTEMS
AUTOMATIC TRUNK TEST CIRCUIT
AUTOMATIC NUMBER IDENTIFICATION - TYPE B
CROSSBAR NO. 1 OR PANEL

CHANGES

A. Changed or Added Functions

A.1 Provision is made to permit testing noncoin trunks not arranged for 2-party service with the TP key in the outpulsing identifier test circuit operated. (option XM for panel trunks and option XN for crossbar trunks).

B. Changes in Apparatus

B.1 Added

TMD - 2Y Lamp, App Fig. 11, Option XP

D. Description of Changes

D.1 Options XM (panel) and XN (crossbar) are added to permit testing trunks not arranged for 2-party service with the TP key in the outpulsing identifier test circuit operated.

D.2 Circuit Note 121 is added to explain the use of options XM and XN.

D.3 Option XP is added to provide a lamp indication that a timed disconnect test is being made.

D.4 Circuit Note 123 is added to explain the use of option XP.

D.5 The 33D and 33L varistors have been rated Mfr Disc. They are replaced by the 33DR and 33LR codes, respectively.

D.6 The 145 and 221-type resistors have been rated Mfr Disc. The 145A and 221A code resistors from 1 ohm to 2.1 megohms are replaced by KS-20810, L1A resistors. The 145A code resistors above 2.1 megohms are replaced by 263A code resistors.

D.7 The 147-type resistors have been rated Mfr Disc. The 147D code resistor, TM1, is replaced by a 263A code resistor. The resistance value is changed from 11.2 megohm to 11.1 megohm, which is a preferred value.

D.8 For description of operation see CD Issue 8A.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 5223-JSS-RMW-VK

COMMON SYSTEMS
 AUTOMATIC TRUNK TEST CIRCUIT
 AUTOMATIC NUMBER IDENTIFICATION - TYPE B
 CROSSBAR NO. 1 OR PANEL

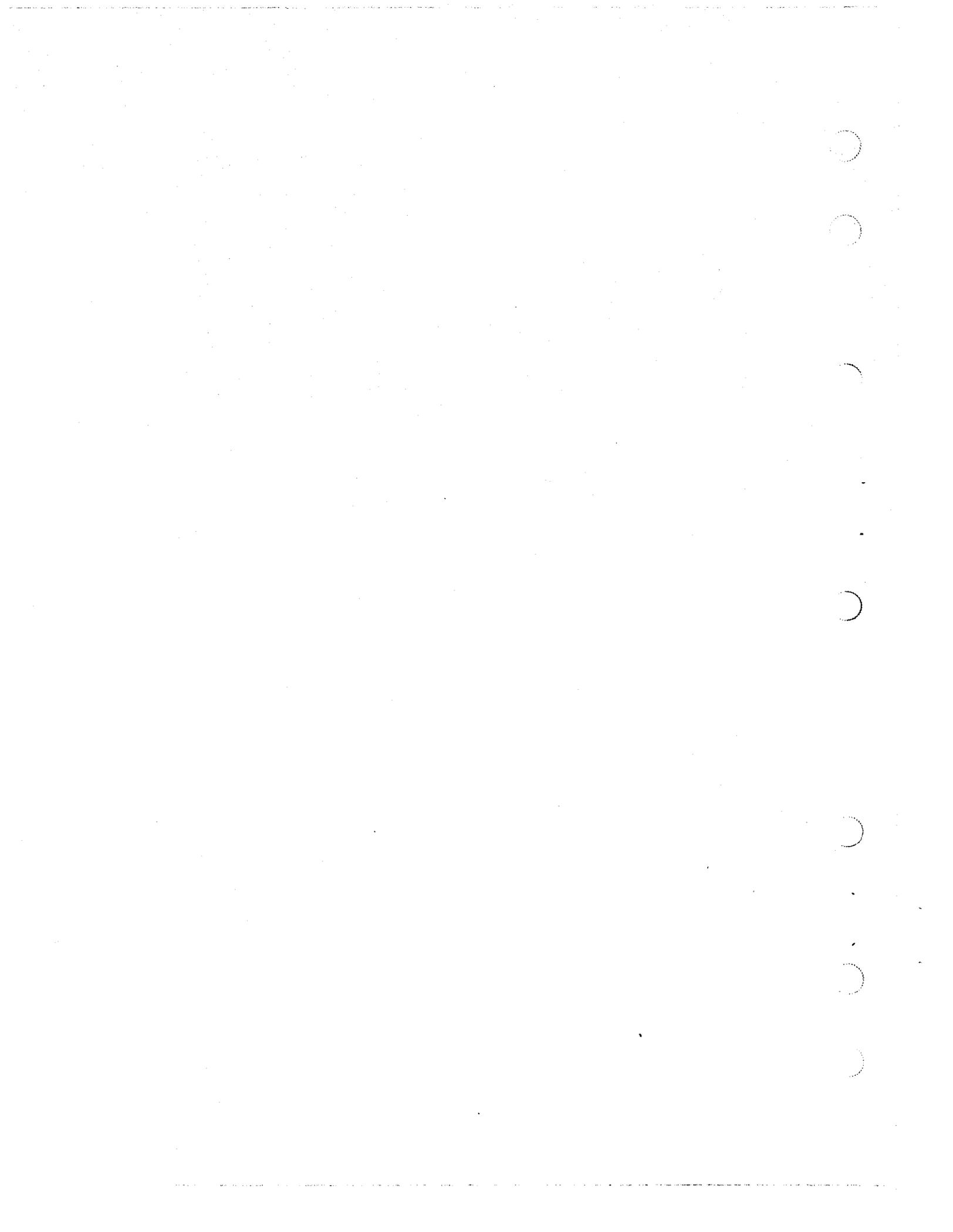
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SECTION I - GENERAL DESCRIPTION

1. GENERAL DESCRIPTION OF OPERATION

1.01 This ANI trunk test circuit provides for automatic testing of trunks which are arranged for automatic identification of the calling customer number and are outgoing from a panel or No. 1 crossbar office to a CAMA office, TSP office, or TSPS office.

1.02 The trunk circuits that are used to handle station-to-station calls from noncoin lines will hereafter be referred to as Station-to-Station (STA) trunks. The trunk circuits that are used for special toll or operator assistance traffic originated by coin or noncoin lines will be referred to as Special Toll (SPL T) and/or Operator Assistance (OPR ASST) trunks. The trunk circuits that are arranged for high-low supervision (loop signaling) will be referred to as loop trunks, and the trunk circuits that are arranged for E and M lead signaling will be referred to as E and M lead trunks (E and M).

1.03 The trunk test circuit functions with an outpulser identifier test circuit to simulate the signals which would be encountered on a service call to the originating and terminating ends of the trunk circuit. It functions independently of the originating and terminating circuits used on a service call. The trunk test circuit checks the operation of the start identification feature in the trunk circuit and receives an indication from the outpulser identifier test circuit that the test number is identified and outpulsed correctly. Marginal tests are applied to the calling and called end supervisory relays, and a continuity and polarity check of the originating tip and ring circuit at start and end of call is made. The wink feature of the MF trunks and the end pulse feature of the PCI trunks are tested. A semiconductor diode test is provided for panel trunks. By operating any one of several keys in the trunk test circuit and outpulser identifier test circuit, special tests may be applied to the trunk.

1.04 On special toll and operator assistance trunks arranged for temporary non-ANI operation, tests of the trunk ANI features are bypassed.

1.05 The trunk test circuit is associated with the ANI trunk circuits through the crosspoints of a crossbar switch or switches and the trunk miscellaneous circuit. It is associated with an outpulser and identifier through the ANI trunk circuit while the identification feature of the trunk is tested. The trunk test circuit is designed to test a maximum of 500 ANI trunks if one crossbar switch is equipped, a maximum of 999 ANI trunks if two crossbar switches are equipped, up to 1499 ANI trunks with three crossbar switches, or 1999 ANI trunks with four crossbar switches. Automatic progression from one trunk to the next is provided.

2. MAIN DIVISIONS OF CIRCUIT

2.01 The trunk access circuit consists of a crossbar switch, control relays for select magnets, hold magnets, and crosspoint contacts. This circuit may be used to select trunks on an automatic progression basis or on an individual trunk selection basis. When there are more than 500 ANI trunks in an office, an additional crossbar switch or switches are provided. When all trunks on one switch have been tested, the test circuit advances automatically to test trunks appearing on the next switch.

2.02 The test progress circuit consists of a selector switch and control relays. The selector switch is stepped automatically and applies various tests in sequence to the trunk circuit. A satisfactory test advances the switch to the succeeding test. A test failure causes the test circuit to block and bring in an alarm. Eight selector switches are provided for the various types of trunks tested (see 3.10).

2.03 The test circuits associated with the selector switches apply the following tests to the trunk circuit on a routine basis.

- (a) Marginal tests of the trunk supervisory relays.
- (b) Continuity and polarity tests of the tip and ring circuits.
- (c) Test of the calling party identification feature.
- (d) Test of the end pulse feature in PCI trunks.

- (e) Test of the wink feature in MF trunks.
- (f) Ground removal test and semiconductor diode test in a panel office (varistor test).
- (g) Test of terminating holding features in special toll and operator assistance trunks.
- (h) Test of ringback features in special toll and operator assistance trunks.
- (i) Test of coin functions in coin trunks.
- (j) Check of S or S1 lead ground after the trunk has recognized district cut-through.

2.04 The following special test may also be applied to the trunk if the associated keys are operated.

- (a) Test of the trunk TP relay in a crossbar office.
- (b) Test of the party test feature on tip party calls in a panel office.
- (c) Test of the timed release feature.
- (d) Transmission measuring test.
- (e) Abandoned call test for panel trunks and crossbar coin trunks.

2.05 A timing and alarm circuit provides overall timing for the test circuits and timing for a busy trunk, and operate an alarm relay if the test circuit blocks or times out. Three additional timing circuits provide timing for the various functions checked by the test circuit.

3. GENERAL FUNCTIONS AND FEATURES

OUTLINE OF OPERATION

3.01 The trunk test circuit is furnished as a unit with the outpulser identifier test circuit. Keys which control the operation of the trunk test circuit are furnished partially in the trunk test circuit, partially in the outpulser identifier test circuit. By the operation of these keys the test circuit may be arranged to perform a series of routine tests in sequence on a group of trunk circuits, automatically progressing from one trunk to the next as the tests are completed.

3.02 By the operation of keys special tests may also be applied to a trunk circuit; and the test circuit may be made to repeat a test, to pass a busy trunk, or to select a particular trunk for testing.

3.03 If a trouble is encountered, the test circuit blocks and actuates an audible and visual alarm. Progress lamps and trouble lamps located on the lamp panel aid in analyzing the trouble condition.

3.04 The test circuit gains access to the trunk through a connecting circuit and makes a busy test. If the trunk is idle it is seized. Trunk class relays are operated which indicate the class of trunk attached and select the progress switch and sequence of tests to be applied to the trunk circuit. The test progress switch advances through the various tests in sequence. The test circuit functions independently of the originating and terminating circuits used on a service call. When the trunk is seized, the originating and terminating ends of the trunk are connected to the test circuit.

3.05 When the calling party identification feature of the trunk is tested, an outpulser is attached to the trunk and connects to an identifier as on a service call. The outpulser and identifier function to identify and outpulse the calling line number as on a service call, except that the number identified and outpulsed is the test calling line number set up in the outpulser identifier test circuit. The test circuit receives the number outpulsed and, when all digits have been received, transmits an identification check signal to the trunk test circuit.

3.06 The test circuit may be arranged to test trunk circuits which serve 2-party lines or trunk circuits which serve individual lines.

CONNECTING CIRCUITS

3.07 The connecting circuit consists of up to four 100-point, 5-wire crossbar switches, the control relays for the switch components, and miscellaneous start circuit relays. The control relays cause operation of the correct select and hold magnets and enable one of the five contacts on the selected crosspoint, either on an automatic progression basis or on an individual trunk selection basis. When a trunk is selected

it functions to operate trunk test cut-in relays located on the trunk frame. These relays close a number of leads between the trunk and the trunk test circuit, and a busy test is then made. If the trunk is busy, an indication is given on the lamp panel and the test circuit times 2 minutes before actuating an audible and visual alarm. If the trunk tests idle, it is selected and made busy to service calls. Busy trunks may be bypassed by operating the PB key.

CLASS INDICATION

3.08 Eight general types of trunks are tested, namely: station-to-station - crossbar MF, crossbar PCI, panel MF, and panel PCI; and special toll and operator assistance - crossbar coin, crossbar non-coin, panel coin, and panel noncoin. The panel and crossbar No. 1 MF trunks may be arranged for either high-low supervision (loop signaling) or E and M lead signaling. Each of the noncoin classes is further subdivided into classes as trunks which serve 2-party or other than 2-party lines. The crossbar coin is further subdivided into classes as trunks equipped to serve coin station sets arranged for dial-tone-first operation, and those equipped to serve coin station sets arranged for coin-first operation. The class leads of trunks of the same class are multiplied. When the test leads are closed through from the trunk circuit, class relays are operated in the test circuit and associated class lamps are lighted. The trunk signaling arrangement, loop or E and M is indicated to the test circuit by the presence or absence of ground from the trunk over the M lead. Ground on the M lead operates relay EMLT which arranges the test circuit for E and M lead trunk testing.

TEST PROGRESS CIRCUIT

3.09 The test progress circuit consists of a selector switch and control relays. The switch is stepped automatically and applies a series of tests in sequence to the trunk circuit. A test progress lamp is lighted at each functional position of the selector switch. The test relays associated with a particular test control the advance of the selector during the test cycle. A satisfactory test causes the selector to advance to the succeeding test. A test failure causes the selector to block. At the end of the test cycle an advance relay is operated to restore the selector to normal.

3.10 Eight test progress switches are provided for the various types of trunks as follows:

<u>Selector</u>	<u>Trunk Type</u>	<u>Trunk Class</u>
A	XBR MF STA	1,2
B	XBR PCI STA	3,4
C	Panel MF STA	5,6
D	Panel PCI STA	7,8
E	XBR noncoin SPL T and OPR ASST	9,10
F	XBR coin, arranged for coin-first operation	11
F	XBR coin, arranged for dial-tone-first operation	12
G	Panel coin, SPL T	13
G	Panel coin, OPR ASST	14
H	Panel noncoin SPL T	15,16
H	Panel noncoin OPR ASST	17,18

3.11 Test progress switch RBT is provided for testing crossbar and panel coin trunks for ringback. On E and M lead trunk tests this selector also makes a false wink test and coin function tests. On panel coin trunks this selector also makes an A relay soak and release test.

3.12 Classes, 1, 3, 5, 7, 9, 15, and 17 designate trunks that are equipped to serve 2-party lines. Classes 2, 4, 6, 8, 10, 16, and 18 designate trunks that are not equipped to serve 2-party lines. Classes 11, 12, 13, and 14 are trunks that serve coin lines, which are always single-party lines; also, class 12 trunks are arranged for dial-tone-first operation. The test selector and series of tests to be applied on a particular test are selected by the class relays operated when the trunk is seized.

TO-RO CIRCUIT

3.13 The TO-RO circuit, which provides terminations for the distant end of the trunk circuit, is used to simulate signals from a CAMA or TSP office.

TI-RI CIRCUIT

3.14 The TI-RI circuit, which provides terminations for the originating end of the trunk circuit, is used to simulate signals from the originating equipment to check the continuity and polarity of the T and R leads at various phases of the testing.

TEST OF TRUNK RELAYS

3.15 Marginal tests are applied to the trunk marginal relays A, CN, CS, CT, L, RC, and TP. The CT semiconductor diode is tested in panel trunks. The release time of the slow-release ON relay is checked for station-to-station trunks.

CONTINUITY AND POLARITY TESTS

3.16 A continuity and polarity test of the trunk tip and ring leads toward the originating equipment is made, simulating conditions before trunk seizure. A through polarity test of PCI trunk tip and ring leads is made at the end of trunk testing when the connection of the T and R leads toward the distant office is restored. A final test is made on MF trunks to check that a high resistance bridge is restored on the outgoing end of the trunk.

TEST OF WINK FEATURE IN MF TRUNKS

3.17 On a service call, the distant office sender sends a momentary reversal or wink to the trunk circuit as a signal to forward the called number. This test checks that when the test circuit applies a simulated wink to the distant end of the trunk, the trunk functions to relay the wink signal to the originating equipment.

TEST OF IDENTIFICATION FEATURE

3.18 The test circuit checks the trunk circuit operation when an outpulser and identifier are attached to the trunk to make identification of the calling line number. This feature is bypassed for special toll and/or operator assistance trunks that are equipped with the temporary non-ANI option.

TEST OF AUTOMATIC RETURN OF INITIAL COIN DEPOSIT FEATURE

3.19 A test is made to check that special toll and operator assistance coin trunks apply the coin return potential to clear the coin station of the initial coin deposit.

FALSE WINK TEST

3.20 A test is made to check that the coin E and M lead trunks return to the talking condition when a wink signal occurs that is not followed by a coin function or ringback signal.

SPECIAL TESTS

A. Tip Party Test

3.21 With the TP key in the outpulser identifier test circuit operated, a tip party call is simulated. The test circuit checks the party test feature and ground removal test feature in panel trunks. Marginal tests are applied to the TP relay in crossbar trunks. The operation of the TP key has no effect on coin trunks. With the TP key operated, coin trunks are tested as if the TP key were not operated.

B. Timed Release Test

3.22 With the TMD key operated, a timed release call is simulated. The purpose of this test is to check the ability of the trunk to function correctly on a call in which the called party disconnects and the calling party holds.

C. Transmission Measuring Test

3.23 With the TRMS key operated and a transmission measuring set connected to the TM IN jack, transmission measurements of the trunk circuit can be made.

D. Coin Function Test

3.24 With the CC or CR key operated, a test is made to check that the coin trunk applies the correct coin collect or coin return signal to the originating line. The CC or CR key must be operated where coin trunks are provided, even on test cycles such as tip party tests of noncoin trunks, in order to permit the test circuit to advance over the coin trunks. The operation of the CC or CR key has no effect on non-coin trunks.

E. Abandoned Call Test

3.25 A test is made to check that panel trunks can release on an abandoned call or overflow condition before the outpulser seizure. A test is made to check that the crossbar coin trunks can be released properly by the outpulser on an abandoned call. The AB1 key is operated to prime the test circuit to make the test on the panel trunks, and the AB2 key is operated to prime the test circuit to make the test on the crossbar coin trunks. The operation of the AB1 and AB2 keys has no effect on trunks for which the test does not apply. These trunks will be tested as if the AB1 or AB2 key was not operated.

