TRANSMISSION TESTS
USING NO. 12A, OR NO. 20A, TRANSMISSION MEASURING SET
STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section describes methods of making transmission tests in step-by-step offices by means of the test line circuit for one-way transmission testing supplying the standard testing power of 1 milliwatt at 1000 cycles, or equivalent portable testing power supply, and the No. 12A, or No. 20A (SD-91016-01), transmission measuring set.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 The tests covered are:

(A) Local Connectors - Offices Equipped With Transmission Test Line Circuit SD-32021-01 Fig. 3, or Connector Test Line Circuit SD-31719-01 Fig. D

(B) Local Connectors - Offices Not Equipped With Transmission Test Line Circuit SD-32021-01 Fig. 3, or Connector Test Line Circuit SD-31719-01 Fig. D

(C) Toll Transmission Selectors

(D) Outgoing Repeaters and Associated Interoffice Trunks

(E) Subscriber Recording Completing Trunks

(F) Message Rate Trunks

(G) Local Coin Trunks

(H) Intercepting Trunks

(I) Trunks With Message Ticketer

(J) Interoffice Trunks From Message Ticketer Equipment

(K) Trunks To a P.B.X From Selector Multiple With Connector Multiple

(L) Outgoing Trunks From DSA Switchboard

(M) Cord Circuits - DSA Switchboard

(N) Operator's Telephone Circuits - DSA Switchboard

1.04 The information previously shown in the Addendum, Issue 1, covering transmission test requirements for circuits in which 120CS, DS, ES, etc., repeating coils have been furnished in place of the 120C, D, E, etc., coils and where the circuit drawings have not been reissued to cover the new coils is now included as Part 5 of this section.

1.05 The transmission test requirements for most circuits are shown on the circuit drawings. Where the requirements are not shown on the drawings, or when testing circuits in which D-specification repeating coils have been replaced by low loss 120-type repeating coils and the circuit drawings have not been reissued to include the transmission test requirements for the 120-type coils, the transmission requirements for the new coils should be furnished locally by the transmission group in accordance with local procedures. The 120-type coils are not connected into the circuits in the same manner as the D-specification coils with respect to the winding terminal numbers. If the 120-type coils are connected in the same manner as the D-specification coils when replacing coils in existing circuits, excessive transmission losses will occur. Where the circuit drawings have not been reissued to include the proper connecting information for the 120-type coils, the necessary information should be obtained locally from the transmission group.

1.06 A record should be made of those circuits which show greater than the maximum allowable circuit loss. No record need be made of those circuits meeting the requirements.

1.07 Frequently the tests outlined in this section involve several circuits in the testing train, one or more having its individual allowable losses. In such cases the overall loss readings are made on a comparative basis for a similar group of circuits. As for example, if testing interoffice trunks, a trouble on any particular trunk will generally be indicated by the loss on that trunk departing substantially from the loss of the remaining trunks in the group. In the case of interoffice trunks, the 1000-cycle losses for the trunks being tested should be furnished locally.

1.08 Tests (A) and (B) for connectors are based on the use of connector test lines of the type that have no connected apparatus which would cause a transmission loss. In case the test line is of the type that causes a loss the test line circuit for one-way transmission testing, or portable testing power supply, and the measuring set should both be connected to the connector test line and its loss determined. When the loss through the connector is read on the meter in accordance with Test (A), or (B), the loss due to the connector test line must be deducted from the reading to obtain the loss of the connector.

1.09 In some instances in determining an individual circuit loss it may be necessary to consider the loss due to cabling, wiring, etc. between the circuit under test and the 1 milliwatt sending appearance (point at which the measuring set has been calibrated). This may be accomplished by connecting the measuring set to the testing circuit at a point which includes all cabling and wiring except the individual circuit under test and reading the loss on the meter from this point, which should be deducted from the over-all circuit loss.

1.10 These tests, when conducted on a routine basis, should preferably be made during periods of light traffic to avoid interfering with service and to facilitate testing. When performing Test (K) the P.B.X. attendant should be notified that the trunk will be temporarily out of service for the test. When the test is completed advise the P.B.X. attendant that the trunk has been restored to service.

2. APPARATUS

All Tests

2.01 No. 12A Transmission Measuring Set, or No. 20A Transmission Measuring Set J94020A (SD-91016-01).

2.02 One P3F Cord equipped with a No. 309 Plug and a No. 310 Plug (3P12H). (Required when calibrating the transmission measuring set at the switchboard or at the message ticketer trunk test frame.)

2.03 Two W3A Cords, each equipped with a No. 310 Plug, three No. 59 Cord Tips and three No. 108 Cord Tips (3W3A). (Required when calibrating the transmission measuring set at the distributing frame.)

Tests (A), (B), (C), (D), (E), (F), (H), (I), (J) and (K)

2.04 D-81763 Dial Hand Test Set, or equivalent, equipped with a D-96823 Slider.

2.05 One P3C Cord equipped with a No. 310 Plug and a No. 240A Plug (3P2A).

Tests (A) and (K)

2.06 Special Patching Cord wired and equipped in accordance with Fig. 1 made up locally. (For Test (A), required only in offices equipped with transmission test line circuit SD-32021-01. For Test (K), required only where the trunk apparatus is located on the connector frame and the transmission test line circuit SD-32021-01 is not provided.)

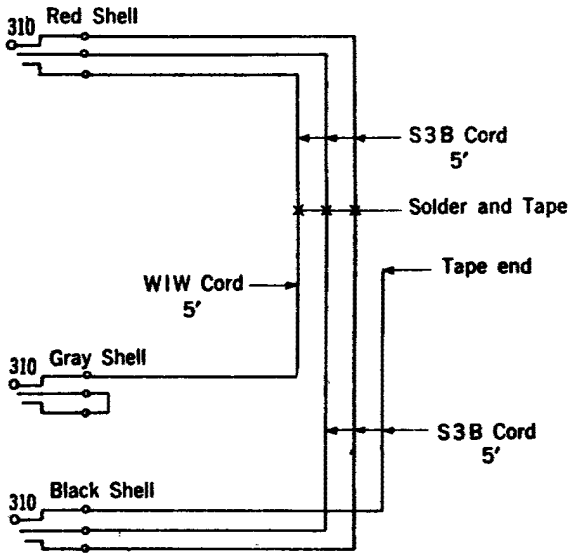

Fig. 1

Tests (A) and (B)

2.07 One No. 893 Cord equipped with two No. 360A Tools (1W13B) and two No. 365 Tools. (Required only when testing level hunting connector test line terminal number 11.)

Tests (A), (I) and (J)

2.08 One No. 258 Plug. (In Test (A), required only when testing level hunting connectors with connector test line circuit SD-31719-01.)

Test (B)

2.09 One No. 310 Plug with ring and sleeve strapped. (Required for other than level hunting connectors when office is equipped with connector test line jacks No. 3 and No. 4.)

2.10 No. 32C Test Set. (Required only when testing level hunting connectors in offices equipped with connector test line jacks No. 3 and No. 4.)

2.11 One W1W Cord equipped with a No. 310 Plug, a No. 59 Cord Tip and a No. 108 Cord Tip (1W11A). (Required only in offices not equipped with connector test line jacks No. 3 and No. 4.)

Tests (E) and (H)

2.12 KS-6320 Orange Stick.

Tests (G) and (H)

2.13 Test set and apparatus normally used for operation tests of the trunks as listed in the appropriate section. (For Test (H), this apparatus is only required when testing from the toll transmission selector, or the toll preceding selector in repeated dialing toll trains.)

Tests (G), (H) and (K)

2.14 Two P3E Cords, each equipped with two No. 310 Plugs (3P7A). (Only one cord is required for Tests (H) and (K).)

Test (H)

2.15 No. 258 Plugs, as required - (trunk finder make-busy).

2.16 No. 477A (or No. 375A) Make-Busy Tools, as required.

Test (I)

2.17 One P2B Cord equipped with two No. 310 Plugs (2P4C).

Tests (I) and (J)

2.18 One No. 184 Plug with ring and sleeve strapped.

Test (K)

2.19 One W3A Cord equipped with a No. 310 Plug, three No. 59 Cord Tips and three No. 108 Cord Tips (3W3A). One of the cords listed in 2.03 may be used. (Required only when the trunk apparatus is located on the relay rack.)

Tests (H) and (L)

2.20 Operator's Telephone Set. (For Test (H), only required when testing from toll switchboard.)

Tests (L), (M) and (N)

2.21 One P3F Cord equipped with a No. 309 Plug and a No. 310 Plug (3P12H). The same apparatus as covered in 2.02 may be used.

Test (M)

2.22 H Cabinet Screwdriver.

Test (N)

2.23 No. 82A test set or No. 220 plug.

3. USE OF TRANSMISSION MEASURING SET

3.01 The transmission measuring set should be located in a horizontal position.

3.02 The accuracy limits of the measuring sets vary according to the portion of the meter scale being used to obtain readings. It may be necessary to consider extra tolerance when measuring losses over 15 db if using the No. 12A set, or over 20 db if using the No. 20A set, necessitating readings on the meter scale above the 5 db range. The accuracy limits for each portion of the scale are given in sections covering a description of the measuring sets.

3.03 The scale readings of the No. 12A or No. 20A transmission measuring sets should be obtained within the 0 to 5 db range, if possible. If the reading is more than 5 db, operate the pad keys as necessary to bring the needle into the lower range. The value indicated by the designation of the operated key should be added to the meter reading to obtain the measured loss in the circuit.

3.04 Either set should be calibrated each time before starting a series of tests as described below. The readings of the meter change due to changes in temperature of the copper oxide rectifier. Therefore, the set should be calibrated frequently during the first hour of its use, or until it reaches a stable condition, after exposure to higher or lower temperatures than the temperature of the room in which it is to be used.

No. 12A Transmission Measuring Set

Method of Calibrating

3.05 Calibrating at Switchboard: - Insert the plug of an idle position cord circuit into the DIAL jack of the test set and leave the DIAL key of the test set normal. This provides the required sleeve condition. With a P3F cord, connect the MEAS jack of the test set to the switchboard jack of the test line circuit for one-way transmission testing, or other 1 milliwatt supply jack.

3.06 Calibrating at the distributing frame: - Connect the MEAS jack of the test set to the T, R, and S terminals of the test line circuit for one-way transmission testing (trunk unit) by means of a W3A cord. Insert the plug of another W3A cord into the DIAL jack of the test set and connect the No. 59 cord tip associated with the ring of this cord to a resistance battery (ring of a spare subscriber line relay circuit) and the No. 59 cord tip associated with sleeve of this cord to ground. Operate the DIAL key for approximately 1 second and then restore this key to normal to start the 1 milliwatt machine.