PARTICULAR CIRCUIT SELECTION

3.26 Any trunk may be selected for test by individual operation and release of keys S-PCS, H-PCS, and XC-PCS, with the MS key operated, causing the test circuit to be stepped to the trunk desired. If two crossbar switches are furnished, switch 0 is selected with the SWT key option ZH normal, and switch 1 is selected with the key operated. If three or four crossbar switches are provided, repeated operations of the SWS key option ZI select the desired switch.

CONTROL ADVANCE AND REPEAT FEATURES

3.27 Whenever the test circuit blocks because of trouble in the circuit under test, it may be call advanced to the next trunk by activation of the CA feature in the outpulser identifier test circuit. If option ZD is furnished, operation of the CA feature is required in order to restore the trunk, which then allows the test circuit to restore. Where crossbar coin trunks are involved, the CA features causes a coin signal to be sent to the trunk in order to unlock the trunk. If the REP key is operated, a retest will be made on the same trunk.

PASS BUSY

3.28 The test circuit is arranged to distinguish between busy and idle trunks and to wait for the trunk circuit to become idle, after which it will proceed with the test. The PB key may be operated, causing the test circuit to pass trunks that are busy. The BY lamp lights each time a busy trunk is encountered, and the PB register is scored each time a busy trunk is bypassed.

ST AND RN KEYS

3.29 A cycle of tests is started by (a) operation of the TT key, in the outpulser identifier (OIT) circuit, and (b) any of the special test keys required, followed by operation of the ST key in the OIT circuit. With option ZC, the release of the ST key at any time will stop the

test immediately; with option ZD, the release of the ST key will allow the test in progress to complete and then prevent the advance of the test circuit. In either case, reoperation of the ST key will cause the test circuit to advance. When the ST key is released and the RN key is operated, the test circuit will restore to normal immediately with option ZC or at the end of the test in progress with option ZD. Reoperation of the ST key, after operation and release of the RN key, will cause the test circuit to start testing on the first trunk of the first crossbar switch.

TIMING

A. Timer 1

3.30 Timer 1 provides timing intervals of approximately 1 minute each. These intervals are recorded on minor selector switch TM1 to provide an overall timing interval of 3 minutes or a 2-minute interval while awaiting a busy trunk. A timing alarm is provided.

B. Timers 2 and 3

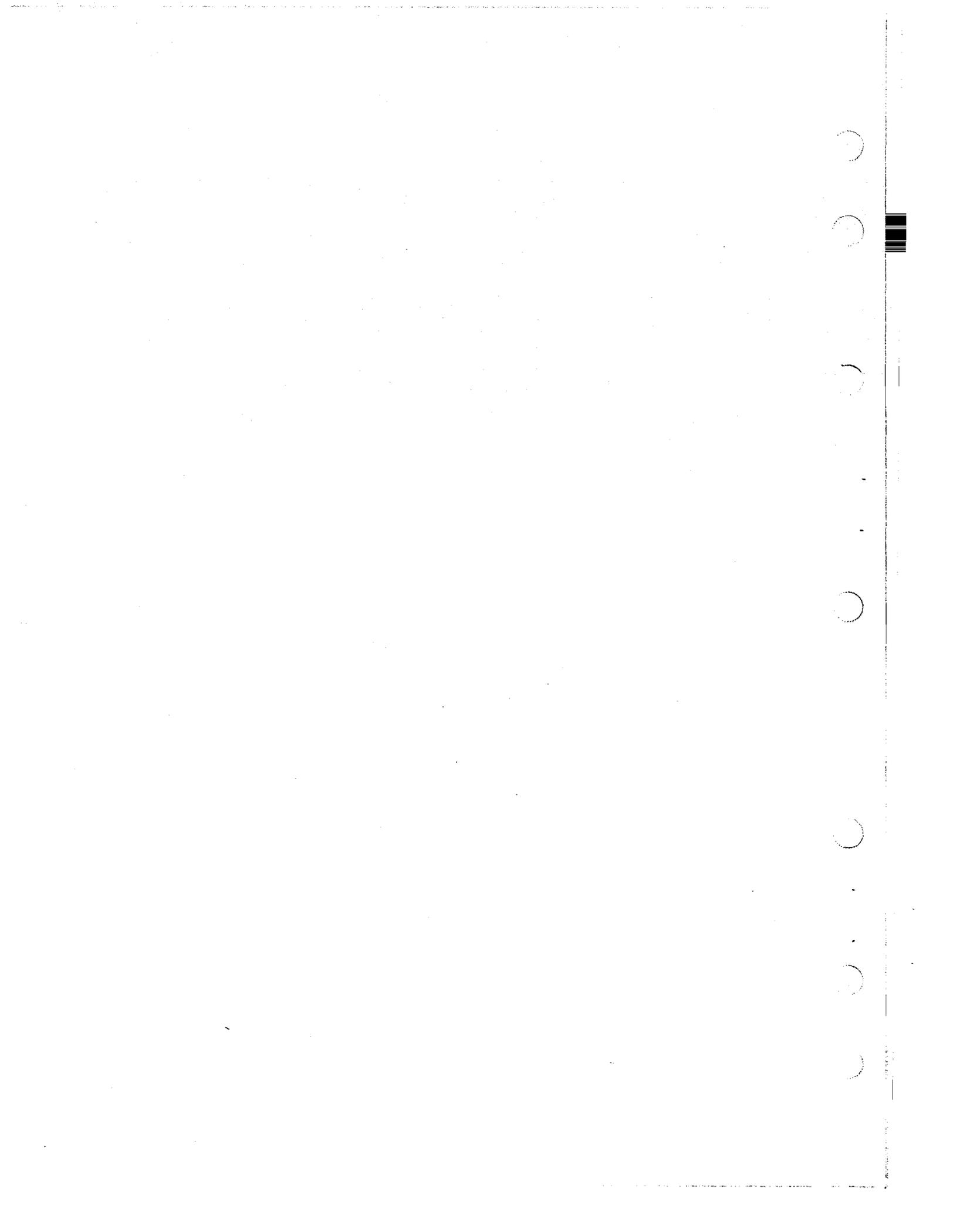
3.31 Timers 2 and 3 provide timing intervals required for certain tests. Timer 2 provides three different timing intervals: 0.96 to 2.2 seconds, 1.9 to 4.2 seconds, and 7.5 to 16 seconds. Timer 3 provides an 80- to 85-millisecond interval and a 230- to 255-millisecond interval.

C. Timer 4

3.32 Timer 4 is used to provide additional timing intervals required for tests of special toll and operator assistance trunks. It provides three different timing intervals: 86 to 90-milliseconds, 410 to 460-milliseconds, and 2.2 to 2.6 seconds.

REPEAT TEST - OUTPULSER IDENTIFIER TEST CIRCUIT, SD-95815-01

3.33 Where option YD is furnished, the REP key of this circuit is used for control of the automatic repeat test feature of the Outpulser Identifier Test Circuit, SD-95815-01.



SECTION II - DETAILED DESCRIPTION

1. CONNECTING CIRCUIT

START ON FIRST TRUNK

1.01 This operation is covered on SC1 and SC4. When the TT key and the ST key in the outpulsor identifier test circuit are operated, the test circuit is connected to the first trunk.

1.02 There are 100 crosspoints on each 10 vertical crossbar switch. Each crosspoint contains a set of five contacts. Since each contact is associated with one trunk circuit, five trunks are accommodated by one crosspoint, and a total of 500 trunks may be tested through this switch. Although five contacts are closed upon operation of the hold magnet, only one of the five contacts is effective because only one of the five XC- relays is operated. The purpose of enabling this one contact is to operate the trunk TT relay for the trunk being tested. The TT relay is operated from battery through the winding of the marginal XTT relay. Relay XTT operates only if there is a cross between two TT relays. If it operates, it lights lamp XTT and blocks the test circuit.

1.03 The trunk TT relay operated operates the FR- relays in the miscellaneous circuit for trunk frame and connects leads from the trunk through the trunk miscellaneous circuit to the test circuit. With the trunk TT relay and the miscellaneous circuit FR- relay operated, a CL- relay is operated. One CL- relay is provided for each group of trunks requiring the same treatment. With the test in progress and relay CT operated, EMLT is connected to the trunk frame miscellaneous M lead to determine the signaling arrangement, loop or E and M, of the trunk under test. If the connected trunk is arranged for loop signaling, the M lead is open and relay EMLT remains normal, and if the connected trunk is arranged for E and M lead signaling, ground from the trunk over the M lead operates relay EMLT. With relay EMLT operated, the test circuit is arranged for E and M lead trunk testing.

1.04 Eighteen class relays are provided, representing the eighteen classes of ANI trunks tested by the test circuit. The CL- relay operates on a circuit from ground on its winding through contacts of the trunk TT and miscellaneous circuit FR- relays to battery on the winding of the marginal CLX relay. The CL- relay operated operates its associated CL- lamp. The CLX relay operates if there is a cross between the CL- relays. If it operates, it lights lamp CLX and blocks the test circuit.

1.05 The CL- relay operated operates a combination of two or more of the following relays: CLFN, CLXB, CLMF, CLPI, XBP, XBP1, PNP, PCN, and XBCN. This translates the trunk class number into a description of the trunk main function, ie, panel or crossbar, PCI or MF outpulsing, station-to-station, special toll, or operator assistance; coin or noncoin. With the class information translated and checked, the TCI relay operates.

RELEASE AND ADVANCE TO NEXT TRUNK

1.06 This operation is covered on SC2. Upon completion of a test, relay OK operates to release the trunk just tested and to advance the test circuit to the next trunk. The CT register is operated to score the number of trunks that have been tested. Relays CA2 and CA3 are slow-release to ensure the release of all relays in the test circuit before starting the test of the next trunk.

CHANGE OF HOLD MAGNETS

1.07 This operation is covered on SC5. When a trunk associated with the No. 4 contact of a crosspoint has been tested, it is necessary to open that crosspoint by releasing the hold magnet and to operate the succeeding hold magnet to close the desired crosspoint. This change is accomplished by the hold magnet control circuit shown on FS2. This circuit consists of a group of W-Z type relay combinations such as HE and HE1, HD and HD1, etc, which operate in sequence. Relay HE2 is a slave for HE;

relay HE3 is a slave for HE1. Hold magnet 0 is operated with all the hold magnet control W-Z combinations normal. The relays that are operated for a given hold magnet can be determined from FS2. For example, in order to operate hold magnet No. 7, relays HC, HD, HE2, and HE3, must be operated. For SC5, the change described is from hold magnet 0 to hold magnet 1. This requires operation of relays HE and HE3.

1.08 Upon completion of the test of the trunk associated with No. 4 contact of hold magnet 0, relay OK operates. The sequence of operation is similar to that shown in SC2, except that relay H is prevented from reoperating immediately after XC4 has released until hold magnet 1 has operated. Then, relay H operates to prepare for the next test.

CHANGE OF SELECT MAGNETS

1.09 This operation is covered on SC6. When the trunk associated with the No. 4 contact of a crosspoint on hold magnet 9 has been tested, it is necessary to

- (a) Release hold magnet 9 and the operated select magnet and
- (b) Operate the succeeding select magnet and hold magnet 0.

This change is accomplished by the select magnet control circuit and the hold magnet control circuit shown on FS1 and FS2, respectively. The select magnet control circuit consists of a group of W-Z type relay combinations such as SD and SD1, SC and SC1, etc, similar to the hold magnet control circuit mentioned in 1.07. The relays that are operated for a given select magnet can be determined from FS1. For example, in order to operate select magnet 1, relays SD and SD2 must be operated.

1.10 Upon completion of test of the trunk associated with No. 4 contact of hold magnet 9, using select magnet 0, relay OK operates. The sequence of operation is similar to that shown in SC2 and SC5. However, before relay CA2 can reoperate, SEL 0 must have released and SEL 1 must operate. Operation of relay CA2 then releases relay XC4 which closes the path for relay H when hold 0 has operated.

CHANGE OF CROSSBAR SWITCH

1.11 This operation is covered on SC9. If more than 500 trunks are to be tested, additional crossbar switches up to a maximum of four are furnished, each switch accommodating no more than 500 trunks. The SWT1 through 6 relays control the operation of hold and select magnets on the second, third, and fourth crossbar switches. Relays SWTA to SWTD are used as counting relays to enable the circuit to "remember" which switch is in use. Relay SWT, which operates when the last select magnet on each switch operates, operates the appropriate SWT- relays, causing the test circuit to progress to the next crossbar switch.

UNEQUIPPED TERMINAL

1.12 This operation is covered on SC17. When the connecting circuit advances to a terminal which is unequipped, the sequence of operation is similar to that shown in SC2, except that the operation of the CK1 relay causes the UT relay to operate instead of the TT relay of a trunk. The operation then is similar to release at end of test, and the connecting circuit advances to the next terminal.

END OF CYCLE

1.13 This operation is covered on SC4. If the test circuit has progressed through testing of the last equipped trunk, it advances automatically to the first terminal beyond the last trunk. The sequence of operation is similar to that shown in SC18, except that the operation of the CK1 relay causes the EC relay to operate instead of the TT relay of a trunk. The EC relay operated lights an EC lamp and causes the circuit to block. If only one crossbar switch is furnished, and the last terminal of the switch is equipped with a trunk, the EC relay is operated after the last trunk has been tested SC9.

2. PRELIMINARY TESTS AND TRUNK SEIZURE

BUSY TEST

2.01 This operation is covered on SC4. When the connecting circuit has functioned to connect to a trunk circuit and the class relays have operated, the BT1 relay is

operated to connect the BT relay to the trunk sleeve over the S or S1 lead. If the trunk is busy, ground on the sleeve will operate the BT relay, lighting lamp BY and holding relay SRL. The test circuit will wait, and busy timing progresses unless key PB is operated (see 16.09). If key PB is normal, relay BT releases when the trunk becomes idle and ground is removed from the S or S1 lead. Relay BT releases relay BT1. Relay BT1 released connects ground to the trunk S or S1 lead to make the trunk test busy to service calls. When relay SRL releases, the test circuit starts the trunk test.

2.02 Where option ZL is furnished, the BT diode, in series with the BT relay, isolates the BT relay from the sleeve of panel ANI trunks in such a way as to prevent the BT relay from acting as a shunt that could interfere with the quick release of a panel district selector L relay at the end of a service call. In addition, the BT1 diode slows the release of relay BT1 long enough to ensure release of a panel district selector L relay, where the test circuit waits for a trunk to become idle.

2.03 When a busy trunk is encountered that does not become idle before the time-out interval, the AL relay operates and brings in an alarm. If option ZT Mfr Disc. is furnished, relay AL locks. Under this condition, operation of the CA key is required to recycle the test frame. If option ZT has been removed, the test circuit will automatically retire the busy trunk time-out alarm and proceed with trunk testing functions, if the trunk that produced the alarm becomes idle before the alarm is retired manually.

TRUNK SEIZURE

2.04 This operation is covered on SC4. After a satisfactory busy test, ground is placed on the S lead to a panel trunk or S1 lead to a crossbar trunk to hold the trunk busy to service calls. When the slow-release relay SRL has released, the trunk TT1 relay operates to close through additional leads to the trunk test circuit to

- (a) remove the test circuit ground from the sleeve toward the originating equipment and
- (b) replace it with ground from the trunk.

2.05 The Start Trunk Test relay STT in operating checks that all preceding operations of the test circuit have been successfully completed, namely:

- (a) the start key is operated,
- (b) a select magnet has operated,
- (c) a hold magnet has operated,
- (d) a single crosspoint terminal has been closed through,
- (e) a trunk circuit has been seized,
- (f) there is no cross in the TT leads of the trunks,
- (g) the trunk class indication is complete,
- (h) a satisfactory busy test of the trunk sleeve has been made, and
- (i) the alarm relay has not operated.

The STT relay operates the auxiliary STTA relay which in turn operates the ON1 relay.

3. TEST PROGRESS SWITCH CONTROL AND RETURN TO NORMAL

3.01 The control circuits for the test progress switches are as follows:

- (a) FS6 - Station-to-station crossbar MF trunks
- (b) FS7 - Crossbar PCI trunks
- (c) FS8 - Station-to-station panel MF trunks
- (d) FS9 - Panel PCI trunks
- (e) FS35 - Special toll and operator assistance crossbar noncoin trunks - loop and E and M lead signaling
- (f) FS36 - Crossbar coin trunks - loop and E and M lead signaling
- (g) FS37 - Panel coin trunks - loop and E and M lead signaling
- (h) FS38 - Special toll and operator assistance panel noncoin trunks - loop and E and M lead signaling

3.02 The test progress switch is a back acting, 6-bank selector switch which advances automatically through 22 positions if ground is applied to its interrupter contact. The selector is stepped from its normal position 1 when the ON1 relay operates at start of trunk testing, connecting ground to terminal 1 of arc 1 through operated contacts of the appropriated class relay(s). From there, the switch is advanced step-by-step by ground applied to the successive terminals of arc 6 upon successful completion of each test. When the selector has advanced through the trunk test positions, the AV1-8 relay is operated to restore the selector to normal position 1. The AV- relay locks to ground on the ON1 relay and connects ground to the interrupter contact of the selector. In position 1 of the selector the OK relay operates, operating the OK1 relay. The OK1 relay operated releases the AV- relay, stopping the selector switch in position 1.

3.03 A means of automatically restoring the selector switch to normal is provided by connecting ground to terminals 2 to 22 of the selector arc 2 to the winding of the AV-relay. The connection is made through a back contact of the TCI relay to restore the selector if it is moved off-normal falsely, or through a make-contact of the CA⁴ relay to restore the selector if the CA key of the outpulsor identifier test circuit is operated.

3.04 Ground is connected directly to the winding of the step magnet to block the selector if the test circuit blocks due to a test failure or time-out. Test progress lamps are lighted in sequence as the selector is advanced through the test positions to indicate the progress of testing.

4. MARGINAL TESTS OF TRUNK RELAYS

TP RELAY TEST - CROSSBAR TRUNKS

4.01 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, positions 2 and 3.
- (b) SC12, crossbar PCI trunk, B selector, positions 2 and 3.
- (c) SC19, crossbar special toll and operator assistance noncoin trunk, E selector, positions 2 and 3.

4.02 If no 2-party trunks are being tested, the CL2, CL⁴, or CL10 relay is operated and the selector switch bypasses positions 2 and 3. If 2-party trunks are tested, but the TP key in the outpulsor identifier test circuit is not operated, the CL1, CL3, or CL9 relay is operated and the selector switch bypasses positions 2 and 3.

A. TP Nonoperate Test

4.03 If 2-party trunks are tested and the TP key in the outpulsor identifier test circuit is operated, operating the TPT relay, the TP relay is operated when the selector stops in position 2 to apply a nonoperate test to the TP relay of the trunk. The TP relay operated removes ground from the S1 lead to the trunk and replaces it with 130-volts battery through a high resistance.