Note: If the cord test line unit is provided, it will not be necessary to connect the ring of the W3A cord to resistance battery or to operate and restore the DIAL key. In this case the

W3A cord associated with the MEAS jack should be connected to the T, R and S terminals of the cord unit test line circuit. If a portable testing power supply is used it will only be necessary to connect the T and R of the MEAS jack to the output terminals of the machine, and no connection is made to the DIAL jack.

3.07 Calibrating at the message ticketer trunk test frame: - Connect the MEAS jack of the transmission measuring set to the frame line jack D of the message ticketer trunk test circuit. Operate the SEND 1MW key at the trunk test frame.

3.08 With all keys of the transmission measuring set normal, adjust the CAL rheostat, if necessary, with a small screwdriver until the meter reads 0 on the black scale.

No. 20A Transmission Measuring Set

3.09 Strap binding posts SM and SD together.

3.10 The No. 20A transmission measuring set requires power for the vacuum tubes contained in the set. Connect the set with the cord furnished to 60-cycle power if available, or if not available, connect A and B battery to the binding posts as shown on the circuit label (or SD-91016-01). In either case, connect ground to the -BG post.

Method of Calibrating

3.11 Proceed as in 3.05, 3.06 or 3.07.

3.12 With both keys of the set normal, operate the CAL key.

3.13 If the meter does not read 5 db adjust the CAL rheostat with a small screwdriver, until a reading of 5 db is shown on the meter.

3.14 Operate the 5 key (the CAL key remaining operated) and adjust the SCALE ADJ rheostat until the meter reads 0 db. (A slight overadjustment so that the needle moves beyond zero will reduce the number of repetitions of this correction.)

3.15 Repeat 3.12 to 3.14 until the meter reading is correct at both points. Restore the CAL key to normal.

4. METHOD

(A) Local Connectors - Offices Equipped With Transmission Test Line Circuit SD-32021-01 Fig. 3, or Connector Test Line Circuit SD-31719-01 Fig. D

4.01 At the relay rack, operate the 3-way key to the TRANS position if using circuit SD-32021-01 or the TRS key if using circuit SD-31719-01.

Note: If a portable transmission testing power supply is to be used in offices equipped with circuit SD-31719-01, connect the T and R terminals associated with the make contacts of the TRS key to the portable testing supply at the line distributing frame.

4.02 At the connector frame, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.03 If using test line SD-32021-01, insert the BLACK shelled plug of the special patching cord, Fig. 1, into jack No. 3 of the connector test line and, if testing other than level hunting connectors, insert the GRAY shelled plug into jack No. 4 of the connector test line. Insert the RED shelled plug of this cord into the PS and T jack.

Regular and Rotary Hunting Connectors

4.04 If the connector is normal, insert the No. 240A plug into the test jack of the connector.

Note: If testing combination connectors, insert the plug into the local test jack.

4.05 Other than ten-party terminal-per-line connectors: - Operate the DIAL key and dial the connector test line number (99). Restore the DIAL key to normal. Observe that the connector stops on the test line terminal.

4.06 Ten-party terminal-per-line connectors: - Operate the DIAL key and dial the connector test line number and a ringing digit (991). Restore the DIAL key to normal. Observe that the connector stops on the test line terminal. Trip the ringing by momentarily short-circuiting the T and R wiper terminals at the connector test jack by means of a small screwdriver.

Caution: To avoid personal contact with the ringing current, do not touch the blade of the screwdriver when tripping the ringing.

4.07 Observe the reading of the meter, which is the loss through the connector.

4.08 Remove the No. 240A plug from the test jack and observe that the connector releases.

Level Hunting Connectors

4.09 If the connector is normal, insert the No. 240A plug into the test jack of the connector and operate the DIAL key of the test set. If testing connectors where the connector test line number is (11), connect ground to the commutator terminal for level No. 1 by means of the No. 893 cord.

TABLE A

Circuit	Issue	Wiring or Figure	Block Relay Operated	Block Relay Non-Operated	Insulate Relay Contacts
SD-31719-01	3D		(TN)	(SL)	Tip lead at (ID)
SD-31414-01	4D	"X" wiring)			
SD-31416-01	6D	"X" wiring)			
SD-31384-01	4D	Fig. C)		(SL)	
SD-31415-01	4D	Fig. C)			
SD-31414-01	4D	"Y" wiring)			
SD-31458-01	5D	)			
SD-31416-01	6D	"Y" wiring)			
SD-31384-01	4D	Fig. D)	(TN)	(SL)	
SD-31451-01	5D	)			
SD-31450-01	4D	)			
SD-31459-01	4D	)			
SD-31415-01	4D	Fig. D)			

4.10 If using test line SD-32021-01 Fig. 3, insert the GRAY shelled plug of the special patching cord, Fig. 1, into jack No. 4 of the connector test line.

4.11 If using test line SD-31719-01 Fig. D, insert a No. 258C plug into the TL1 jack of the connector test line.

4.12 Dial the first (tens) digit of the connector test line number. Restore the DIAL key to normal. Observe that the connectors stop on the test line terminal.

4.13 Observe the reading of the meter, which is the loss through the connector.

4.14 Remove the No. 893 cord ground connection from commutator level No. 1, if being used. Remove the plug from jack No. 4, or jack TL1, of the connector test line.