4.04 Timer 2 is used to ensure that the nonoperate current is applied to the trunk TP relay for a time sufficient to give it a satisfactory test before the selector switch is advanced to the next position. The TPK relay should remain normal, indicating that the trunk TP relay does not operate. When timer 2 has functioned, it operates relay ET2A and the selector is advanced to position 3. If the TPK relay has operated, indicating that the nonoperate test of the trunk relay has failed, the BLK relay is operated and the test circuit blocks, lighting a TPF lamp.

B. TP Operate Test

4.05 In position 3 of the selector, the TPO relay operates to apply an operate test to the TP relay of the trunk. The TPO relay operated replaces the high resistance in the S1 lead with a low resistance.

4.06 With option X Mfr Disc. furnished, the TPK relay should operate, indicating that the trunk TP and TP1 relays have operated. The TPK relay operated lights the TPK lamp and advances the selector to position 4.

4.07 With option ZS furnished, the TPK relay should operate and lock, indicating that the trunk TP and TP1 relays have operated. Relay TPK disconnects the low resistance from the S1 lead and connects the low resistance winding of relay TPK1 in

series with the S1 lead. Relay TPK1 is marginal and will operate if the trunk TP and TP1 relays have successfully lowered the resistance in the S1 lead. The TPK1 relay operated lights the TPK1 lamp and advances the selector to position 4.

4.08 If the TPK or TPK1 relay fails to operate, the test circuit will time out and block, lighting lamp TPF.

CT RELAY TEST - CROSSBAR TRUNKS

4.09 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, positions 4 and 5.
- (b) SC12, crossbar PCI trunk B selector, positions 4 and 5.
- (c) SC19, crossbar special toll and operator assistance loop and E and M lead noncoin trunk, E selector, positions 4 and 5.

- (d) SC21, crossbar loop and E and M lead coin trunk, F selector, positions 2 and 3.

A. CT Nonoperate Test - Crossbar Trunk

4.10 The CT relay operated connects 48-volts battery through a high resistance and the winding of polar relay CT2 to the trunk CT relay over lead CTD. The CT2 relay operates, checking the continuity of the path through the trunk CT relay to ground. The CT2 relay operates the CT3 relay which lights the CT2 lamp. Timer 3 is used to ensure that the nonoperate current is applied to the trunk CT relay for a time sufficient to give a satisfactory test before the selector is advanced to the next position.

- (a) The CT relay operated also connects relay EMLT to the trunk miscellaneous circuit M lead. If the connected trunk is arranged for E and M signaling, the M lead is grounded and relay EMLT operates. With relay EMLT operated, the test circuit is arranged for E and M lead trunk testing.

4.11 The CT1 relay should remain normal, indicating that the trunk CT relay does not operate. When timer 3 has functioned, it operates relay ET3B and the selector is advanced to position 5 (position 3 for coin trunks). If the CT1 relay has operated, indicating that the nonoperate test of the trunk CT relay has failed, the test circuit will time out and block, lighting a CTF lamp.

B. CT Operate Test - Crossbar Trunk

4.12 In position 5 (position 3 for coin trunks) of the selector, the CTO relay operates, decreasing the resistance in the trunk CT operate path. The CT1 relay should operate, indicating that the trunk CT relay has operated, in turn operating the trunk CT1 relay. The CT1 relay operated advances the selector to the next position. If the CT1 relay does not operate, indicating that the operate test of the CT relay has failed, the test circuit will time out and block, lighting a CTF lamp.

CT RELAY TEST AND SEMICONDUCTOR DIODE VARISTOR TEST - PANEL TRUNK

4.13 This operation is covered on:

- (a) SC13, panel MF station trunk, C selector, positions 2, 3, and 4.
- (b) SC14, panel PCI trunk, D selector, positions 2, 3, and 4.
- (c) SC23, panel coin loop and E and M lead trunk, G selector, positions 2, 3, and 4.
- (d) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, positions 2, 3, and 4.

A. CT Nonoperate Test - Panel Trunk

4.14 The CT relay operates in position 2 of the selector, connecting 48-volts battery through a high resistance and the winding of polar relay CT2 to the trunk CTD lead and connecting ground to the trunk CTP

lead. This provides a path from battery to ground through the CT relay of the trunk, shunting the CT varistor with direct ground. Timer 3 is used to ensure that the nonoperate current is applied to the trunk CT relay for a time sufficient to give a satisfactory test before the selector is advanced to the next position. The CT2 relay operates, checking the continuity and polarity of the path through the trunk CT relay. The CT2 relay operates the CT3 relay which lights lamp CT2. The CT relay operated also connects relay EMLT to the trunk miscellaneous circuit M lead. If the connected trunk is arranged for E and M lead signaling, the M lead is grounded and relay EMLT operates. With relay EMLT operated, the test circuit is arranged for E and M lead trunk testing.

4.15 The CT1 relay should remain normal, indicating that the trunk CT relay does not operate. When timer 3 has functioned, it operates relay ET3A and the selector is advanced to position 3. If the CT1 relay has operated, indicating that the nonoperate test of the trunk CT relay has failed, the test circuit will time out and block, lighting a CTF lamp.

B. Semiconductor Diode Varistor Test - Panel Trunk

4.16 The VAR relay operates in position 3 of the selector switch, removing the ground which shunted the CT varistor in the trunk and removing the high-resistance, 48-volt battery from the CTD lead. By means of a voltage divider circuit, a low negative potential is applied to the CTD lead through the winding of the CT2 relay. The CT2 relay remains operated, checking the continuity of the circuit through the trunk CT relay and varistor to ground. The CT varistor in the trunk offers high resistance to the low voltage circuit, preventing the trunk CT relay from operating. Timer 2 is used to ensure that the low voltage test is applied for a time sufficient to provide a satisfactory test of the varistor.

4.17 The CT1 relay should remain normal, indicating that the trunk CT relay does not operate. When timer 2 has functioned, it operates relay ET2A and the selector is advanced to position 4. If the CT1 relay has operated, indicating that the varistor test has failed, the test circuit blocks, lighting a CTF lamp. The progress lamp VAR, which is also lighted at this time, indicates a varistor test failure rather than a CT relay failure.

C. CT Operate Test - Panel Trunk

4.18 The release of the VAR relay and operation of the CTO relay in position 4 of the selector changes the condition on the CTD lead to provide low-resistance, 48-volt battery through the winding of the CT2 relay to operate the CT relay of the trunk. The CT varistor offers low resistance to the 48-volt circuit, permitting the trunk CT relay to operate.

4.19 The CT1 relay should operate, indicating that the trunk CT relay has operated, in turn operating the trunk CT1 relay. If the CT1 relay does not operate, indicating that the operate test of the CT relay has failed, the test circuit will time out and block, lighting a CTF lamp. The ON relay in the noncoin MF trunks will operate at this time and lock to itself, until released by the operation of the trunk SP relay. The SP relay operates locally in this trunk to release the ON relay and is released when ground is removed from the CTL lead when the test circuit CT relay releases. The SP relay in the station MF trunk is operated over the TFO lead by the operated CT1 relay in the test circuit.

EP RELAY TEST - PCI TRUNKS

4.20 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, positions 6 and 7.
- (b) SC14, panel PCI trunk, D selector, positions 5 and 6.

4.21 In position 6 of the B selector, position 5 of the D selector, the test circuit checks that the relays operated during the CT relay test have restored to normal before starting the trunk EP relay test.

A. EP Nonoperate Test

4.22 To apply a nonoperate test to the trunk EP relay, the relay is first soaked negative to ensure that the nonoperate test will meet conditions actually encountered in service. The EPT relay is operated.

4.23 The terminations provided for the TI and RI leads of the trunk during the EP relay test are shown in FS13, TI-RI circuit. The EPT relay operated connects a soak bath for the trunk EP relay from battery

through the EPSO resistor on the RI lead to ground on the TI lead. Timer 2 measures a timed interval for the EP relay negative soak after which the EP2 relay operates, completing a path over the TI and RI leads to apply a nonoperate test to the trunk EP relay. Timer 3 is used to ensure that the nonoperate current is applied for a time sufficient to provide a satisfactory test. The test circuit EP relay should remain normal, indicating that the trunk EP relay does not operate. When timer 3 functions, it operates the FT3A relay, advancing the selector to the next position. If the EP relay has operated, indicating that the EP nonoperate test has failed, the BLK relay is operating and the test circuit blocks, lighting an EPF lamp.

B. EP Operate Test

4.24 In position 7 of the B selector, position 6 of the D selector, the EP2 relay is released, completing a path over the TI and RI leads to apply a negative soak to the trunk EP relay. The test circuit checks that timer 2 and timer 3 have returned to normal before operating the EPO relay to remove the negative soak and apply an operate test to the trunk EP relay. Timer 2 is used to ensure that the operate current is applied for a sufficient time before the operation of the trunk EP relay is checked by the test circuit. When timer 2 functions, it operates the ET2A relay and, if the test circuit EP relay has operated, advances the test selector to the next position. If the EP relay has not operated, indicating that the operate test of the EP relay has failed, the BLK relay is operated and the test circuit blocks, lighting an EPF lamp.

CS RELAY TEST - MF STATION TRUNKS

- 4.25 This operation is covered on:
- (a) SC11, crossbar MF trunk, A selector, positions 6 and 7.
 - (b) SC13, panel MF trunk, C selector, positions 5 and 6.
- 4.26 In position 6 of the A selector, position 5 of the C selector, the test circuit checks that the relays operated during CT relay test have restored to normal before starting the trunk CS relay test.

A. CS Operate Test - Station MF Trunks

4.27 A negative soak is first applied to the CS relay, the continuity of the soak path is checked, and the CS relay is checked nonoperated. An operate test of the CS relay is then made, followed by a positive soak.

4.28 The terminations provided for the TO and RO leads of the trunk during CS relay test are shown in FS12, TO-RO circuit. The CSX relay operated causes the operation of the trunk ON relay, reducing the resistance in the CS operate path. The CSSX relay operates, checking the continuity of the soak path. The CSK relay nonoperating, checks that the CS relay is nonoperated. With the CSSX relay operated, the SO and auxiliary SOA relays are operated to remove the negative soak and apply an operate test to the CS relay. Timer 3 is used to ensure that the operate current is applied for a sufficient time before the operation of the CS relay is checked by the test circuit. The CSK relay should operate, indicating that the CS relay has operated. When timer 3 has functioned, it operates relay ET3B, advancing the selector to the next position. If the CSK relay has not operated, indicating that the operate test of the trunk CS relay has failed, the test circuit times out, operating the BLK relay and lighting a CSF lamp.

B. CS Release Test - Station MF Trunks

4.29 A positive soak is applied to the CS relay before the release test is made. The ET3B relay, operating at the end of the previous test, reduced the resistance in the RO lead to a low value to apply the positive soak. When the selector is advanced to the release test position, the CSR relay operates changing the resistance in the RO lead to a high value. The CSK relay should release, indicating that the CS relay has released. Timer 2 is used to ensure that the current is reduced for a time sufficient to release the CS relay before its release is checked. When timer 2 has functioned, it operates the ETM2 relay advancing the selector to the next position. If the CSK relay has not released, indicating that the release test of the trunk CS relay has failed, the test circuit times out, operating the BLK relay and the CSF lamp.

4.30 The operation and release of the CS relay just described causes the trunk RV relay to operate and release. This simulates the momentary reversal sent to the auxiliary sender to outpulse the called number.

C. Special Toll and Operator Assistance Trunks; Loop Trunks CS Relay Operate Test - E&M Trunks E Relay Operate Test

4.31 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk, E selector, position 8.
- (b) SC21, crossbar coin loop and E and M lead trunk, F selector, position 8.
- (c) SC23, panel coin loop and E and M lead trunk, G selector, position 10.
- (d) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 10.

4.32 Loop Signaling Trunks; The trunk CS relay is tested on its primary winding; the secondary winding being shunted down by the low bridge condition which is maintained during CS operate and release tests. A negative soak is applied to the CS relay; the continuity of the soak path is checked, and the CS relay is checked nonoperated. An operate test of the CS relay is then made, timed by timer 3. At the end of the timed interval, a positive soak is applied. The CSK relay checks the operation of the trunk CS relay. If the CSK relay does not operate, the test circuit times out, lighting the BLK and CSF lamps.

4.33 E and M Trunks: The E relay operate test is made, and its operation is checked by the operation of relay CSK. If relay CSK does not operate, the test circuit times out and operates the BLK and EF lamps.

D. Special Toll and Operator Assistance Trunks; Loop Trunks CS Relay Release Test - E and M Trunks Release E Relay

4.34 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunks, E selector, position 9.

(b) SC21, crossbar coin loop and E and M lead trunks, F selector, position 9.

(c) SC23, panel coin loop and E and M lead trunks, G selector, position 12.

(d) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunks, H selector, position 12.

4.35 Loop Signaling Trunks: A positive soak is applied to the CS relay before the release test is made. The ET3B relay, operating at the end of the CS operate test, reduced the resistance in the RO lead to a low value to apply the positive soak. When the selector advances to the release test position, the CSR relay operates, changing the resistance in the RO lead to a high value. Timer 2 is used for this test. Release of the trunk CS relay is confirmed by the operation of the test circuit CSK1 relay (crossbar) or the release of the CSK relay (panel). If the trunk CS relay fails to release, the test circuit times out and blocks, operating the CSF lamp.

4.36 E and M Lead Trunks: When the selector advances to the release test position, the CSR relay operates. Relay CSR operated operates relay E1 which in turn releases the trunk E or CS2 relay. If the trunk E or CS2 relay fails to release, the test circuit times out and blocks, operating the EF lamp.

4.37 The operation and release of the loop trunk CS relay or the E and M lead trunk E or CS2 relay just described causes the trunk RV relay to operate and release, simulating the momentary reversal sent to the auxiliary sender as a signal to outpulse the called number (special toll trunks).

4.38 On tests of panel noncoin trunks arranged for operator assistance traffic (class 17 and 18), it is necessary to prevent operation of the trunk SI relay when the trunk RV relay operates, since relay SI would prevent the release of relay RV. To prevent operation of relay SI, the trunk TM relay is operated from the test circuit over lead TML (option ZM) during the CS relay operate and release test. Relay TM operated holds open the operate circuit to the trunk SI relay, and the trunk RV relay is allowed to release to indicate release of the CS relay.

A RELAY TEST - MF TRUNKS

A. A Operate Test - Station MF Trunks

4.39 This operation is covered on:

- (a) SC11, crossbar station MF trunk, A selector, position 9.
- (b) SC13, panel station MF trunk, C selector, position 8.

4.40 The A operate test is applied immediately after a continuity and polarity check of the TI and RI leads FS13 has been made (see 5.). The operation of the AOP relay

- (a) removes the CP relay and CP resistor and
- (b) places a low resistance bridge across the TI and RI leads.

The trunk A relay should operate. The operation of the marginal trunk A relay advances the selector to the next position.

B. A Soak and Release Test - Station MF Trunks

4.41 This operation is covered on:

- (a) SC11, crossbar station MF trunk A selector, positions 17 and 18.
- (b) SC13, panel station MF trunk, C selector, positions 15 and 16.

4.42 A soak is applied to the trunk A relay before the release test is made. The check of the identification feature has just been completed. The operation of the AT2 relay places the low resistance ASK relay across the trunk TI and RI leads, FS13. The operation of the ASK relay checks the continuity of the TI and RI leads to battery and ground through the trunk A relay windings. The ARLS relay operated checks that the trunk A relay is operated.

4.43 The selector advances and the ACS relay is operated to remove the ASK relay from the trunk TI and RI leads and to replace it with a high resistance bridge. The ARLS relay should release, indicating that the trunk A relay has released. If the A relay fails to release, the test circuit times out and blocks, lighting an AF lamp.

C. A Operate Test - Crossbar Special Toll and Operator Assistance Trunks

4.44 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk E selector, position 7.
- (b) SC21, crossbar coin loop and E and M lead trunk, F selector, position 5.

4.45 The A operate test is applied immediately after a continuity and polarity check of the TI and RI leads FS13 has been made (see 5.). The operation of the AOP relay removes the CP relay and CP resistor and places a low resistance bridge across the TI and RI leads. The trunk A relay should operate, operating the trunk ON relay which grounds the trunk S lead and operates the test circuit SL1 relay. The operated ON relay in loop trunk reduces the high bridge to the outgoing T and R to a low bridge (seizure signal). The operated ON relay in E and M lead trunks operates the trunk A1 relay which removes ground and connects -48 volt battery to the trunk M lead. The A relay operation is confirmed by the operation of the AOP1 relay, the low bridge of loop trunks is confirmed by the operation of relay MG and the battery on the E and M lead trunk M lead is confirmed by the operation of the M relay which in turn operates the MG relay. If the trunk A relay does not operate or if the above confirmations are not made, the test circuit times out TMI and blocks, lighting the AOP and AF lamps.

D. A Soak and Release Test - Crossbar Special Toll and Operator Assistance Loop and E and M Lead Trunks

4.46 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunks, E selector, positions 17 and 18,
- (b) SC21, crossbar coin loop and E and M lead trunk, F selector, positions 6 and 7.

4.47 The operation of the AT2 relay places the low resistance ASK relay across the TI and RI leads, giving the trunk A relay a heavy positive soak. The ASK relay operates, checking the TI and RI continuity, and allows the ARLS relay to operate, verifying that the trunk A relay is operated.

4.48 The selector advances and the ACS relay operates, removing the ASK relay from the TI and RI leads and leaving a high resistance bridge. The trunk A relay should release, releasing the ARLS relay and advancing the selector. A failure of the soak or release test will cause the test circuit to time out TML and block, lighting the AF lamp. The SOAK or ARLS lamp will also be lighted.

E. A Relay Test - Panel Special Toll and Operator Assistance Trunks

4.49 The A relay is a supervisory relay bridged across the trunk incoming T and R leads. With operator assistance trunks, certain local office operations make it necessary to present a marginal L relay, having a higher nonoperate value than the A relay, to the sender circuit. When the RV relay in the trunk is operated (usually by the trunk CS relay), the L relay is removed and the A relay substituted for it.

4.50 On tests of operator assistance trunks, the L relay is tested in positions 6 and 7 of the selector switch (see 4.74 through 4.77). The CS relay operate test is made in position 10. The operation of the CS relay (see 4.31) causes the A relay to be substituted for the L relay, allowing the A relay to be tested in position 11 (see 4.53). On special toll trunks there is no L relay to be tested so the A relay operate test is made in position 6 (see 4.51). The A relay test performed in position 11 is incidental and serves no useful function.

A Relay Operate Test - Panel Special Toll Loop and E and M Lead Trunks

4.51 This operation is covered on:

- (a) SC23, panel special toll coin loop and E and M lead trunk, G selector, position 6.
- (b) SC24, panel special toll noncoin loop and E and M lead trunk, H selector, position 6.

4.52 This test is made immediately after the originating continuity and polarity test (see 5.). The AOP relay operates, removing the CP relay from the TI-RI circuit and substituting the AOP-resistor. The

trunk A relay should operate, operating the AO relay. The operation of the loop trunk A relay lowers the outgoing T and R bridge resistance (off-hook forward) allowing the MG1 relay to operate. The operated A relay in E and M leads trunks operates the trunk ON relay which in turn operates the trunk M relay. Relay M operated removes ground and connects -48 volt battery to the trunk M lead (off-hook forward) which operates the test circuit M relay. The M relay operated operates relay MG1. The AO and MG1 relays operated advance the selector. If the trunk A relay does not operate and/or the off-hook forward signal is not received, the test circuit times out (TML) and blocks, lighting the AOP, AF, and BLK lamps.

A Relay Operate Test - Panel Special Toll and Operator Assistance Loop and E and M Lead Trunks

4.53 For special toll trunks this is a repeat of the test made in position 6 (see 4.50). This operation is covered on:

- (a) SC23, panel coin loop and E and M lead trunk, G selector, position 11.
- (b) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 11.

4.54 The trunk A relay operate test is applied by relay AOL operated. Timer 4 is used to time this test. If the trunk A relay operates within the timed interval, the test circuit AO relay operates and the selector advances. If the trunk A relay does not operate, timer 4 operates and the test circuit blocks lighting the AOP, AF, and BLK lamps.

A Relay Soak and Release Test - Panel Special Toll and Operator Assistance Loop and E and M Lead Trunks

4.55 This operation is covered on:

- (a) SC23, panel coin loop trunk, RBT selector, position 10, G selector, positions 15 and 16.
- (b) SC23, panel coin E and M lead trunk, RBT selector, positions 8 and 9, and G selector, position 15.

- (c) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, positions 17 and 18.
- 4.56 The low resistance ASK relay is bridged across the TI and RI leads by the operation of the AT2 relay, giving the trunk A relay a heavy positive soak. The operated ARLS relay confirms that the trunk A relay is operated, and the operation of the ASK relay advances the selector. The ACS relay operates to remove the low resistance ASK relay from the bridge, leaving the ARL- resistance to apply a release test to the trunk A relay. The release of the ARLS relay confirms the release of the trunk A relay and advances the selector. If the trunk A relay fails to release, the test circuit times out TM1 and blocks, lighting the ARLS, AF, and BLK lamps.
- ON RELAY RELEASE TEST - STATION TRUNKS
- 4.57 This operation is covered on:
- (a) SC11, crossbar station MF trunks, A selector, position 19.
 - (b) SC12, crossbar PCI trunks, B selector, positions 18 and 19.
 - (c) SC13, panel station MF trunk, C selector, position 18.
 - (d) SC14, panel PCI trunk, D selector, position 17.
- 4.58 If a crossbar PCI trunk is tested, the ON relay is checked operated before the ON release test is applied. The HEP1 relay is operated, operating the trunk CS relay. Timer 2 is used to provide a time delay before the operation of the trunk ON relay is checked by the test circuit CS relay normal, which advances the B selector to apply the ON release test.
- 4.59 The ON relay release test checks the release time of the slow-release ON relay in the trunk. The ONCK relay operates, operating the ONR relay which starts timer 3. The ONCK relay is locked to ground on the ON relay in the crossbar trunk or to ground on the CT1 relay in the panel trunk. The path to ground through the selector switch by which the ON relay is held operated at this time (CS2 lead) is opened by the operation of the STM3 relay. Timer 3 is used to limit the interval during which

the release condition is applied. A check is made to determine whether the ON relay is still operated immediately after timer 3 functions to operate the ET3A relay. If the ON relay holds over its specified release time, the ONK relay operates and advances the selector switch. If the ON relay fails to hold over the test release time, the test circuit blocks and an ONF lamp is lighted.

CS RELAY TEST - PCI TRUNKS

- 4.60 This operation is covered on:
- (a) SC12, crossbar PCI trunk, B selector, positions 12, 13, and 14.
 - (b) SC14, panel PCI trunk, D selector, positions 7 and 8.

A. CS Operate Test

4.61 The CSO relay operates, applying a negative soak over the TO and RO leads FS12 to the CS relay in the trunk. The CSS relay operating, checks the continuity of the soak path through the trunk CS relay. The Slow-Operate SO relay ensures that the negative soak is applied for a sufficient interval and then operates the SOA relay to reverse the polarity on the TO and RO leads and apply operate current to the CS relay. The operation of the CS relay is checked by checking for presence of ground on the IS lead. Timer 3 is used to allow time for the operation of the trunk SI relay and the SIK1 relay before the operation of the trunk CS relay is checked. The SIK1 relay operating checks the operation of the CS relay and, when timer 3 has functioned, advances the selector switch. If the CS relay fails to operate, the test circuit blocks and a CSF lamp is lighted. When testing special toll and operator assistance trunks, a ground is applied to leads TI and RI to the trunk under test to prevent the charge and/or discharge of the trunk A and B capacitors from interfering with the operate test of the trunk CS relay.

B. CS Release Test

- 4.62 The CSR relay operates to insert a large resistance in the operate path of the trunk CS relay, causing its release. The release of the CS relay is checked by
- (a) checking for presence of ground on the TM lead panel trunks and

- (b) operation of relay CS over the IS lead for crossbar trunks.

Timer 2 is used to ensure that time is allowed for the release of the trunk CS relay and the operation of the trunk TM relay before checking. If the CS relay fails to release, the test circuit blocks and a CSF lamp is lighted.

C. CS Reoperate and TM Release - Panel PCI Trunk

4.63 The release of the SO and SOA relays is checked before the HEPl relay is operated to reoperate the CS relay of the trunk. The CS relay operating releases the trunk TM relay, which was used to check the release of the CS relay in the previous test. The test circuit TM relay releasing checks the release of the trunk TM relay and advances the selector switch from position 9 to position 10.

D. CS Reoperate - Crossbar PCI Trunk

4.64 The release of the SO and SOA relays is checked before the HEPl relay is operated in position 14 of the B selector to reoperate the CS relay of the trunk.

A RELAY TEST - PCI TRUNKS

4.65 On a crossbar PCI trunk, the A relay test is made immediately following the CS relay test. The release of the SO and SOA relays is checked before the HEPl relay is operated to reoperate the CS relay of the trunk. The test circuit CS relay releasing checks the operation of the trunk CS relay, and the test circuit proceeds with the A relay test. The A relay release test, originating polarity test, and A relay operate test are applied in that sequence.

4.66 On a panel PCI trunk, the A relay test is applied following identification check. The A relay originating polarity test, operate test, and release test are applied in that sequence.

A. A Soak and Release Test - PCI Trunks

4.67 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, positions 14 and 15.
- (b) SC14, panel PCI trunk, D selector, position 15.

4.68 A soak is applied to the trunk A relay before the release test is made. The operation of the ATl relay places the low resistance ASK relay across the trunk TI and RI leads, FS13. The operation of the ASK relay checks the continuity of the TI and RI leads to battery and ground through the trunk A relay windings. The ARLS relay operated checks that the trunk A relay is operated. On a crossbar trunk test, the selector advances.

4.69 On either a panel or crossbar trunk test, the ACS relay is operated to remove the ASK relay from the trunk TI and RI leads and replace it with a high resistance bridge. The ARLS relay should release, indicating that the trunk A relay has released. If the A relay fails to release, the test circuit times out and blocks, lighting an AF lamp.

B. A Relay - Originating Polarity Test - PCI Trunks

4.70 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, position 16.
- (b) SC14, panel PCI trunk, D selector, position 13.

4.71 This test checks the polarity which is present on the tip and ring leads toward the originating equipment before the trunk is seized. The OPT relay operates, bridging the CP relay and CP resistor across the trunk TI and RI leads, FS13. The CP relay operating checks the continuity and

polarity of the TI and RI leads to battery and ground through the A relay windings. The CP1 relay operates, advancing the selector.

C. A Relay Operate Test - PCI Trunks

4.72 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, position 17.
- (b) SC14, panel PCI trunk, D selector, position 14.

4.73 The A relay operate test is applied immediately after a continuity and polarity check of the TI and RI leads FS13 has been made. The operation of the AOP relay removes the CP relay and CP resistance bridge across the TI and RI leads and replaces it with a low resistance bridge. The A relay should operate, advancing the selector switch.

L RELAY TEST - PANEL OPERATOR ASSISTANCE TRUNKS

A. L Relay Nonoperate Test

4.74 This operation is covered on:

- (a) SC23, panel operator assistance coin loop and E and M lead trunk, G selector, position 6.
- (b) SC24, panel operator assistance non-coin loop and E and M lead trunk, H selector, position 6.

4.75 The LT relay operates in position 6, bridging the TI and RI leads with a high resistance to make a nonoperate test on the trunk L relay. Timer 3 is used to ensure a sufficient time for the test. If at the end of the timed interval the trunk L relay has not operated (LO normal), the selector advances to position 7. If, however, the trunk L relay has operated, operating the LO relay, the test circuit blocks, lighting the LT, NOT, and BLK lamps.

B. L Relay Operate Test

4.76 This operation is covered on:

- (a) SC23, panel operator assistance coin loop and E and M Lead trunk, G selector, position 7.
- (b) SC24, panel operator assistance noncoin loop and E and M lead trunk, H Selector, position 7.

4.77 The LOT relay operates, lowering the resistance bridged across the TI and RI leads to apply an operate test to the trunk L relay. The trunk L relay operates, operating the LO relay and causes the off-hook condition to be connected (off-hook condition: loop trunks, low resistance outgoing T and R bridge; E and M lead trunks, battery on lead M). The MG1 relay operates over the lowered loop resistance or due to the operation of relay M which operates from the battery on lead M. The MG1 and LO relays operated advance the selector. If the trunk L relay does not operate and/or the off-hook signal is not received, the test circuit times out TML, lighting the LT, OT, and BLK lamps.

RC RELAY TEST - LOOP SPECIAL TOLL AND OPERATOR ASSISTANCE NONCOIN TRUNKS AND CN RELAY TEST - LOOP COIN TRUNKS

4.78 The RC and CN relays are marginal relays bridged across the trunk outgoing T and R leads (in series with the CS relay). The RC relay is used to detect ringback signals, and the CN relay detects coin control signals. Despite the differences in purpose, the methods of operation and therefore the methods of testing the RC and CN relays are similar, and they will be treated together in this and the following paragraphs.

A. Crossbar Special Toll and Operator Assistance Trunks - Loop Trunks RC/CN Nonoperate Test

4.79 This operation is covered on:

(a) SC19, crossbar special toll and operator assistance noncoin loop trunk, E selector, position 15.

(b) SC12, crossbar coin loop trunk, F selector, position 16.

4.80 The RC/CN relay is tested on its primary winding. The MG1 relay operating checks that the trunk is in the low bridge condition with the RC/CN secondary winding shunted, and it operates the RC relay to start the non-operate test. Timer 2 is used. If the trunk RC/CN relay remains nonoperated, the selector is advanced. A false operation of the trunk RC/CN relay causes the test circuit to block and bring in an alarm.

B. Crossbar Special Toll and Operator Assistance Trunks - Loop Trunks RC/CN Operate Test

4.81 This operation is covered on:

(a) SC19, crossbar special toll and operator assistance noncoin loop trunks, E selector, position 16.

(b) SC21, crossbar coin loop trunk, F selector, position 17.

4.82 The relays operated in the previous position are released. The MG1 relay operates, checking that the trunk is in the low bridge condition. Relays RCO and RC operated apply operate current to the trunk RC/CN relay, which should operate. Operation of the trunk RC relay is confirmed by operation of the RD and D relays, detecting ringing current on the TI and RI leads. Operation of the trunk CN relay is confirmed by the test circuit CN1 relay, which advances the selector. If the RC/CN relay fails to operate, the test circuit times out (timer 4) and blocks.

C. Panel Special Toll and Operator Assistance Trunks - Loop Trunks RC/CN Nonoperate Test

4.83 This operation is covered on:

(a) SC23, panel coin trunks, G selector, position 8.

(b) SC24, panel special toll and operator assistance noncoin trunks, H selector, position 17.

4.84 The operation of the NOT relay starts timer 2 and applies the nonoperate current over the TO and RO leads to the trunk RC/CN relay. If the noncoin trunk RC relay has not operated at the end of the timed interval, the RBT2 relay is operated to start the operate test; if the coin trunk CN relay has not operated, the selector advances. If the trunk relay operates, detected by the operation of the RD relay for noncoin trunks or the CN1 relay for coin trunks, the test circuit blocks and brings in an alarm. On the noncoin test, the nonoperate current is applied toward the trunk in the direction to hold operated the trunk CS relay, since the trunk is off-normal at this time and is depending on a tandem holding condition.

D. Panel Special Toll and Operator Assistance Loop Trunks - RC/CN Operate Test

4.85 This operation is covered on:

(a) SC23, panel coin trunks, G selector, position 9.

(b) SC24, panel special toll and operator assistance noncoin trunks, H selector, position 17.

4.86 The OT relay operates, reducing the resistance in series with the trunk RC/CN relay, which should operate. The operation is confirmed by the RD relay, which detects that the noncoin trunk has applied ringing toward the calling line, or by the CN1 relay for the coin trunks. The operation of the coin trunk CN relay activates the trunk automatic return of initial coin deposit feature ARID. The ARID feature, when tested, is verified by the operation of relays CRK and ARCK. Relay CRK is operated by the coin return potential applied by the trunk. When the RC/CN relays are checked operated, the operate condition is removed. Subsequent release of the noncoin trunk RC relay causes the test circuit to apply the A relay soak condition, the A relay is checked operated, and the selector is advanced. The release of the coin trunk CN relay, or when the ARID test is applied, the released CN and the operated ARCK relays, cause the selector to advance. If the trunk RC/CN relay does not operate, the test circuit times out and blocks.

5. ORIGINATING CONTINUITY AND POLARITY TEST - MF TRUNK

5.01 This operation is covered on:

- (a) SC11, crossbar station MF trunk, A selector, position 8.
- (b) SC13, panel station MF trunk, C selector, position 7.
- (c) SC19, crossbar special toll and operator assistance noncoin trunk, E selector, position 6.
- (d) SC21, crossbar coin trunk, F selector, position 4.
- (e) SC23, panel coin trunk, G selector, position 5.
- (f) SC24, panel special toll and operator assistance noncoin trunk, H selector, position 5.

5.02 The test circuit checks the release of the relays operated on the previous test and checks that timer 2 has restored to normal before operating the OPX relay to apply the originating continuity and polarity test.

5.03 This test checks the polarity which is present on the tip and ring leads toward the originating equipment. The terminations provided for the TO, RO, TI, and RI leads of the trunk during the continuity and polarity test are shown on FS12 and FS13, respectively.

5.04 The CP relay which is bridged across the TI and RI leads of the test circuit operates from battery on the tip lead ground on the ring lead through the trunk A relay windings. Timer 2 is used. The CP relay operating checks the continuity and polarity of the TI and RI leads. When timer 2 functions, the ET2A relay is operated, advancing the selector switch.

6. CHECK RV OPERATED - MF TRUNK

6.01 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, position 11.

- (b) SC13, panel MF station trunk, C selector, position 10.

- (c) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunks, E selector, position 10.

- (d) SC21, crossbar coin loop and E and M lead trunks, F selector, position 10.

- (e) SC23, panel coin loop and E and M lead trunk, G selector, position 13.

- (f) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 13.

6.02 On a service call, the ANI trunk receives an off-hook signal when the CAMA or TSP(S) sender is attached, and the sender restores the on-hook when ready to receive the called number. With loop signaling, the off-hook signal is reverse polarity over the TO and RO leads, and with E and M lead signaling, the off-hook is ground on lead E. The momentary off-hook causes the operation and release of the trunk RV relay. This action by relay RV momentarily reverses leads TI and RI to signal the sender at the originating end to send the called number. The WK relay is operated to simulate the above off-hook signal. Relay WK1 is operated to place the CP relay across the TI and RI leads to check the polarity at the originating end of the trunk. The CP relay should operate, indicating that the trunk has functioned to transmit the reversal to the originating end, and advance the selector.

7. CHECK IDENTIFICATION FEATURE

CHECK SI UP - MF TRUNKS

7.01 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, position 12.

- (b) SC13, panel MF station trunk, C selector, position 11.

- (c) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk, E selector, position 11.

- (d) SC21, crossbar coin loop and E and M lead trunk, F selector, position 11.

7.02 The start identification (SI) relay must be operated in the trunk before the outpulser can be seized to cause identification. On a service call, the trunk SI relay is operated on the second momentary off-hook (wink signal) from the far end. In the test sequence, the operate and release test of the loop trunk CS relay, or the E and M lead trunk CS2/E previously made have conditioned the trunk to operate relay SI when relay CS CS2/E is again operated.

7.03 The WK relay is operated to apply a start identification signal (wink) to the trunk. This signal operates the loop trunk CS relay, or the E and M lead trunk CS2/E relay. The trunk relay operated operates the trunk SI relay which in turn grounds the SI lead advancing the test selector. If the trunk SI relay fails to operate, the test circuit times out and blocks, lighting an SIF lamp.

CHECK SI UP - PCI TRUNKS

7.04 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, position 8.
- (b) SC14, panel PCI trunk, D selector, position 7.

7.05 The SI relay of the panel PCI trunk is checked operated during the CS operate test. Once operated, the SI relay locks to the ON relay operated in the trunk.

7.06 After sending the called number, the customer sender sends a final heavy positive pulse to CAMA. This causes the trunk EP relay to operate and release, operating the trunk ON and EP1 relays. The identification signal operates the trunk CS relay. In panel PCI trunks, the SI relay also operates. There is no SI relay in the crossbar PCI trunks.

7.07 When testing panel PCI trunks, the trunk SI relay is checked operated by relay SIK1 as indicated in SC14. When testing crossbar PCI trunks, the trunk CS relay is checked operated by action of the test circuit CS relay as shown in SC12.

CHECK CT1 and SPI UP

7.08 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, position 13.
- (b) SC12, crossbar PCI trunk, B selector, position 9.
- (c) SC13, panel MF station trunk, C selector, position 12.
- (d) SC14, panel PCI trunk, D selector, position 10.
- (e) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk, E selector, position 12.
- (f) SC21, crossbar coin loop and E and M lead trunk, F selector, position 12.
- (g) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 14.

7.09 The IDY relay operates, connecting resistance battery to the S lead of the trunk FS5 to simulate district cut-through. The trunk CT relay should operate, operating the trunk CT1 relay, and causing the outpulser link to attach an outpulser. For a panel trunk, the PTY relay is also operated at this time. If an outpulser is not connected to the ANI trunk within a 2- to 5-second interval, the trunk circuit grounds the TTO lead of the test circuit. The TTO relay operates, causing the test circuit to block and light a TTO lamp.