4.15 Remove the No. 240A plug from the test jack and observe that the connector releases.

(B) Local Connectors - Offices Not Equipped With Transmission Test Line Circuit SD-32021-01 Fig. 3, or Connector Test Line Circuit SD-31719-01 Fig. D

4.16 Offices equipped with connector test line jacks No. 3 and No. 4: - At the connector frame, insert the No. 310 plug (with ring and sleeve strapped) if testing other than level hunting connectors, or the RED shelled plug of the No. 32C test set if testing level hunting connectors, into jack No. 4 of the connector test line. Lock operated the RED key of the No. 32C test set.

4.17 Offices not equipped with connector test line jacks No. 3 and No. 4: - At the relay rack clear the tip and ring of the connector test line for testing by blocking the relays and insulating relay contacts in the approved manner in accordance with Table A.

Note: Information as to relay blocking or insulating of contacts is given for circuits up to and including the issue number shown in the issue column. Changes in Table A should be made locally, if necessary, when later issues of circuits are installed. Space is provided for listing new circuits.

4.18 At the line distributing frame, temporarily connect the trunk unit of the test line circuit for one-way transmission testing, or portable testing power supply, to the connector test line associated with the connectors to be tested. If a portable testing power supply is being used in offices equipped with connector test line jacks No. 3 and No. 4 connect the sleeve of the connector test line to the sleeve of a spare line circuit for terminating service only, or to sleeve of a spare regular subscriber line circuit.

4.19 At the connector frame, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

Regular and Rotary Hunting Connectors

4.20 Offices not equipped with connector test line jacks No. 3 and No. 4: - Connect the No. 59 cord tip of the W1W cord to ground and insert the plug of this cord into the TL jack of the test line.

4.21 If the connector is normal, insert the No. 240A plug into the test jack of the connector.

Note: If testing combination connectors, insert the plug into the local test jack.

4.22 Other than ten-party terminal-per-line connectors: - Operate the DIAL key and dial the connector test line number (99). Restore the DIAL key to normal. Observe that the connector stops on the test line terminal.

4.23 Ten-party terminal-per-line connectors: - Operate the DIAL key and dial the connector test line number and a ringing digit (991). Restore the DIAL key to normal. Observe that the connector stops on the test line terminal. Trip the ringing by momentarily short-circuiting the T and R wiper terminals at the connector test jack by means of a small screwdriver.

Caution: To avoid personal contact with the ringing current, do not touch the blade of the screwdriver when tripping the ringing.

4.24 Observe the reading of the meter, which is the loss through the connector.

4.25 Remove the No. 240A plug from the test jack and observe that the connector releases.

Level Hunting Connectors

4.26 If the connector is normal, insert the No. 240A plug into the test jack of the connector and operate the DIAL key of the test set. If testing connectors where the connector test line number is (11), connect ground to the commutator terminal for level No. 1 by means of the No. 893 cord.

4.27 Offices equipped with connector test line jacks No. 3 and No. 4: - Release the RED key of the No. 32C test set.

4.28 Offices not equipped with connector test line jacks No. 3 and No. 4: - Connect the No. 59 cord tip of the W1W cord to ground and insert the plug of this cord into the TL1 jack of the test line.

4.29 Dial the first (tens) digit of the connector test line number. Restore the DIAL key to normal. Observe that the connector stops on the test line terminal.

4.30 Observe the reading of the meter, which is the loss through the connector.

4.31 Remove the No. 893 cord ground connection from commutator level No. 1, lock operated the RED key of the No. 32C test set or remove the plug from the TL1 jack of the test line.

4.32 Remove the No. 240A plug from the test jack and observe that the connector releases.

(C) Toll Transmission Selectors

4.33 Where the toll transmission selector has access to only 1000 terminals in the office, it will be necessary in testing the 1000 groups other than the one in which the connector terminal number of the test line for one-way transmission testing appears, to connect the test line terminal temporarily to a vacant connector terminal at the distributing frame in the particular 1000 group under test. If the selectors under test are arranged to absorb digits repeatedly on certain levels, select a connector terminal associated with a selector level not arranged in this manner. Any intercepting connections to the vacant terminal should be disconnected for the period of the test.

Note: If a portable testing power supply is being used, connect the sleeve of the vacant connector terminal used for testing to the sleeve of a spare line circuit for terminating service only, or to the sleeve of a spare regular subscriber line circuit. Connect the output terminals of the portable set to the T and R vacant connector terminals.

4.34 At the transmission selector frame, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.35 If the selector is normal, insert the No. 240A plug into the test jack of the selector. Operate the DIAL key and dial the proper digits to reach the connector terminal number being used for transmission testing. Restore the DIAL key to normal. Observe that the selector steps to the proper level and cuts in on an idle trunk.

Note: If the selector is arranged to absorb the initial digit on the level under test, an extra digit must be dialed before dialing the test line number.

4.36 Observe the reading of the meter, which is the loss through the toll transmission selector.

Note: If the test line for one-way transmission testing is arranged for use with toll transmission selectors that supply tone to the intercepting operator, the meter needle will show slight deflections at 4-second and 2-second intervals corresponding to the machine ringing cycle. The reading should be made during the 4-second period.

(D) Outgoing Repeaters and Associated Interoffice Trunks

4.37 At the repeater frame, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.38 If the repeater is idle, insert the No. 240A plug into the test jack of the repeater. Operate the DIAL key and dial the number

required to reach the test line for one-way transmission testing in the terminating office. If the trunk terminates in a tandem selector it will be necessary to route the call through to an office equipped with the test line. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key to normal.