7.10 If an outpulser is attached, it functions as on a service call to check party information and operate the SP relay of the trunk. When the outpulser operates the SPI relay to check for an abandoned call, it looks over the trunk T and R leads at the TI and RI leads of the test circuit. The TI and RI leads of the test circuit present:

- (a) a closed loop, if this is a PCI class of call or

- (b) a bridge through the CP relay and CP1 resistor in parallel, if this is an MF class of call, to simulate a customer bridged across the line.

For a panel 2-party class of call, the PTY relay operating has connected a 1500-ohm resistance across the TI and RI leads to simulate the customer loop. The test circuit CT1 and SPO relays operating check that the trunk CT1 and SP1 relays have operated and advance the selector to the next position. The SPO relay operating transfers the trunk TO and RO leads from the test circuit into the MF receiving circuit which is part of the outputer identifier test circuit, FS12. The loop trunk CS relay holds operated to ground and battery on the T and R leads in the MF receiving circuit. The SPO relay operated also operates the REC relay in preparation for identification check.

7.11 When E and M lead trunks are tested the ground on the tip lead from the outputer identifier test circuit is prevented from shunting down the trunk A relay at conclusion of the outputer abandoned call test by opening the tip lead with a break contact of relay M. When the trunk A relay has re-operated, relay A0 operates and recloses the tip lead for transmission of the calling number to the MF receiver.

7.12 The B selector is advanced to pass by one position immediately following the check of the CT1 and SP1 relays. The panel selectors, C and D, use this position to check that the outputer has been satisfied on party test.

PARTY TEST - PANEL STATION TRUNKS

7.13 This operation is covered on:

- (a) SC13, panel MF station trunk, C selector, position 13.
- (b) SC14, panel PCI trunk, D selector, position 11.
- (c) SC15, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 15.

7.14 If the outputer determined from its check of party information that the trunk attached serves 2-party lines, it makes party test following operation of the trunk SP1 relay to determine whether a tip or ring party is being served on this call. If the test call is simulating a tip party, the TP key in the outputer identifier test circuit has been operated, and the test selector waits for a check that the outputer has been satisfied on party test before advancing to complete the check of the identification feature. Resistance ground is connected to the TI lead by the TPT relay operated, presenting a tip party indication to the outputer. The TPK relay operating indicates that the TP relay in the trunk has been operated by the outputer.

IDENTIFICATION CHECK

7.15 This operation is covered on:

- (a) SC11, crossbar MF station trunk, A selector, position 14.
- (b) SC12, crossbar PCI trunk, B selector, position 11.
- (c) SC13, panel MF station trunk, C selector, position 14.
- (d) SC14, panel PCI trunk, D selector, position 12.
- (e) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 16.

7.16 The REC relay was operated earlier by the SPO relay in preparation for identification check. The REC relay operated removes resistance battery from the S lead of the trunk and connects the S lead into the outputer identifier test circuit. The outputer, which is attached to the trunk circuit, continues its operation as on a service call, attaching an identifier circuit and operating the trunk ID relay to connect identification tone to the line sleeve. For a panel 2-party trunk, the selector waits for a check that the outputer has completed party test before advancing to complete the identification check.

7.17 In the outpulser identifier test circuit, the S lead terminates in a capacitance resistance network that takes the place of the network associated with a customer line for purposes of automatic number identification on a service call. With the use of this network, the identifier makes identification of the test calling line number, which has been set up by means of keys in the outpulser identifier test circuit. The identifier transfers the number which it has identified into the outpulser and then releases. The trunk MF relay is now operated by the outpulser which outpulses the number over the TO and RO leads toward the outgoing CAMA end of the trunk. At this time the TO and RO leads at the outgoing end of the trunks are connected into the MF receiving circuit, as described in 7.10. The outpulser identifier test circuit checks that the correct number of digits is received by the MF receiving circuit. If a satisfactory check is made, the IOK relay is operated by the outpulser identifier test circuit.

7.18 The IOK relay is operated over lead IOK if the test call simulates a ring party customer (TP key normal) or a tip party customer (TP key operated, and the trunk being tested is arranged for two-party service). If the TP key is operated while testing a coin trunk, however, the OIT circuit will ground lead IOK1. In this case relay IOK is operated over lead IOK1 through make contacts of relays XBCN or PCN. If the TP key is operated while testing noncoin trunks not arranged for two-party service the OIT circuit will ground lead IOK1. To operate relay IOK in this case, make contacts of relays CL10 option XN and/or CL16 and CL18 (option XM) complete the path from lead IOK1 to the winding of relay IOK.

7.19 Loop Trunks: The CS relay of the trunk releases when the MF relay operates, releasing the trunk SI relay. E and M Lead Trunk: The MF relay operated releases relay CS2 which releases relay SI. When the outpulser releases the trunk MF relay at the end of the outpulsing, the CS relay of loop trunks reoperates to battery and ground in the MF receiving circuit and reoperates the SI relay. The released MF relay in E and M lead trunks reoperates relay CS2 which reoperates the SI relay. The SIK relay checks that trunk SI has operated, or that the trunk CS relay reoperates if a crossbar PCI

is being tested. If the sleeve ground has been maintained, relay SLK will still be operated, locked to the sleeve ground. The SIK, IOK, and SLK relays advance the selector to the next position. Timer 2 is used to operate the BLK relay and light an IF lamp if an identification check is not completed within a timed interval.

IDENTIFICATION AND OUTPULSING - SPECIAL TOLL AND OPERATOR ASSISTANCE TRUNKS, AUTOMATIC RETURN OF INITIAL COIN DEPOSIT TEST - COIN TRUNKS AND POSITIVE BATTERY CHECK CROSSBAR COIN DIAL-TONE-FIRST TRUNKS

7.20 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk, E selector, positions 12 and 13.
- (b) SC21, crossbar coin loop and E and M lead trunk, F selector, position 13.
- (c) SC23, panel coin loop and E and M lead trunk, G selector, position 14.

7.21 The attached outpulser functions as on a service call to check party information and seize an identifier to identify the simulated calling number that has been keyed into the outpulser identifier test circuit. The S lead has been switched by the REC relay to a network in the OIT which simulates the number network associated with the originating customer line on a service call. The outpulser outpulses the identified number to an MF receiver in the OIT that simulates the distant office, the number is checked and, if the identification and outpulsing are valid, the selector is advanced. As on a non-ANI service call, the trunk will function to return the initial coin deposit ARID following the district selector cut-through signal, or as on ANI calls, either during the outpulsing of the identified calling number or following a failure to connect to an outpulser. Key ARID is provided where some but not all of the coin trunks tested are arranged for ARID. With key ARID operated or with option YM, the test circuit monitors the TI and RI leads, and if coin return potential is received from the trunk, relay CRK operates; and if after a timed interval (timer 4), the coin return potential is still connected, relay ARCK operates. In

the case of crossbar coin trunks equipped for operation with dial-tone-first coin station sets, the test circuit in addition to the above tests, also checks the trunk function that changes the trunk talking battery to the calling station from -48 volt to +48 volt. If the correct polarity appears on the TI and RI leads, the action of the CP relay will cause relay PBK1 to operate. Failure of relay PBK1 to operate will cause the test circuit to block. A satisfactory completion of the above tests is indicated by the operation of relays IOK, PBK1, and ARCK. These relays operated advance the selector to the next position (see 7.18).

Note: The test circuit will block if key ARID is operated while testing coin trunks not arranged for ARID.

8. GROUND REMOVAL TEST - PANEL NONCOIN TRUNKS

8.01 This operation is covered on:

- (a) SC13, panel MF station trunk, C selector, position 17.
- (b) SC14, panel PCI trunk, D selector, position 16.
- (c) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 19.

8.02 The ground removal test is applied immediately after the A relay release test, if the TP key was operated. The trunk TP relay is operated at this time. The ON relay is released when the A relay releases and the trunk calls in an outpulsor to make ground removal test. The outpulsor functions to operate the trunk SP1 relay, which operates the SPO relay of the test circuit under control of the ACS relay which was operated on the previous test. The SPO relay operated operates the GRT relay which connects the TG and RG relays to the TI and RI leads, FS13. The TG and RG relays operate, checking the continuity of the T and R leads into the outpulsor on ground removal test. The outpulsor is satisfied on ground removal test and releases the trunk SP1 relay. The GTK relay operating checks the operation of the RG and TG relays and, when the SPO relay releases, indicating satisfactory completion of the ground removal test, the selector is advanced.

8.03 When the outpulsor operates the trunk SP1 relay, the trunk TP relay is released. With relay TP released and relay SP1 operated the trunk ON relay reoperates. If the trunk circuit is SD-21992-01, the ON relay will momentarily open the sleeve lead when it reoperates, since contact 8 of this relay is an EBM contact. To prevent relay SLK in the test circuit from releasing at this time, a diode is connected across the winding of relay SLK under control of relays GKT and CL15 or CL17. The diode slows up the release of relay SLK enough to allow the trunk ON relay to reground the sleeve lead before relay SLK can release.

9. THROUGH CONTINUITY AND POLARITY CHECK - PCI TRUNKS

9.01 The through continuity and polarity test checks that the correct polarity appears on the TI and RI leads toward the originating equipment after the TTI relay has been released, restoring the T and R lead connection to the CAMA office. This test is made only on PCI trunks, as the MF trunks do not have a continuous circuit through from the originating end to the CAMA office.

9.02 This operation is covered on:

- (a) SC12, crossbar PCI trunk, B selector, position 20.
- (b) SC14, panel PCI trunk, D selector, position 18.

9.03 The RV relay is operated to release the TTI relay and to operate the OPT relay, placing the CP relay and resistance across the trunk TI and RI leads. With the TTI relay normal, the CP relay looks over the T and R leads of the trunk to the CAMA office. If the correct polarity appears on these leads, the CP and CPI relays operate and the selector advances.

10. HIGH BRIDGE AND RELEASE TEST - MF TRUNKS

10.01 This operation is covered on:

- (a) SC11, crossbar station MF trunk, A selector, position 20.
- (b) SC13, panel station MF trunk, C selector, position 20.

- (c) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunks, E selector, position 20.
- (d) SC21, crossbar coin loop and E and M lead trunks, F selector, positions 20 and 21.
- (e) SC23, panel coin loop and E and M lead trunk, G selector, positions 20 and 21.
- (f) SC24, panel special toll and operator assistance loop and E and M lead trunks, H selector, position 20.

10.02 This test is made to check that the MF trunks present a high bridge to the distant office when the trunk relays are normal. Special toll and operator assistance trunks are checked to make sure that they have removed the S lead ground, releasing the original switch train. The panel coin trunk winkoff feature is also tested.

10.03 A marginal relay is used to check the TO and RO leads. Nonoperation of this relay indicates a high resistance bridge across the outgoing end of the trunk, and a successful high bridge test.

10.04 The S lead of special toll and operator assistance trunks is monitored to ensure that when the trunk restores to normal, it removes the S lead ground that was used to hold the local office switch train. Successful completion of these two tests causes the test selector to advance.

10.05 Panel coin trunks have a winkoff feature that is tested during release of the trunk. The trunk is arranged to remove the S lead ground, releasing the originating switch train, and then to reground the S lead to hold itself busy to hunting district and/or office selectors until the trunk has completely restored to normal. The sleeve check relay and position 20 and 21 of the G selector are used for this test.

11. TERMINATING HOLDING TEST - SPECIAL TOLL AND OPERATOR ASSISTANCE TRUNKS

11.01 Special toll and operator assistance trunks are required to be able to hold the originating connection under control of distant office, even if the originating customer disconnects. This feature is tested in the terminating holding test.

11.02 This operation is covered on:

- (a) SC19, crossbar special toll and operator assistance noncoin loop and E and M lead trunk, E selector, position 14.
- (b) SC21, crossbar coin loop and E and M lead trunk, F selector, position 14.
- (c) SC23, panel coin loop and E and M lead trunk, G selector, position 17.
- (d) SC24, panel special toll and operator assistance noncoin loop and E and M lead trunk, H selector, position 19.

11.03 The TI-RI loop is opened to simulate a calling customer disconnect, and the trunk is held by off-normal polarity over the TO and RO leads from the simulated distant office. The trunk should be held under control of the terminating end, maintaining a grounded S lead on the originating end. This grounded S lead, used to hold the originating switch train on a service call, is used as an indication that the trunk has not released. If, after a timed interval (timer 2), the S lead is still grounded, the terminating holding test is satisfied. If, however, the trunk does not hold under CAMA control, the S lead is not grounded at the end of the timed interval and test circuit blocks, activating an alarm.

11.04 If the TP key is operated and the trunk being tested is a panel noncoin trunk not arranged for two-party service, the TPT relay will be operated, but the trunk will not call in the outpulser for a ground removal test. In order to advance the H selector from position 19, make contacts of relays CL16 and CL18 (option XM) bypass the open contact of relay TPT in the operate path of the H sender stepping magnet.

12. RINGBACK TEST - SPECIAL TOLL AND OPERATOR ASSISTANCE NONCOIN E AND M LEAD TRUNKS

12.01 This operation is covered on:

- (a) SC19, crossbar noncoin E and M lead trunk, E selector, positions 15 and 16.
- (b) SC24, panel noncoin E and M lead trunk, H selector, position 17.

12.02 Crossbar Trunks: In position 15 the battery on the M lead from the trunk is confirmed by the operation of relay M. Relays RBT³, RBT⁴, and RCE operate in preparation for the ringback test. In position 16 the release of relays RBT³ and RCE causes a wink ringback signal to be transmitted over the E lead to the trunk. On receipt of the wink, the trunk connects ringing current to the TI and RI leads which is verified by the operation of relays RD and R. The ringing interval is timed for minimum length by timer 2. After the timed interval (timer 2), the R relay, if operated, advances the selector, or the R relay, if normal, causes the test circuit to block and light the RCF lamp.

12.03 Panel Trunks: A wink ringback signal is transmitted over the E lead to the trunk. On receipt of the wink, the trunk connects ringing current to the TI and RI leads which is verified by the operation of relays RD and R. The ringing interval is timed for minimum length by timer 2. After the timed interval (timer 2), the R relay, if operated, will advance the selector, or the R relay, if normal, causes the test circuit to block and light the RCF lamp.

13. FALSE WINK TEST - E AND M LEAD COIN TRUNKS RINGBACK TEST - LOOP AND E AND M LEAD COIN TRUNKS

13.01 This operation is covered on:

- (a) SC21, crossbar coin loop trunk, F selector, position 15, and RBT selector, positions 1 through 9.
- (b) SC21, crossbar coin E and M lead trunk, E selector, position 15, and RBT selector, positions 1 through 6.

(c) SC23, panel coin loop trunk, G selector, position 15, and RBT selector, positions 1 through 9.

(d) SC23, panel coin E and M lead trunk, G selector position 15, and RBT selector positions 1 through 6.

13.02 Loop Trunks: The ringback signal to the coin trunks consists of a series of four on-hook, off-hook, flashes over the TO and RO leads. These flashes (polarity reversals) last approximately 0.1 second each. The trunk counts the flashes to make sure that the first flash is not a disconnect signal, and then applies ringing current to the originating line.

13.03 Within the test circuit the flashes are generated by alternate operations and releases of the REV relay, controlled by the RBT selector and timers 3 and 4. After three flashes the trunk should return ringing. A fourth flash is generated and the trunk is checked for continuation of the ringing. At the end of the fourth flash the RBT selector advances when the ringing stops.

13.04 E and M lead Trunks: The ringback signal to the coin trunks is a momentary off-hook (WINK) followed by an inband signal of 700 and 1700 Hz. The momentary off-hook activates the trunk signal receiver, and the 700- and 1700- Hz signal activates the trunk ringback feature.

13.05 A false wink test is made prior to the ringback test. This test checks that the trunk will restore to talking condition after a wink signal that is not followed by an inband coin control of ringback tone signal. The test circuit sends a momentary off-hook over the E lead and then times (timer 2), in which time, it checks that the trunk signal receiver circuit is activated (test relay TDRA operated), and that the trunk is restored to the talking condition after a trunk timed interval (test relay RCE operates).

13.06 The trunk detects the ringback signal and applies ringing current to the originating line, verified by relays RD and R in the test circuit. In order to ascertain that the trunk does not release during

ringback, the S lead is monitored. Ground on the S lead indicates that the trunk is holding the connection and, with ringing verified, a successful test has been made. If the ringback signal does not cause ringing current to be applied to the originating line or if the S lead check indicates that the trunk has released (S lead not grounded), the test circuit blocks and activates an alarm.

COIN FUNCTION TEST - COIN E AND M LEAD TRUNKS

13.07 This operation is covered on:

- (a) SC21, crossbar coin trunk, F selector position 15, and RBT selector, positions 10, 11, and 12.
- (b) SC23, panel coin trunk, G selector position 15, and RBT selector, positions 10, 11, and 12.

13.08 The Coin Collect (CC) or Coin Return (CR) key must be operated for this test. The coin signal, a momentary off-hook followed by an MF signal, is sent to the trunk. The momentary off-hook causes the trunk to activate its dual-channel receiver to receive the MF signal. The MF signal, 700 and 1100 Hz for coin collect, or 1100 and 1700 Hz for coin return, is then connected to the TO and RO leads for approximately 410 to 460-milliseconds. The dual-channel receiver and trunk respond to the coin signal received, and the trunk connects coin potential to the TI and RI leads. The test circuit checks for the proper coin potential, and, if present, will advance the test. The test circuit in advancing removes the MF coin signal and then checks that the trunk functions to remove the coin potential.

14. COIN FUNCTION TEST - COIN TRUNKS

14.01 This operation is covered on:

- (a) SC21, crossbar coin trunk, F selector, positions 18 and 19.
- (b) SC23, panel coin trunk, G selector, positions 18 and 19.

14.02 The coin collect (CC) or coin return (CR) key must be operated for this test. The coin signal is applied to the trunk for approximately 80-milliseconds (timer 3), and the trunk coin signal detection relay is checked operated. The trunk A relay, which should hold operated through CC/CR and ONH operated and CNR released (crossbar) or reoperate from the trunk CN1 relay (panel), is checked operated and the test selector is advanced.

14.03 The trunk, upon detecting the coin control signal from the test circuit over the TO and RO leads, should apply coin battery to the TI and RI leads for at least 500-milliseconds. At the end of a 500-millisecond timed interval (timer 4), which is started when the test circuit removes the coin control signal from the outgoing end of the trunk, the coin battery that the trunk applies toward the originating line is checked. If the proper coin signal is present on the TI and RI leads, and the trunk is maintaining a low bridge forward, the test selector advances to the next position. If the proper coin signal is not present at the end of the timed interval, the test circuit blocks, activating an alarm.

15. SPECIAL TESTS

TIMED RELEASE TEST - STATION TRUNKS

15.01 This operation is covered on:

SC16, station-to-station trunks - crossbar MF, A selector, position 18; crossbar PCI, B selector, position 13; panel MF, C selector, position 16; panel PCI, D selector, position 15.

15.02 The purpose of this test is to check the ability of the trunk to function correctly on a call on which the called party disconnects and the calling party holds. The general procedure in the CAMA trunk on a service call is to time this condition for an interval and then to disconnect and signal the outgoing trunk to break down the connection.

15.03 When a timed release test is to be applied, the TMD key is operated as well as the TT key and ST key in the out-pulser identifier test circuit. The test proceeds as described in the preceding paragraphs, until the test selector reaches the position in which the timed release test is applied. The timed release test is applied after the trunk relays have been operated for the identification check. For panel and crossbar MF trunks, the SIK relay, which was checked operated during the identification check, is held operated by the SI relay in the trunk.

15.04 The TMD relay is operated, operating the MG relay. The MG relay operates the TMDA relay under control of the SIK relay. The TMDA relay operated removes the bridge across the trunk TO and RO leads

- (a) simulating called party disconnect and
- (b) releasing the CS relay in the trunk.

The TMDA relay operated provides a short across the TO and RO leads to prevent the CS relay in the trunk from chattering. For PCI trunks, the TMDA relay closes a bridge across the TI and RI leads to hold the trunk A relay operated. Ground is also removed from the CS2 lead to remove the operating path from the trunk ON relay. Relay MG locks to lead EP or to lead CT1. By this means, a check is made that the trunk ON relay has released, releasing relay MG. Relay MG now operates relay ACS to release the trunk A relay, as shown in SC16 for panel trunks. For crossbar MF trunks, the trunk A relay is released by the release of the trunk ON relay.

15.05 The release of the SIK relay checks that the trunk has completed its functions on timed release and operates the CA4 relay. The CA4 relay operated operates the AV- relay, causing the test selector to restore to normal. If a trouble occurs on timed release test, the CA4 relay remains normal and the test circuit blocks.

15.06 For crossbar PCI trunks, relay TMD1 also operates when the B selector reaches position 13. Relay TMD1 operates relay SIK, and relay TMD operates relay MG and TMDA. The TMD1 relay also locks to off-normal ground. Relay MG locks over lead CT1, and will release when the trunk times out and removes ground from lead CT1. The release of relay MG now operates relay CA4. Relay CA4 operates the AV- relay to restore the test selector to normal.

TIMED RELEASE TEST - SPECIAL TOLL AND OPERATOR ASSISTANCE TRUNKS

15.07 This operation is covered on:

- (a) SC20, crossbar special toll and operator assistance noncoin loop and E and M lead trunks, E selector, position 18.
- (b) SC22, crossbar coin loop and E and M lead trunks, F selector, position 16.
- (c) SC23, panel coin loop and E and M lead trunks, G selector, position 20.
- (d) SC24, panel special toll and operator assistance loop and E and M lead trunks, H selector, position 20.

15.08 The TMD key must be operated in order to make a timed release test. The trunk test proceeds as usual until the timed release test position is reached (some time after calling number identification). While the operate circuit for the trunk CS/E relay is removed to simulate called party disconnect, the test circuit does not release the trunk A relay, simulating a calling party who does not disconnect. The trunk S lead, which is grounded while the trunk is off-normal, is monitored. The trunk should restore to normal, removing the S lead ground and allowing the test selector to advance. If the trunk does not release, the test circuit times out (timer 1) and blocks.

15.09 The ground removal test which is usually made on panel tip party calls (TP key operated in the outpulser identifier test circuit) is canceled for a timed release test. The reason for this is that removal of the resistance ground on the T-R loop verifies that the call was originated by a tip party and the tip party identification was not caused by a trouble ground on the line. On a timed disconnect, it is assumed that the calling party is still off-hook and the resistance ground will appear on the line. This would cause a failure on the ground removal test, which is therefore canceled.

TRANSMISSION MEASURING TEST

15.10 This operation is covered on SC15. A particular circuit is selected as described in the paragraph covering particular selection. The TRMS key is operated as well as the TT key and ST key in the outpulser identifier test circuit. The test proceeds as described in the preceding paragraphs until the test selector reaches

the position in which the transmission measuring test is applied. In this position, the S1MW relay is operated, operating the trunk ON relay, if not already operated, and lighting an S1MW lamp. The S1MW relay operated also transfers the TI and RI leads of the trunk to the control of the TIM IN jack and the TO and RO leads to the control of the TM CAL jack and the transmission test circuit. Lead H is grounded to connect the 1000-Hz tone to this circuit.

15.11 With a transmission measuring set connected to the TM IN jack, a transmission test is made, using a 1-mw, 1000-Hz supply. The impedance of the measuring set should match that of the transmission line. The transmission test set may be calibrated by use of the TM CAL jack. The CA key is operated to restore the test selector to normal. The CA relay operated connects resistor TM across the TM IN jack to protect the meter from inductive surge.

ABANDONED CALL TEST

A. Abandoned Call Test - Panel Trunks

15.12 This operation is covered on:

- (a) SC13, panel MF station trunk, C selector, positions 10 through 12.
- (b) SC14, panel PCI station trunk, D selector, positions 7 through 10.
- (c) SC23, panel special toll and operator assistance coin trunk, G selector, positions 13 and 14.
- (d) SC24, panel special toll and operator assistance noncoin trunk, H selector, positions 13 and 14.

15.13 If a call is abandoned before out-pulser seizure, the panel trunk ON relay locks to itself. After a 2- to 5-second timed interval, the trunk releases and restores to normal. The operation of the AB1 key simulates an abandoned call. The sleeve lead is monitored to check that the trunk holds itself busy during the timed interval, and then the trunk is checked to ensure that it has restored to normal.

B. Abandoned Call Test - Crossbar Coin Trunks

15.14 This operation is covered on SC21, crossbar special toll and operator assistance coin trunk, F selector, positions 12 through 21 and RBT selector, positions 10 through 12. (The RBT selector is used only on E and M lead trunk tests.)

15.15 An abandoned-call before the outpulser abandonment check causes the crossbar coin trunk to lock, awaiting a coin return signal from CAMA. The AB2 key operated simulates this condition. The outpulser detects the abandoned call and releases; and the test circuit checks to see that the trunk holds itself busy, applies a coin return signal to the originating line, and then restores to normal. This test is not made on trunks arranged for temporary non-ANI operation. Contact 1B or relay NANI prevents the operation of relay AB2.

16. SPECIAL FEATURES

TIMING CIRCUITS

A. Timer TM1

16.01 When relay ST operates, it operates relay STM1 to start a 1-minute, rec-cycling timed interval. One side of capacitors TMLA and TMLB is grounded and, prior to operation of relay STM1, the other side is grounded through resistor TMLB. This serves to discharge capacitors TMLA and TMLB. Relay STM1 operated:

- (a) Removes ground from one side of the capacitor, allowing it to charge toward +135 volts through timing resistor TM1, the winding of relay ETM1, and resistor TMLC.
- (b) Connects ground to one side of potentiometer TM1, setting the cathode of tube TM1 at a predetermined voltage.
- (c) Prepares the locking circuit of relay ETM1.

16.02 Tube TM1 fires when the voltage across capacitors TMLA and TMLB reaches a value which, when added to the preset bias on the cathode, is sufficient to break down

the starter gap of the tube. The 135-volt charging potential, resistor TM1, capacitor TM1, and the preset bias are chosen to cause the tube to fire approximately 1 minute after relay STM1 operates. Relay ETM1 operates in series with the main gap of tube TM1 and locks to relay STM1. Relay ETM1

- (a) extinguishes tube TM1 with its locking ground,
- (b) operates the rotary magnet of minor switch TM1, causing it to take one step, and
- (c) operates slow-release relay TDR1 to provide a short delay, before recycling the timer, so that the timing capacitor is allowed sufficient time to discharge fully to ground.

Relay TDR1 releases STM1, which releases ETM1, which releases TDR1. When relay TDR1 has released, relay STM1 reoperates and repeats the above cycle. Whenever relay ST is released with minor switch TM1 off-normal, the release magnet of the minor switch is energized, resetting it. The purpose of potentiometer TM1 are:

- (a) to provide leakage compensation by allowing the tube to fire with a potential on its starter anode to compensate for leakage effects and
- (b) to permit the setting of an exact time interval, allowing for tolerance of gas tubes, resistors, and capacitors.

16.03 Relay TDR1 is also operated by recycle timer relay RT1. The RT1 relay is operated by the CA3 relay on each cycle of the test circuit. When relay RT1 operates, it locks through the operated off-normal contacts on minor switch TM1. Relay RT2 operated also energizes the release magnet of minor switch TM1 through operated off-normal contacts on the switch.

B. Timers TM2, TM3, and TM4

16.04 Timers TM2, TM3, and TM4 operate in the same general way as timer TM1. Each timer uses a gas-filled tube that does not conduct current until it becomes ionized. Start relay STM- operates to start the timing interval, and end relay ETM- operates to end timing. At the start of the timing interval, a voltage is impressed across the main gap (terminals 2 and 4 of TM-), but this voltage is too low to ionize the tube. At the same time, a lower voltage is impressed on the control terminal, and this voltage gradually rises as the timing capacitor charges. When the voltage reaches the critical value for the control gap, the tube will ionize and conduct current to operate the end timing relay ETM-. Using relay TM2 as an example, operation of relay STM2 at the start of the timing interval removes a short circuit from the TM2A capacitor and connects the winding of relay ETM2 from ground to terminal 4 of the TM2 tube. Current now starts to flow through the secondary winding of relay ETM2 and the capacitor charging it. Initially, the voltage across the capacitor is zero. After an interval determined by the charging voltage, capacitor TM2A, resistor TM2, and resistor TM2A (if not shorted out by relay REC), the voltage across the capacitor rises to a value sufficient to ionize the tube shorter gap. The main gap of the tube ionizes and operates relay ETM2. The time intervals for timers TM2, TM3, and TM4 are described in Section I, 3.30 through 3.32.

16.05 Timers TM3 and TM4 operate in a similar manner. These timers are equipped with potentiometers, by means of which the voltage applied to the TM- tubes may be changed in order to obtain the times specified. This feature allows the timer to be maintained within the specified units over long periods of operation or to be adjusted easily when a tube is replaced.

16.06 When the ETM- relay operates, it opens the circuit through the tube, deionizing the tube. Relays ETM2, ETM3, and ETM4 have auxiliary relays ET2A, ET2B, ET3B, and ET4A, respectively, which operate when the ETM- relay operates and provide additional contacts. In general, contacts on the ET- relays cause the test circuit to advance or block, depending upon whether or not the test being conducted is completed successfully within the timed interval.

CONTROL ADVANCE

16.07 This operation is covered on SC7. The CA feature is controlled in the outpulsor identifier test circuit by the operation of the CA key or by use of a remote control jack. Either action operates the trunk test circuit CA relay.

16.08 The CA relay operated operates the CA4 relay which causes the test circuit to release the trunk and to return to normal. The CA4 relay also operates the CA5 relay which opens the trunk tip and ring leads and the CS2 lead, preventing false operation of relays in the trunk as the test circuit restores to normal. When the key is released, the XC- relay that was locked to relay CA2 releases and the test circuit advances to the next trunk.

PASS BUSY

16.09 This operation is covered on SC3. If the PB key is operated and the BT relay operates during busy test of a trunk, the PB relay is operated. The PB relay operated operates the OK relay which causes the test circuit to advance to the next trunk. The BY lamp is lighted and the PB register is scored.

PARTICULAR CIRCUIT SELECTION

16.10 This operation is covered on SC10. In order to make particular circuit selection, it is first necessary to operate the Manual Select (MS) key. This causes the operation of select magnet 0, hold magnet 0, and relay XCO.

16.11 If only two crossbar switches are furnished, switch 0 is selected with the SWT key normal and switch 1 with the SWT key operated. If three or four crossbar switches are furnished, the second, third, and fourth switches are selected by repeated operations of the SWS key.

16.12 Selection of the desired select magnet is now made by repeated operations of the S-PCS key until the desired S- lamp lights. Selection of the hold magnet is made in a similar manner by repeated operation of the H-PCS key until the desired H- lamp lights. Selection of the XC- relay is also made in a similar manner by repeated operations of the XC-PCS key until the desired XC- lamp lights. After the trunk selection is completed, the MS key should be restored to normal and the ST and TT keys should be operated to start testing.

16.13 With the S-PCS key operated beyond select magnet S9, relay RN1 operates, releasing any of the select magnet control relays that may be operated. It will be necessary to restore the S-PCS key to release RN1; then, reoperation of the key will reactivate the circuit for select magnet selection. If the H-PCS key is operated beyond the hold magnet H9, relay RN2 operates, releasing any of the hold magnet control relays that may be operated. Restoring the H-PCS key releases relay RN2, and reoperation of the key will reactivate the circuit for hold magnet selection.

REPEAT TEST

16.14 This operation is covered on SC8. When the REP key is operated, the initial test for busy and the trunk seizure are made in the usual manner. In addition, relay STTA operates relay REP. Relay REP locks to relay ST, and subsequent busy tests are omitted. When the test is completed, register RST operates instead of relay OK.

16.15 A busy condition is maintained by the trunk sleeve so that is cannot be seized by a service call. At the end of

test, the trunk test circuit is recycled without causing the connecting circuit to function to change crosspoints. If the test circuit blocks with the REP key operated and the test circuit is advanced by means of the CA key, the CA4 and CA5 relays are operated to release the trunk circuit and return the test circuit to normal. The operation of the CA5 relay connects the SL relay to the S or S1 lead of the trunk. The SL relay operates from ground in the trunk circuit and remains operated until the trunk circuit returns to normal. The BY lamp is lighted under control of the SL relay operated until the trunk circuit returns to normal. When the CA key is released, a repeat test is made.

MONITORING ON BUSY TRUNKS - OPTION ZU

16.16 A monitoring arrangement is provided to permit a craftsman, in response to a busy time-out alarm, to monitor the T

and R leads of a busy trunk to determine if the trunk is busy in service or for some other reason. Operation of the nonlocking M Key operates the M1 and M2 relays to connect the high impedance monitoring circuit across the T and R leads on the calling party end of the trunk, through the contacts of the operated TT relay in the trunk.

17. INDEX OF DESCRIPTION OF OPERATION
PARAGRAPHS

17.01 Table I provides an index to the paragraphs in SECTION II of this circuit description which describe the operation for each position of each of the test progress switches. Also included for each switch are the class numbers of trunks tested, and the sequence chart on which detailed relay operations are shown.

TABLE I
INDEX OF SECTION II DESCRIPTION OF OPERATION PARAGRAPHS

SW. POS.	A CL1,2 SC11	B CL3,4 SC12	C CL5,6 SC13	D CL7,8 SC14	E CL9,10 SC19	F CL11,12 SC21	G CL13,14 SC23	H CL15-18 SC24	RBT CL11,12 SC21		RBT CL13,14 SC23	
									LP	EM	LP	EM
1									13.01	13.01	13.01	13.01
2	4.01	4.01	4.13	4.13	4.01	4.09	4.13	4.13	13.01	13.01	13.01	13.01
3	4.01	4.01	4.13	4.13	4.01	4.09	4.13	4.13	13.01	13.01	13.01	13.01
4	4.09	4.09	4.13	4.13	4.09	5.01	4.13	4.13	13.01	13.01	13.01	13.01
5	4.09	4.09	4.25	4.20	4.09	4.44	5.01	5.01	13.01	13.01	13.01	13.01
6	4.25	4.20	4.25	4.20	5.01	4.46	4.51 ST 4.74 OA	4.51 ST 4.74 OA	13.01	13.01	13.01	13.01
7	4.25	4.20	5.01	4.60 SI 15.12 A	4.44	4.46	4.76	4.76	13.01	BP	13.01	BP
8	5.01	7.04	4.39	4.60 15.12 A	4.31	4.31	4.83 LP BP EM	BP	13.01	BP	13.01	4.55
9	4.39	7.08	BP	4.63 15.12 A	4.39	4.34	4.85 BP EM	BP	13.01	BP	13.01	4.55
10	BP	BP	6.01 15.12 A	7.08 15.12 A	6.01	6.01	4.31	4.31	RTN	13.07	4.55	13.07
11	6.01	7.15	7.01 15.12 A	7.13	7.01	7.01	4.53	4.53	RTN	13.07	RTN	13.07
12	7.01	4.60	7.08 15.12 A	7.15	7.08 7.20	7.08	4.34	4.34	RTN	13.07	RTN	13.07
13	7.08	4.60 15.01 T	7.13	4.70	7.20	7.20	6.01 15.12 A	6.01 15.12 A	RTN	RTN	RTN	RTN
14	7.15	4.60 4.67	7.15	4.72	11.02	11.02	7.20 15.12 A	7.08 15.12 A	RTN	RTN	RTN	RTN
15	BP	4.67	4.41	4.67 14.01 T	4.79 LP 12.01 EM	13.01 13.07	4.55 R	7.13	RTN	RTN	RTN	RTN
16	BP	4.70	4.41 14.01 T	8.01 G	4.81 LP 12.01 EM	4.79 LP 15.07 T	4.55	7.15	RTN	RTN	RTN	RTN

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TABLE I (Cont)