4.39 Observe the reading of the meter, which is the loss through the repeater, the interoffice trunk and the circuits at the terminating end through which the connection was completed.

(E) Subscriber Recording Completing Trunks

4.40 At the selector frame on which are located selectors having direct access to the trunks under test, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.41 Remove the cover of an idle selector and insert the No. 240A plug into the test jack of the selector. Operate the DIAL key and dial the selector to the level having access to the trunks under test. Observe that the selector steps to the proper level and cuts through on the first idle trunk.

4.42 When the toll operator answers, request a connection to the test line circuit for one-way transmission testing. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key to normal. Observe the reading of the meter, which is the loss through the outgoing trunk from the selector, the incoming trunk if testing 2-wire outgoing trunks, and the toll cord circuit used in completing the connection to the test line.

Note: If the selector is arranged to absorb the initial digit on the level under test, an extra digit must be dialed before access to the test level is obtained.

4.43 To test the next idle trunk on the level, reoperate the DIAL key and rapidly open and close the off-normal springs of the selector by means of the KS-6320 orange stick applied to the tip of the off-normal finger. Observe that the selector rotates to the next idle trunk and cuts through. Proceed as in 4.42. Note any trunks that are busy and test such trunks when they become idle, except trunks permanently made busy. At the completion of the tests replace the switch cover.

(F) Message Rate Trunks

4.44 At the primary line switch bay, or line finder frame, associated with the trunks under test, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.45 In a line switch office, temporarily connect a 1000-ohm ground, at the terminal assembly, to the MM lead of the spare line switch permanently assigned for testing message rate trunks. Set the associated master switch to direct the idle line switches opposite the trunk to be tested. Insert the No. 240A plug into the test jack of the spare line switch and operate the DIAL key of the test set.

4.46 In a line finder office, if the line finder is idle, insert the No. 240A plug into the MONITOR jacks of the line finder associated with the trunk to be tested and operate the DIAL key of the test set.

4.47 After hearing dial tone, dial the number of the test line for one-way transmission testing. Restore the DIAL key to normal.

4.48 Observe the reading of the meter, which is the loss through the message rate trunk and the connection used in completing the connection.

(G) Local Coin Trunks

4.49 At the coin trunk relay rack, prepare the coin trunk test set for testing with the exception of connecting the test set to the coin trunk test jack in accordance with the appropriate section.

4.50 Connect the jack of the trunk test set, which is normally connected to the coin trunk test jack, to the DIAL jack of the transmission measuring set using a P3E cord. Operate the DIAL key of the latter test set.

4.51 Connect the MEAS jack of the transmission measuring set to the test jack associated with the incoming end of the coin trunk to be tested, using a P3E cord.

4.52 If the trunk is idle, prepare the coin trunk test set for dialing and dial the number of the test line for one-way transmission testing. Restore the DIAL key of the transmission measuring set to normal.

4.53 Observe the reading of the meter, which is the loss through the coin trunk and the connector used to complete the connection.

(H) Intercepting Trunks

From Connector Multiple Direct to Switchboard (Not Through Trunk Finders)

4.54 At the connector frame, insert the plug of the hand test set into the DIAL jack

of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS jack of the test set.

4.55 Insert the No. 240A plug into the test jack of an idle switch which has direct access to the trunk under test and operate the DIAL key of the test set.

4.56 Dial the last two digits of a vacant connector terminal number. Observe that the connector stops on the terminal dialed.

4.57 When the intercepting operator answers, request a connection to the test line circuit for one-way transmission testing. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key to normal.

4.58 Observe the reading of the meter, which is the loss through the connector, the trunk under test, the incoming trunk to the switchboard if testing 2-wire trunks from the connector and the cord circuit used in completing the connection to the test line.

From Local A-B Toll Preceding and A-B Toll Transmission Selector Levels

4.59 At the selector frame, proceed as in 4.54 and 4.55.

4.60 Dial the selector to the vacant level and observe that it steps to the level dialed and stops on the terminals of the trunk under test.

4.61 When the intercepting operator answers, request a connection to the test line circuit for one-way transmission testing. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key to normal.

4.62 Observe the reading on the meter, which is the loss through the selector level trunk, the outgoing trunk from the trunk finder and incoming trunk to the switchboard, if trunk finders are being used, and the cord circuits used in completing the connection to the test line.

4.63 To test the next trunk on the level, reoperate the DIAL key, remove the switch cover and rapidly open and close the off-normal springs of the selector by means of the KS-6320 orange stick applied to the tip of the off-normal finger. Observe that the selector rotates to and stops on the next trunk. Proceed as in 4.61 and 4.62. At the completion of the tests replace the switch cover.

From Toll Preceding, Toll Transmission and Toll Intermediate Selector Levels - Where the Toll Intermediate Selectors Are Preceded By Toll Transmission Selectors

4.64 At the toll transmission selector frame, or toll preceding selector frame when testing trunks from toll preceding selectors in repeated dialing toll trains, prepare the trunk test set for testing, with the exception of connecting the test set to the selector test jack, in accordance with the appropriate section.

4.65 Connect the jack of the trunk test set, which is normally connected to the selector test jack, to the DIAL jack of the transmission measuring set using a P3E cord. Operate the DIAL key of the latter test set.

4.66 Connect the MEAS jack of the transmission measuring set to the test jack of an idle toll transmission selector, or toll preceding selector, as required, which has access to the trunks under test, using a P3C cord.