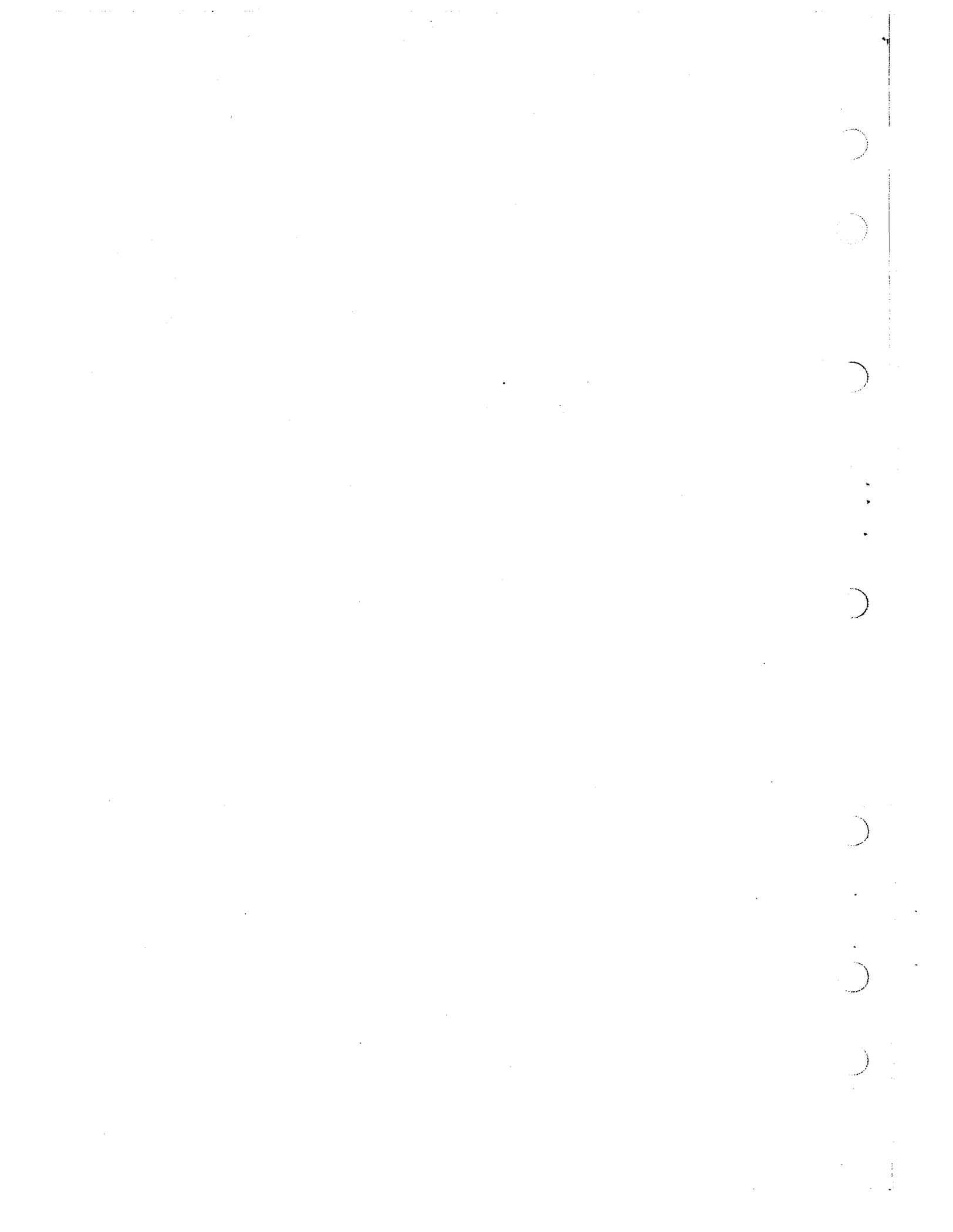
INDEX OF SECTION II DESCRIPTION OF OPERATION PARAGRAPHS

SW. POS.	A CL1,2 SC11	B CL3,4 SC12	C CL5,6 SC13	D CL7,8 SC14	E CL9,10 SC19	F CL11,12 SC21	G CL13,14 SC23	H CL15-18 SC24	RBT CL11,12 SC21		RBT CL13,14 SC23	
									LP	EM	LP	EM
17	4.41	4.72	8.01 G	4.57	4.46	4.81 LP BF EM	11.02	4.55 RC	RTN	RTN	RTN	RTN
18	4.41 15.01 T	4.57	4.57	9.02	4.46 15.07 T	14.01	14.01	4.55	RTN	RTN	RTN	RTN
19	4.57	4.57	BP	RTN	BP	14.01	14.01	8.01 G 11.02	RTN	RTN	RTN	RTN
20	10.01	9.02	10.01	RTN	10.01	10.01	10.01 15.07 T	10.01 15.07 T	RTN	RTN	RTN	RTN
21	RTN	RTN	RTN	RTN	RTN	10.01	10.01	BP	RTN	RTN	RTN	RTN
22	RTN	RTN	RTN	RTN	RTN	RTN	RTN	RTN	RTN	RTN	RTN	RTN

Notes

- A Abandoned Call Test
- G Ground Removal Test
- R See also 13.01, 13.07 (EM) and RBT Selector
- T Timed Disconnect Test
- BP Bypass
- EM E & M Lead Trunks
- LP Loop Trunks
- ST Special Toll Trunks
- OA Operator Assistance Trunks
- RC See also 4.83 (LP), 4.85 (LP), or 12.01 (EM)
- RTN Return to Normal (Position 1)
- SI See also 7.04

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SECTION III - REFERENCE DATA

1. WORKING LIMITS

- 1.01 The voltage limits assumed for tests of relays in the trunk are:
- (a) 48.5 to 50 volts for 48-volt battery.
 - (b) 133 to 135 volts for positive and negative 135-volt batteries.
- 1.02 The test circuit itself is designed to operate with 45 to 50 volts for the 48-volt battery. However, correct times for the timers and correct current for marginal tests of trunk relays will be obtained with the voltages specified above.

2. FUNCTIONAL DESIGNATIONS

2.01 Relays

<u>Designation</u>	<u>Meaning</u>
AB1	Early Abandoned Call Test, Panel Trunks
AB1A	Early Abandoned Call Test, Panel SPL T and OPR ASST Trunks
AB1K	Checks that Trunk has been Seized on Abandoned Call Test
AB2	Abandoned Call Test (Crossbar Coin)
AB2A	AB2 Auxiliary
ACS	A Trunk Change Soak Current to Release Current
AL	Alarm-Test Circuit Time-Out or Block
AO	A SPL T and OPR ASST Trunks Operate
AOP	A Trunk Operate
AOP1	A Crossbar SPL T and OPR ASST Trunks Check
AR1	ARID Auxiliary, Panel
ARCK	Automatic Return of Initial Coin Deposit Check
ARID	Automatic Return of Initial Coin Deposit Test

Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
ARLS	A Trunk Release
ASK	A Trunk Soak
AT1	A PCI Trunk release Test
AT2	A MF Trunk Release Test
AV1	Advance Test Progress Switch Crossbar MF Station Trunk Test
AV2	Advance Test Progress Switch Crossbar PCI Trunk Test
AV3	Advance Test Progress Switch Panel MF Station Trunk Test
AV4	Advance Test Progress Switch Panel PCI Trunk Test
AV5	Advance Test Progress Switch Crossbar SPL T and OPR ASST Noncoin Trunks
AV6	Advance Test Progress Switch Crossbar Coin Trunks
AV7	Advance Test Progress Switch Panel Coin Trunks
AV8	Advance Test Progress Switch Panel SPL T and OPR ASST Noncoin Trunks
BLK	Block Due to Test Failure
BLK1	Block Due to Test Failure (SPL T and OPR ASST Trunks)
BLK2	Block Due to Test Failure
BT	Busy Trunk
BT1	Busy Test of Trunk
CA, CA1-5	Call Advance
CB	Coin Battery and Timed Disconnect
CC	Coin Collect
CCK	Coin Collect Check
CK1	Check that One of the Five XC- Relays is Operated

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Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
CL1	Crossbar Station MF 2-Party Trunk Class
CL2	Crossbar Station MF (2-Party Not Used) Trunk Class
CL3	Crossbar PCI 2-Party Trunk Class
CL4	Crossbar PCI (2-Party Not Used) Trunk Class
CL5	Panel Station MF 2-Party Trunk Class
CL6	Panel Station MF (2-Party Not Used) Trunk Class
CL7	Panel PCI, 2-Party Trunk Class
CL8	Panel PCI (2-Party Not Used) Trunk Class
CL9	Crossbar Noncoin SPL T or OPR ASST 2-Party Trunk Class
CL10	Crossbar Noncoin SPL T or OPR ASST (2-Party Not Used) Trunk Class
CL11	Crossbar Coin Trunk Class
CL12	Crossbar Coin Trunk Dial-Tone-First Class
CL13	Panel Coin SPL T Trunk Class
CL14	Panel Coin OPR ASST Trunk Class
CL15	Panel Noncoin SPL T 2-Party Trunk Class
CL16	Panel Noncoin SPL T (2-Party Not Used) Trunk Class
CL17	Panel Noncoin OPR ASST 2-Party Trunk Class
CL18	Panel Noncoin OPR ASST (2-Party Not Used) Trunk Class

Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
CLMF	MF Trunk Class
CLPI	PCI Trunk Class
CLPN	Panel Trunk Class
CLX	Class Check Only One Class Relay Operated
CLXB	Crossbar Trunk Class
CN1	Checks Operation of Coin Relay in Trunk
CNK	Checks that Trunk has Applied Correct Coin Potential
CNR	Removes Coin Signal
CP,CP1	Continuity and Polarity
CR	Coin Return
CRK	Coin Return Check
CS	Checks CS Relay (Crossbar PCI Trunks) Down
CS1	CS (SPL T or OPR ASST Trunk) Operate Check
CS2	Crossbar Special Toll and Operator Assistance Trunk CS Relay Test
CS3	Panel Special Toll and Operator Assistance Trunk CS Relay Test
CSK	CS1 Trunk Check
CSK1	CS (Crossbar OPR ASST Trunk) Release Check
CSO	CS (PCI Trunk) Operate
CSR	CS (PCI Trunk), CS1 (MF Trunk) Release
CSS	CS (PCI Trunk) Negative Soak
CSSX	CSI (MF Trunk) Check Negative Soak

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Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
CTS	CS (Panel SPL T and OPR ASST Trunk) Operate
CSX	CS1 MF Trunk Operate
CT,CT2,3	CT Trunk Test
CT1	CT Trunk Operate Check
CTO	CT Trunk Operate Test
DISC	Disconnect.
DTF	Dial-Tone-First (Crossbar Coin)
E1	Release E and M Lead Trunk E or CS2 Relay
EC	End of Cycle
EMCN	E and M Lead Trunk Coin Class
EMLT,EMT,EMTS	E and M Lead Trunk Test
EMTP	Follows EMTS (Panel Trunks)
EP	EP (PCI Trunk) Operate Check
EP2	EP (PCI Trunk) Check
EPO	EP (PCI Trunk) Operate
EPT	EP (PCI Trunk) Test
ET2A	Timer 2 Auxiliary
ET2B	Timer 2 Auxiliary SPL T and OPR ASST Trunks
ET3A,B	Timer 3 Auxiliary
ET4A	Timer 4 Auxiliary
ETM1	Timer 1 - End of Overall Testing
ETM2	Timer 2 - End of Test Timing
ETM3	Timer 3 - End of Test Timing
ETM4	Timer 4 - End of Test Timing

Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
FR	Seizure of Misc Circuit for Trunk Frame
FWK,FWK1	False Wink Test E and M Lead Coin Trunks
GRT	Ground Removal Test (Panel 2-Party Trunk)
GTK	Ground Removal Test Check (Panel 2-Party Trunk)
H	Hold Magnet Operated
HA	Hold Magnet Auxiliary Operates in Reverse to H Relay
HB,HC,HCl,HD,HD1,HE,HE1,HE2,HE3	Hold Magnet Control
HBR	High Bridge Test
HEP1	CS (PCI Trunk) Hold Identification Test
HZS	Hertz Signal Connected (Coin or Ringback E and M Trunks)
HZSR	Hertz Signal Removed (Coin or Ringback E and M Trunks)
IDY	Identification Test
IOK	Identification Check
LA, LA1	Advance to Next Level of Crossbar Switch
LO	L Relay (Panel OPR ASST Trunk) Check
LOT	L Relay (Panel OPR ASST Trunk) Operate Test
LT	L Relay (Panel OPR ASST Trunk) Test
M	Monitor E and M Lead Trunk M Lead
M1,2	Monitor

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Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
MG	Marginal Test of Supervisory Relays (MF Station Trunk)
MG1	Marginal Test of Supervisory Relays (SPL T and OPR ASST Trunks)
MS	Manual Selection
NANI	ANI Features (in Trunk) Bypassed
NOT	Nonoperate Test of CN or RC (Panel SPL T or OPR ASST Trunk) Relay
OK,OK1	Test Completed Satisfactorily
ON1	Off Normal
ONCK	Check ON Trunk Relay
ONH	Simulates Calling Customer (On-Hook)
ONK	Check ON Release Time
ONR	ON Trunk Release Test
OPT	Originating Polarity Test (PCI Trunk)
OPX	Originating Polarity Test (MF Trunk)
OT	Operate Test CN or RC Relay (Panel SPL Trunk)
PB	Pass-Busy Trunk
PBK,PBK1	Positive Talk Battery Check Crossbar Coin Dial-Tone-First Class
PCN	Panel Coin Trunk Class
PNP	Panel SPL T or OPR ASST Trunk Class
PTY	Party Test (Panel Trunk)
R	Follows RD
RBT	Ringback Test (Panel SPL T and OPR ASST Trunks)

Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
RBT1,2	Ringback Test Auxiliary (Panel Noncoin SPL T and OPR ASST Trunks)
RBT3,RBT4	Ringback and Coin Function Signal, E and M Lead Trunks
RBT5	Follows RBT (Panel E and M Lead Trunks)
RC	Test of RC or CN (Crossbar SPL T or OPR ASST Trunk) Relay
RC1	Follows RC
RCE	Ringback and Coin Function Signal, E and M Lead Trunks
RCO	RC or CN (Crossbar SPL T or OPR ASST Trunk) Relay Operate Test
RD	Detects Ringing Current Applied to Calling Line
REC	Receive Registration
REP	Repeat Test
REV	Reverses Polarity to Trunk Outgoing T and R Leads
RG	Check Continuity of R Lead on Ground Removal Test by Outpulser
RK	Checks Operation of RC or CN Relay (Panel SPL T or OPR ASST Trunk)
RLCS	Remove Loop Trunk Coin Signal
RLS	Coin Trunk Release Functions (Loop Trunks)
RN,RN1,2	Return to Normal
RT1	Recycle Timer 1
RV	Reverse Winding of CP for Polarity Test (PCI Trunk)
S	Select Magnet Operated
S1MW	Send 1 Milliwatt

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Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
SB,SB1,SC SC1,SD,SD1, SC2	Select Magnet Control
SI	SI (Trunk) Test
SIK	SI (Trunk) Check Operated During Identification Check
SIK1	SI (Trunk) Check Operated During CS Operate Test
SL	S or SI Lead Check
SL1	S or SI Lead Check
SLK	Checks Sleeve (Panel SPL T Trunks)
SLK1	Follows SLK (SPL T and OPR ASST Trunks)
SO	Soak CS (Trunk) Relay
SOA	SO Auxiliary
SOAK	Checks Negative Soak, CS Trunk Relay Loop, Special Toll, or Operator Assistance Trunks
SPB	Closes Operate Path for PBK Relay (Crossbar Coin Dial- Tone-First Trunks)
SPO	SPL (Trunk) Check Operated
SR1	Slow Release - Delays Test Start
ST	Start Trunk Selection
STA	ST Auxiliary
STM1	Start Timer 1 - Overall Timing
STM2	Start Timer 2 - Test Timing
STM3	Start Timer 3 - Test Timing
STM4	Start Timer 4 - Test Timing
STT	Start Trunk Testing
STTA	STT Auxiliary
SWA,B,C,D	Counting Relays for Switch Transfer

Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
SWT,SWT1,2	Transfer From Switch 0 to Switch 1
SWT3,4	Transfer From Switch 1 to Switch 2
SWT5,6	Transfer From Switch 2 to Switch 3
TCI	Trunk Cut-In
TDR1	Time Delay Before Recycle of Timer 1
TDRA	Trunk Dual-Channel Receiver Attached
TG	Check Continuity of T Lead on Ground Removal Test by Outpulser
THLD	Check Terminating Holding (SPL T and OPR ASST Trunk)
TM	TM (PCI Trunk) Check Operated
TMD	Timed Disconnect Test
TMD1	Timed Disconnect Test Auxiliary
TMD2	Timed Disconnect Test Auxiliary (Panel OPR ASST and SPL T Trunks)
TMDA	TMD Auxiliary
TP	Simulate Calling Tip Party (Crossbar Trunk)
TPK	TP Trunk Check Operated
TPK1	TP (Crossbar Trunk) Low Resistance Path Check
TPO	TP (Crossbar Trunk) Operate
TPT	Tip Party Test
TRMS	Transmission Measuring Test
TTO	Trunk Time-Out
UT	Unequipped Terminal
VAR	Varistor Test (Panel Trunk)
WK,WK1	CS (MF Trunk) Wink Feature
X	Trouble Cross in Connecting Circuit

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Relays (Cont)

<u>Designation</u>	<u>Meaning</u>
XBCN	Crossbar Coin Trunk Class
XBP	Crossbar SPL T or OPR ASST Trunk Class
XBPI	Auxiliary for XBP
XCO-4	Crossbar Switch Contact
XTT	Trouble Cross in Crossbar Switch Contacts

2.02 Keys

<u>Designation</u>	<u>Meaning</u>
AB1	Early Abandoned Call Test- Panel Trunks
AB2	Early Abandoned Call Test- Crossbar Coin Trunks
ACO	Alarm Cutoff
ARID	Automatic Return of Initial Coin Deposit Test
CC	Coin Collect
CR	Coin Return
H-PCS	Hold Magnet - Particular Circuit Stepping
M	Monitor
MS	Manual Selection
PB	Pass Busy Trunk
REP	Repeat Test
S-PCS	Select Magnet - Particular Circuit Stepping
SWS	Crossbar Switch - Particular Circuit Stepping
SWT	Switch Test Circuit to Second Crossbar Switch
TMD	Timed Disconnect Test
TRMS	Transmission Measuring Test
XC-PCS	Crossbar Switch Contact - Particular Circuit Stepping

2.03 Progress Lamps

<u>Designation</u>	<u>Meaning</u>
A	A Relay (SPL T and OPR ASST Trunks) Operate Test
AB2	Abandoned Call Test - Crossbar Coin Trunks
AOP	A (Station Trunk) Operate Test
ARCK	Automatic Return of Initial Coin Deposit Check
ARID	Automatic Return of Initial Coin Deposit Test
ARLS	A Trunk Release Test
BY	Trunk Selected is Busy
CL1	Crossbar Station MF, 2-Party Trunk Class
CL2	Crossbar Station MF, (2-Party Not Used) Trunk Class
CL3	Crossbar PCI, 2-Party Trunk Class
CL4	Crossbar PCI, (2-Party Not Used) Trunk Class
CL5	Panel Station MF, 2-Party Trunk Class
CL6	Panel Station MF, (2-Party Not Used) Trunk Class
CL7	Panel PCI, 2-Party Trunk Class
CL8	Panel PCI (2-Party Not Used) Trunk Class
CL9	Crossbar Noncoin SPL T or OPR ASST 2-Party Trunk Class
CL10	Crossbar Noncoin (SPL T or OPR ASST 2-Party Not Used) Trunk Class
CL11	Crossbar Coin Trunk Class
CL12	Crossbar Coin Trunk Dial-Tone-First Class
CL13	Panel Coin SPL T Trunk Class

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Progress Lamps (Cont)