4.67 Prepare the trunk test set for dialing and dial the necessary digit or digits to reach the trunk under test. When the trunk is arranged for controlled ringing ring on the trunk to signal the operator.

4.68 When the operator answers, request a connection to the test line for one-way transmission testing. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key of the transmission measuring set to normal.

4.69 Observe the reading of the meter, which is the loss through the toll transmission selector, if being used, the trunk under test, the cord circuit and any other intercepting trunk circuits used to complete the connection to the switchboard.

4.70 To test the next trunk on the level, reoperate the DIAL key of the transmission measuring set. Short-circuit springs Nos. 1 and 2 of the selector while withdrawing the No. 240A plug. Insert a make-busy tool between springs Nos. 1 and 2 of the selector test jack. Observe that the selector does not release. Proceed as in 4.66 to 4.69. At the completion of the tests remove the make-busy tools from the selector test jacks and observe that the switches release.

From Toll Intermediate Selector Levels - Where The Selectors Are Preceded By 4-Wire Toll Switching Trunks

4.71 At an idle toll switchboard position, insert the plug of an operator's telephone set into the position telephone circuit jacks.

4.72 Insert the front plug of a toll cord circuit into the jack of an idle toll switching trunk having access to the trunks under test and originate a call to the vacant toll selector level associated with the trunk to be tested.

4.73 When the intercepting operator answers, request a connection to the test line circuit for one-way transmission testing. When the 1000-cycle tone is heard in the receiver,

insert the associated rear plug of the toll cord circuit used in 4.72 into the MEAS jack of the test set. Restore the cord circuit TALK key to normal.

4.74 Observe the reading of the meter, which is the loss through the switching trunk, the trunk under test, the intercepting cord circuit and any other intercepting trunk circuits used to complete the connection.

4.75 To test the next intercepting trunk on the selector level, remove the rear plug of the cord circuit from the MEAS jack and leave the front plug in the switching trunk. Using another toll cord circuit proceed as in 4.72 to 4.74. At the completion of the tests restore the toll switching trunks to normal.

From Trunk Finders to Switchboard

4.76 At a local selector frame, on which selectors have access to a vacant level intercepting trunk, and in a location near the trunk finder frame, insert the plug of the hand test set into the DIAL jack of the transmission measuring set. Lock the C button operated by means of the D-96823 slider. Insert the No. 310 plug of the P3C cord into the MEAS of the test set.

4.77 Insert the No. 240A plug into the test jack of an idle selector and operate the DIAL key of the test set.

4.78 Dial the selector to a vacant level and observe that the selector steps to the level dialed and stops on the terminals of an intercepting trunk.

4.79 When the intercepting operator answers, request a connection to the test line circuit for one-way transmission testing.

4.80 Observe the reading of the meter, which is the loss through the selector level trunk, the outgoing trunk from the trunk finder, the incoming trunk to the switchboard and the cord circuit used to complete the connection to the test line.

4.81 Remove the No. 240A plug from the selector test jack. Insert a No. 258 plug into the make-busy jack of the trunk finder used in the previous test.

4.82 Proceed as in 4.77 to 4.81 until all have been tested. At the completion of the tests remove the No. 258 plugs from the make-busy jacks of the trunk finders.

(I) Trunks With Message Ticketer

4.83 At the trunk relay equipment, insert the plug of the hand test set, with the C button normal, into jack A of the trunk so that springs No. 1 and No. 2 of the plug make contact with springs 1 and 2 of the test jack. Monitor on the trunk, and if the trunk is idle, insert a No. 258 plug into jack B of the trunk to make the trunk busy for the duration of the test. Remove the plug of the hand test set from jack A.

4.84 After the trunk has been made busy, insert a No. 184 plug (with ring and sleeve strapped) into jack C of the trunk to operate the cut-through relay of the trunk. Connect jack D of the trunk to the frame line jack D of the trunk test circuit, using a P2B cord. Insert the No. 240A plug of the P3C cord into jack A of the trunk so springs No. 1 and No. 2 of the plug make contact with springs 1 and 2 of the test jack. Insert the No. 310 plug of this same cord into the MEAS jack of the transmission measuring set. Operate the SEND 1MW key at the trunk test frame. Observe the reading of the meter, which is the loss through the trunk.

4.85 Restore the trunk to service by removing the test plugs from the trunk jacks, removing the make-busy plug from trunk jack B last. In addition, at the completion of the tests, remove the plug from jack D of the trunk test circuit and restore the SEND 1MW key.

(J) Interoffice Trunks From Message Ticketer Equipment

4.86 At the trunk relay equipment for the trunks with message ticketer, insert the plug of the hand test set, with the C button normal, into jack A of the trunk associated with the interoffice trunk under test so that springs No. 1 and No. 2 of the plug make contact with springs 1 and 2 of the test jack. Monitor on the trunk, and if the trunk is idle, insert a No. 258 plug into jack B of the trunk to make the trunk busy for the duration of the test. Remove the plug of the hand test set from jack A.

4.87 If the conductor loop resistance of the trunk under test exceeds 1200 ohms, insert the No. 310 plug of the P3C cord into the frame line jack A of the trunk test circuit and the No. 240A plug of this cord into jack A of the trunk so that springs No. 1 and No. 2 of the No. 240A plug make contact with springs 5 and 6 of the test jack. Operate the OTR key of the trunk test circuit. Insert the plug of the hand test set into the frame line jack E of the trunk test circuit so that springs No. 1 and No. 2 of the plug make contact with springs 1 and 2 of the test jack. Proceed as in 4.89.

4.88 If the conductor loop resistance of the trunk under test is less than 1200 ohms, insert the plug of the hand test set into jack A of the trunk so that springs No. 1 and No. 2 of the plug make contact with springs 5 and 6 of the test jack.

4.89 Operate the C button of the hand test set and dial the number required to reach the test line for one-way transmission testing in the terminating office. When the 1000-cycle tone is heard in the test receiver, insert a No. 184 plug (with ring and sleeve strapped) into jack C of the trunk to operate the cut-through relay of the trunk. Remove test plug from jack A of the trunk, and from the frame line jacks A and E of the trunk test circuit, if being used. The CS relay of the trunk should maintain the connection to the distant office.

4.90 Insert the No. 240A plug of the P3C cord into jack A of the trunk so that springs No. 1 and No. 2 of the plug make contact with springs 1 and 2 of the test jack. Insert the No. 310 plug of this same cord into the MEAS jack of the transmission measuring set. Observe the reading of the meter, which is the loss through the message ticketer trunk, the interoffice trunk and the circuits at the terminating end through which the connection was completed.

Note: In certain cases it may be necessary or desirable to route the test call through a voice repeater in the distant office. Under these conditions, if the meter shows an off-scale reading (below 0 loss), it will be necessary to employ an external pad with a sufficient known db loss to permit a reading on the 0-5 scale. Connect the external pad between jack A of the trunk and the MEAS jack of the test set.

4.91 Restore the trunk to service by removing the test plugs from the trunk jacks, removing the make-busy plug from jack B last. At the completion of the tests, restore the OTR key of the trunk test circuit to normal.

(K) Trunks To a P.B.X. From Selector Multiple With Connector Multiple

4.92 Trunk apparatus located on connector frame and office equipped with transmission test line circuit SD-32021-01: - At the relay rack, operate the 3-way key of the transmission test line circuit to the TRANS position. At the connector frame, insert one of the plugs of a P3E cord into the PS & T jack of the transmission test line circuit. Proceed as in 4.95.

4.93 Trunk apparatus located on connector frame and office not equipped with transmission test line circuit SD-32021-01: - At the connector frame, insert the GRAY shelled plug of the special patching cord, Fig. 1, into jack No. 4 of the connector test line and insert the BLACK shelled plug of the same cord into jack No. 3 of the test line. At the V.I.D.F., temporarily connect the trunk unit of the test line circuit for one-way transmission testing to the connector test line associated with the connector frames to which the special patching cord is connected. Proceed as in 4.95.

4.94 Trunk apparatus located on a relay rack: - Temporarily extend the trunk unit of the test line circuit for one-way transmission testing from the V.I.D.F. to the relay rack on which the trunks under test are located. At the relay rack, connect the T, R and S leads of the extended test line circuit to the No. 59 cord tips of the W3A cord.

4.95 At the frame on which the trunk circuits under test are located, with the C button normal insert the plug of the hand test set into the DIAL jack of the transmission measuring set and operate the DIAL key. Insert the No. 310 plug of P3C cord into the MEAS jack of the test set. (See 1.10)

4.96 Insert the No. 240A plug of the P3C cord into the A test jack (incoming end) of the trunk under test and monitor on the circuit. If no conversation is heard, operate the C button of the hand test set and listen for the busy signal. If the busy signal is heard, disconnect from the trunk as it is an indication that the trunk has been seized by a connector or that the P.B.X. is originating a call on the trunk. If no busy signal is heard, challenge on the trunk to determine a party is waiting on the trunk.

4.97 If the trunk is idle, insert the plug of the free end of the cord used in 4.92, 4.93 or 4.94 into the B test jack (outgoing end) of the trunk.

4.98 Dial one or two digits, as required, to cause the trunk to ring, trip and cut-through for testing. When the 1000-cycle tone is heard in the test receiver, restore the DIAL key of the test set to normal. Observe the reading of the meter, which is the loss through the trunk circuit.

4.99 Remove the test plugs from jacks A and B of the trunk. Restore the C button of the hand test set and reoperate the DIAL key of the transmission measuring set, to prepare the test sets for testing other trunks.

(L) Outgoing Trunks From DSA Switchboard

4.100 At an idle switchboard position, connect the DIAL jack of the test set to a spare trunk jack which has a 34-ohm sleeve resistance to ground, using a P3F cord. This provides a sleeve circuit for the position cord to be used. Leave the DIAL key of the test set normal.

4.101 Insert the plug of an answering cord, of a position cord circuit normally used with the type of trunk to be tested, into the MEAS jack of the test set. Insert the plug of an operator's telephone set into the position telephone circuit jacks.

4.102 Insert the plug of the calling cord of the cord circuit used in 4.101, into the jack of the trunk under test and originate a call to the test line circuit for one-way transmission testing. If the trunk terminates in a switchboard, request a connection to the test line circuit for one-way transmission testing, otherwise dial the connector terminal number assigned to the test line.

4.103 **Observe** the reading of the meter, which is the loss through the originating and cord circuit, the outgoing trunk and any circuits at the terminating end used to complete the connection to the test line.

(M) Cord Circuits - DSA Switchboard

4.104 Intercepting cord circuits: - At the cord circuit relays, prepare the cord circuit for testing by blocking the relays in accordance with the following, and then proceed as in 4.107.