<u>Designation</u>	<u>Meaning</u>
CL14	Panel Coin OPR ASST Trunk Class
CL15	Panel Noncoin SPL T 2-Party Used Trunk Class
CL16	Panel Noncoin SPL T (2-Party Not Used) Trunk Class
CL17	Panel Noncoin OPR ASST 2-Party Used Trunk Class
CL18	Panel Noncoin OPR ASST (2-Party Not Used Trunk) Class
CLX	Check One, and Only One, Class Relay Operated
CN	CN Trunk Test
CN1	CN1 (Coin Trunk) Check
CNK	Coin Function Check
CNT	Coin Function Test - Panel Trunk
COIN	Coin Function Test - Crossbar Trunk
CPC	Coin Potential Connected
CPK	Originating Continuity and Polarity Check
CSO	CS Trunk Check Operated
CSR	CS (PCI Trunk) Release Test
CT2	CT2 Operated on CT Trunk Test
CTNO	CT Trunk Nonoperate Test
CTO	OT Trunk Operate Test
EC	End of Cycle
EMLT	E and M Lead Trunk Test
EO	E Relay Operate Test
EPNO	EP (PCI Trunk) Nonoperate Test
EPO	EP (PCI Trunk) Operate Test
ER	E Relay Release Test
GRT	Ground Removal Test (Panel Trunk)
HO-9	Hold Magnet Operated
HBR	High Bridge Test

Progress Lamps (Cont)

<u>Designation</u>	<u>Meaning</u>
IDY	Check Identification
L	L Relay (Panel OPR ASST Trunk) Check
LT	L Relay (Panel OPR ASST Trunk) Test
MS	MS Key Operated
N	RN Key Operated
NANI	ANI Features (in Trunks) Bypassed
NOT	Nonoperate Test (SPL T and OPR ASST Trunk Relays)
ONR	ON Trunk Release Test
OPT	Originating Polarity Test
OT	Operate Test of Marginal Relays in SPL T or OPR ASST Trunk
PB	Positive Talk Battery Check
PTY	Party Test
RBT	Ringback Test
RC	RC (SPL T and OPR ASST Trunk) Relay Test
RV	Check Reversal
SO-9	Select Magnet Operated
S1MW	S1MW Relay Operated on Transmission Test
SI	SI Trunk Relay Test
SL1	SL1 Relay Operated
SLK	SLK Relay Operated
SOAK	A Relay Trunk Soak
SP1	SP1 Relay Trunk Checked Operated
SWO	Trunks on First Crossbar Switch are being Tested
SW1 or SWT	Trunks on Second Crossbar Switch are being Tested
SW2	Trunks on Third Crossbar Switch are being Tested
SW3	Trunks on Fourth Crossbar Switch are being Tested

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Progress Lamps (Cont)

<u>Designation</u>	<u>Meaning</u>
TCP	Through Continuity and Polarity Test
THLD	Terminating Holding Test
TPK	TP (Crossbar Noncoin Trunk) Check Operated
TPK1	TP (Crossbar Noncoin Trunk) Low Resistance Path Check
TPNO	TP Relay (Crossbar Noncoin Trunk) Nonoperate Test
TPO	TP Relay (Crossbar Noncoin Trunk) Operate Test
VAR	Varistor (Panel Trunk) Test
WK	Wink Test (MF Trunk)
WO	Winkoff Test
X	Select Magnet of Hold Magnet Operated Falsely
XCO-4	Crossbar Switch Contact Closed

Trouble Lamps (Cont)

<u>Lamps Lighted When Test Circuit Blocks</u> (Cont)	<u>Trouble Encountered</u>
IF	Identification Failure
ONF	ON Trunk Fails on Release Test
RBF	Ringback Failure
RBRF	Ringback Release Failure
RCF	RC (Crossbar SPL T or OPR ASST Trunk) Relay Failure
SIF	SI Trunk Fails to Operate
THDF	Terminating Holding Failure (Crossbar SPL T or OPR ASST Trunk)
TP1F	Party Test Failure (Panel Noncoin Trunks)
TPF	RP (Crossbar Noncoin Trunk) Fails on Nonoperate or Operate Test
TRLF	Trunk Fails on Timed Release Test
TTO	Trouble Time-Out Due to Failure of Outpulser on Identification Test
XTT	Cross in TT- Leads of Trunks

2.04 Trouble Lamps

<u>Lamps Lighted When Test Circuit Blocks</u>	<u>Trouble Encountered</u>
AF	A Trunk Fails on Release Test
AL	Alarm
ARF	Automatic Return of Initial Coin Deposit Failure
BLK	Test Circuit Blocks
CNFF	Coin Function Failure (Crossbar Coin Trunk)
CSP	CS Trunk Fails on Operate Test
CTF	CT Trunk Fails on Operate or Release Test
EF	CS2 or E (E and M Trunk) Fails to Operate
EPP	EP (PCI Trunk) Fails on Operate or Release Test
FWKF	E and M Lead Trunk Fails to Return to Talking Condition Following a False Wink
HBF	High Bridge Failure

3. FUNCTIONS

- 3.01 To connect to a trunk.
- 3.02 To make busy test on a trunk.
- 3.03 To test for ground on S lead of panel trunk.
- 3.04 To test for ground on S1 lead of crossbar trunk.
- 3.05 To apply a series of tests to a group of trunks on an automatic trunk progression basis.
- 3.06 To apply a series of tests to the trunk supervisory relays.
- 3.07 To select a particular trunk by operation of keys.
- 3.08 To allow transmission tests to be made.
- 3.09 To apply continuity and polarity tests.
- 3.10 To make repeated tests on the same trunk when the REP key is operated.

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- 3.11 To advance to the next trunk when the control advance feature is activated in the outpulser identifier test circuit.
- 3.12 With PB key operated, to pass by busy trunks; with PB key normal, to time out and bring in an alarm if a trunk tests busy for a period of 2 minutes and (with option ZF omitted) to automatically retire the alarm and to proceed with trunk testing if the trunk that produced the alarm becomes idle before the alarm is retired manually.
- 3.13 To allow a timed release test to be applied to a group of trunks on an automatic trunk progression basis.
- 3.14 To time out and bring in an alarm if the test is not completed in 3 minutes.
- 3.15 To bring in an alarm immediately if certain troubles are encountered on the test call.
- 3.16 To light lamps to indicate the position of the trunk on the test connector switch, the progress of the test call, and certain types of trouble.
- 3.17 To silence the audible alarm by operation of the ACO key.
- 3.18 To score the CT register each time a new trunk is seized and tested.
- 3.19 To record on the REST register the number of repeat tests made.
- 3.20 To record on the PB register the number of busy trunks passed when the PB key is operated.
- 3.21 The pass terminals on the crossbar switch that are not cross-connected to trunks.
- 3.22 To light the End of Cycle (EC) lamp and to sound a minor alarm after all trunks have been tested.
- 3.23 To test coin control features on coin trunks.
- 3.24 To test ringback features on special toll and operator assistance trunks.
- 3.25 To test the ability of special toll and operator assistance trunks to be held by CAMA regardless of the condition of the originating customer switchhook.
- 3.26 When option ZF is provided, to check that panel MF trunks release properly on an abandoned call prior to seizure of the outpulser.
- 3.27 When option ZD is provided, to maintain a continuous check on the condition of the S or S1 lead of the trunk after cut-through.
- 3.28 To check that crossbar coin trunks release properly, applying the proper coin return signal to the originating line or an abandoned call before outpulser seizure.
- 3.29 With option ZU, to provide an arrangement to monitor on busy trunks.
- 3.30 To check that crossbar coin trunks that are equipped for operation with dial-tone-first coin station sets connect +48 Volt talking battery toward the calling station.
4. CONNECTING CIRCUITS
- 4.01 When this information is listed on a keysheet, the connecting information thereon is to be followed:
- (a) Panel OGT Circuit, MF Pulsing, ANI - SD-21972-01.
 - (b) Panel OGT Circuit, PCI Pulsing, ANI - SD-21974-01.
 - (c) Panel OGT Circuit, MF Pulsing, Special Toll or Operator Assistance, ANI, Coin - SD-21981-01.
 - (d) Panel OGT Circuit, MF Pulsing, Special Toll or Operator Assistance, ANI, Noncoin - SD-21982-01.
 - (e) Crossbar No. 1 OGT Circuit, MF Pulsing, ANI - SD-26209-01.
 - (f) Crossbar No. 1 OGT Circuit, PCI Pulsing, ANI - SD-26210-01.
 - (g) Crossbar No. 1 OGT Circuit, MF Pulsing, Special Toll or Operator Assistance, Noncoin ANI - SD-27554-01.
 - (h) Crossbar No. 1 OGT Circuit, MF Pulsing, Special Toll or Operator Assistance, Coin, ANI - SD-27555-01.
 - (i) Panel Miscellaneous Alarm Circuit for Link Type Offices - ES-20241-0101.

(j) Panel Floor Alarm Board, Miscellaneous and Auxiliary Alarm Circuit - SD-21203-01.

(k) Panel Audible Alarm Circuit for Floor Alarm Board - SD-21819-01.

(l) Crossbar No. 1 or Tandem, Aisle Pilot Circuit - SD-25087-01.

(m) Common Systems - Test Line or Test Trunk Circuit - SD-98100-01.

(n) Common Systems - Identifier Test Circuit, ANI - SD-95815-01.

(o) Common Systems - Miscellaneous Circuit for ANI trunk Frame - SD-95821-01.

(p) Crossbar No. 1 OGT Circuit, MF Pulsing, ANI, Operator Assistance or Special Toll, Noncoin - High-Low or E and M Supervision - SD-27813-01.

(q) Crossbar No. 1 OGT Circuit, MF Pulsing, ANI, Operator Assistance or Special Toll, Coin High-Low or E and M Supervision - SD-27814-01.

(r) Panel OGT Circuit, ANI Type B, MF Pulsing, Special Toll and Station Toll or Operator Assistance, Coin, E and M Lead Signaling - SD-21991-01.

(s) Panel OGT, MF Pulsing, ANI Type B, Special Toll or Operator Assistance, Noncoin, Loop or E and M Lead Signaling - SD-21992-01.

(t) MF Signal Generator Circuit - SD-95867-01.

(u) MF Current Supply and Distribution Circuit - SD-95391-01.

5. MANUFACTURING TESTING REQUIREMENTS

GENERAL

5.01 The automatic trunk test circuit shall be capable of performing all the functions specified in this circuit description and meeting all the requirements of the Circuit Requirements Table and also shall be capable of functioning under test conditions listed below.

VOLTAGE LIMITS

5.02 All timing and operation tests shall be performed with the test voltages within the following limits.

	<u>Minimum Voltage</u>	<u>Maximum Voltage</u>
-48 volt battery	-48.5	-50
+135 volt battery	133	135

6. ALARM INFORMATION

TROUBLE ALARM

A. Conditions

6.01 Certain troubles encountered by the test circuit will immediately cause an alarm. Other troubles encountered by test circuit will not cause an immediate alarm but will block the test circuit and result in a 3-minute time-out, after which an alarm will be brought in.

B. Indications

6.02 The indications given on a test failure include a minor audible and visual alarm. In addition, certain trouble analysis lamps, progress lamps, and location lamps will be lighted on the test frame. Interpretation of the significance of these lamps is described in 2.03 and 2.04.

C. Action Required

6.03 The Alarm Cutoff (ACO) key may be operated to retire the audible and visual alarm. The particular trunk being tested may be found by the location lamps. The progress of the test may be determined by the trouble analysis and progress lamps, providing a basis from which the trouble may be found.

BUSY TEST ALARM

A. Conditions

6.04 If the test circuit encounters a busy trunk, the BY lamp will light. With the PB key normal, if the trunk remains busy for a period of 2 minutes, the test circuit will bring in an alarm. With option ZT omitted, if the trunk becomes idle before action is taken on the alarm, the alarm is

retired, the BY lamp is extinguished, and the test circuit proceeds to test the trunk. Where option ZT has not been omitted and the trunk becomes idle, the BY lamp is extinguished, but the test circuit does not advance.

B. Indications

6.05 The indications given on a busy test alarm include a minor audible and visual floor alarm.

C. Action Required

6.06 The alarm cutoff (ACO) key may be operated to retire the audible and visual alarms. The CA feature in the outpulser identifier test circuit may be activated to step to the next trunk, or the REP key may be operated and then the CA feature activated to make another busy test on the same trunk.

SECTION IV - REASONS FOR REISSUE

B. Changes in Apparatus

B.1 Added

D13 Diode, 446F, Option XO, Fig. 8

B.2 Removed

D4 Diode, 446F, Option YH, Fig. 16

C. Changes in Circuit Requirements Other Than Those Caused by Changes in Apparatus

C.1 When App Fig. 14 is furnished the time interval of timer 3 is increased when the CB relay is operated. No timing requirement is shown for this condition. A timing requirement of 230 to 255-milliseconds is added on this issue.

D. Description of Changes

D.01

(a) During tests of crossbar and panel coin and noncoin trunks arranged for E and M lead signaling the MF receiver may fail to receive the calling number. This is because contact 1B of relay M opens the tip lead to the MF receiver during the time that the outpulser is outpulsing the calling number. (The M relay contact was added on Issue 18A to open a shunt path that prevented the trunk A relay from reoperating at the end of the outpulser abandoned call test.) The tip lead is reclosed by adding contact 12M of relay AO in parallel with contact 1B of relay M.

(b) The option currently assigned to the above contact of relay M is YH as an alternate to option YY. These options apply to crossbar special toll trunks only, and leave the tip lead open for other conditions. Continuity must be provided on this lead for all classes of trunks. Therefore option YH is changed to option 16, which applies to both panel and crossbar E and M lead signaling trunks, and option YY is changed to option XC which applies when option 16 is not required.

D.02 Tests of crossbar and panel coin trunks arranged for E and M lead signaling fail in position 12 of the RBT selector. This is because the operation of relay CNR operates relay ET4A before relay CNK can operate. This causes relay BLK2 to operate and block the test. This is corrected by removing the lead from 11M of relay EMCN to the upper winding terminal of relay ET4A.

D.03 On tests of crossbar and panel coin trunks arranged for E and M lead signaling a change was made on Issue 18A to operate the CNK relay immediately upon recognition of the coin potential in the test circuit (relay CCK or CRK operated). This defeats the purpose of the test, which is to insure that the coin potential is present for at least 500-milliseconds. This condition is corrected by reinserting a contact of relay ET4A in the operating path for relay CNK for all conditions.

D.04 On tests of crossbar and panel coin trunks arranged for loop signaling the circuit will not light the CNFF lamp if no coin potential is detected in the test circuit. The lamp will light only if the wrong potential is detected. This condition is corrected by changing the operate path for the BLK1 relay to operate from timer 1 (ETM1 relay) through relay RLS 1M instead of through break contacts of relays CC and CR.

D.05 On tests of panel coin trunks arranged for loop signaling where the test frame is arranged to test both panel and crossbar E and M lead coin trunks, the G selector will advance from position 18 with relay AO either operated or released when relays CB and CNR are operated. The test selector should advance only if relay AO is operated to check that the trunk A relay reoperates during the coin cycle. This is corrected by rearranging the wiring associated with contacts 11B and 11M of relay AO.

D.06 On the abandoned call test of crossbar coin trunks arranged for E and M lead signaling the test blocks at position 10 of the RBT selector. This is because relay RLCS is not operated in order to permit relay RBT3 to operate. This condition is corrected by providing an operate path for relay RLCS through added contact 3M of relay AB2A from ground through contact 6M of relay EMTS.

D.07 On the abandoned call test of crossbar coin trunks arranged for E and M lead signaling the test blocks in position 21 of the F selector. This is because the release of relays EMLT and EMT reestablish paths in the test circuit which allow the trunk A relay to reoperate. This condition is corrected by releasing relay EMLT in position 22 of the F selector instead of position 21. This change removes the need for diode D4 which is removed.

D.08 When both panel and crossbar options are furnished for testing coin special toll trunks arranged for E and M lead signaling, a path exists for holding relay RBT4 operated on a crossbar trunk test when it should release. This condition is corrected by adding contact 3M of relay CLPN to panel trunk test option YR.

D.09 When testing crossbar special toll trunks for ringback or coin disposal (F selector, position 15) if the trunk should release, relay SLK1 will release and relay BLK1 should operate. Relay BLK1 cannot operate if the circuit is arranged to test only crossbar trunks because the circuit is open at contact 8B of relay AB1A, which is furnished only when panel trunks are tested. This condition is corrected by providing a bypass of this contact when relay AB1A is not provided.

D.10 The timed disconnect test for crossbar coin special toll or operation assistance trunks arranged for E and M lead signaling fails in position 18 of the F selector. This is because the E and M lead trunk test is arranged to bypass position 18, thus not providing an operate path for the TMD relay. This condition is corrected by relocating the timed disconnect test to position 16 of the F selector and eliminating the timed delay in the operating path of the TMT relay. This also removes the need for contact 3B of relay TMD since the F selector now bypasses position 18.

D.11 Tests of panel noncoin special toll or operator assistance trunks per SD-21992-01, when arranged for 2-party service, fail in position 19 of the H selector while making a ground removal test of a call simulating the tip party of a 2-party line. The failure is caused by a momentary open of contact 8 of the trunk circuit ON relay when this relay reoperates after trunk relay TP releases. This momentary open releases relay SLK in the test circuit and blocks the test. This condition is corrected in the test circuit by adding a diode, D13, across the winding of relay SLK under control of relay GRT and relays CL15 or CL17. Since this diode is required only when panel trunks per SD-21992-01 arranged for 2-party service are tested, the diode and associated wiring are designated option X0. Reference to option X0 is added to Note 102 and Note 122 is added.

D.12 The following items correct drawing errors, and bring the SD into agreement with the T-drawings:

- (a) Option H was inadvertently omitted on Issue 18A at contact 10M of relay WK on sheet B8.
- (b) Contact 5B of relay BLK on sheet B25 should have been removed on Issue 15AR. It is removed on this issue.
- (c) When the RC1 relay coil was relocated on sheet B25 on Issue 18A it was designated RC. It is correctly designated RC1 on this issue.
- (d) Contacts 2M of relay ACS and 6M of relay ARLS are shown twice. The appearance on sheet B18 is removed.
- (e) Four errors were introduced when sheet B8 was redrawn on Issue 16D:

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(1) Contact 5M of relay CSO is reinserted between contact 4B of relay SOA and contact 5M of relay SIK1.

(2) Contact 4F of relay HBR should connect to contact 8B of relay WK instead of to options XC or 16.

(3) Resistance lamp HV connects to +130 volt battery designated A.

(4) Resistance CS7 connects to N battery, not Z battery.

Note: This reissue also covers information relating to Appendix 1B - Dwg Issue 20B.

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