Note: Information as to relay blocking is given for circuits up to and including the issue number shown in the issue column. Changes should be made locally, if necessary, when later issues of circuits are installed. Space is provided for listing other circuits.

Cord Circuit	Issue	Block Operated
SD-30311-01	10D	(G) Relay
SD-31208-01	9D	(CT) Relay
SD-31403-01	3AR	(RT) and (C) Relays

4.105 Special Service Common Battery Cord Circuits: - At the front of the switchboard position associated with the cords to be tested, connect the DIAL jack of the test set to a spare switchboard jack which has a 34-ohm sleeve, using a P3F cord. Proceed as in 4.107.

4.106 Combination Cord Circuits: - At the cord circuit relays, prepare the cord circuit for testing by blocking the relays in accordance with the following. See Note in 4.104.

Cord Circuit	Issue	Block Operated
SD-90454-01	14D	(C) Relay
SD-90454-02	15D	(C) Relay

At the front of the switchboard position associated with the cords to be tested, connect the DIAL jack of the test set to a spare switchboard jack which has the proper sleeve resistance, high or low, required by the answering cord for the test to be made. Use a P3F cord. On a routing basis, the answering cord should be tested for both the high and low sleeve conditions.

4.107 Insert the plug of the calling cord of the cord circuit under test, into the jack of the test line circuit for one-way transmission testing which has the proper sleeve resistance (high or low) required by the calling cord for the test to be made. On a routine basis, the calling cord should be tested for both the high and low sleeve conditions, when so arranged.

4.108 Insert the plug of the associated answering cord into the MEAS jack of the test set. Observe the reading of the meter, which is the loss through the cord circuit.

4.109 During the following operations, continue to observe the meter for any changes in the deflection of the needle which would indicate a cut-out or other trouble condition.

4.110 Manipulate the cords and plugs in the following manner: Hold the plug in the jack with one hand and shake the cord with the other hand. Turn the plug around in the jack so as to cause the jack springs to make contact at all possible points of the tip and ring of the plug.

Note: Disregard any momentary deflections of the needle while the plug is being rotated.

4.111 Tap lightly on the key tops using the H cabinet screwdriver to detect loose connections and defective key contacts in the talking circuit.

4.112 Move the key levers slightly forward and backward while exerting a slight pressure to the key lever from each side; that is, perpendicular to the direction of the key's operation, in order to detect faulty key adjustments that might cause clicks.

4.113 At the completion of the tests restore any relays to normal that were blocked operated for the test.

(N) Operator's Telephone Circuits - DSA Switchboard

4.114 At the switchboard position under test, connect one of the MEAS jacks of the test set to the low sleeve jack of the test line for one-way transmission testing, using a P3F cord. Insert the plug of a calling cord (TALK key normal) into the other MEAS jack of the test set. Note the reading of the meter, which is the loss of the cord. Use this cord when making the following measurements.

Bridging Loss Measurements

4.115 With the connections established as in 4.114, insert the twin plugs of the No. 82A test set or 220 plug into the C-D jacks of the operator's telephone circuit under test. Operate the TALK key of the cord circuit being used. Observe the reading of the meter, which is the bridging loss of the cord circuit and the operator's telephone circuit from jacks C-D. If the loss of the telephone circuit alone is desired, subtract the loss of the cord circuit, as determined in 4.114, from the meter reading.

4.116 If the telephone circuit is arranged for monitoring, operate the MON key of the cord circuit, if provided. If monitoring is accomplished by a telephone circuit MON key, operate this key and leave the TALK key of the cord circuit operated. Observe the reading of the meter, which is the bridging loss of the cord circuit and the operator's telephone monitoring circuit. Restore the MON key to normal.

4.117 If the telephone circuit is equipped with a repeating coil between the C-D and A-B jacks, remove the No. 82A test set

or 220 plug from the C-D jacks and insert it into the A-B jacks of the telephone circuit. Operate the TALK key of the cord circuit, if it is not already operated. Observe the reading of the meter, which is the bridging loss of the cord circuit and the operator's telephone circuit from jacks A-B.

Transmitting Loss Measurements

4.118 Remove the P3F cord connection between the test line and test set. Remove the plug of the calling cord from the MEAS jack and insert it into the test line low sleeve jack. Insert the No. 310 or 202 plug, which is connected to the cord of the No. 82A test set or 220 plug, into the MEAS jack of the test. Operate the TALK key of cord circuit, if it is not already operated, and operate the T key of the No. 82A test set or 220 plug. Observe the reading of the meter, which is the transmitting loss of the cord circuit and operator's telephone circuit from jacks C-D or A-B, depending upon whether the bridging loss measurement in 4.117 has been made.

4.119 If the measurement in 4.118 has been made from the A-B jacks of the telephone circuit, remove the No. 82A test set or 220 plug from the A-B jacks and insert it into the C-D jacks of the telephone circuit. Observe the reading of the meter which is the transmitting loss of the cord circuit and operator's telephone circuit from the C-D jacks.

Receiving Loss Measurements

4.120 With the connections established as in 4.118 and the No. 82A test set or 220 plug connected to the C-D jacks of the telephone circuit, operate the R key of the No. 82A test set or 220 plug. Operate the cord circuit MON key, or the operator's telephone circuit MON key, as required, to establish the monitoring circuit. In the latter case, the cord circuit TALK key should be operated. Observe the reading of the meter which is the receiving loss of the cord circuit and the operator's telephone circuit from jacks C-D.

5. TRANMSISSION TEST REQUIREMENTS FOR CIRCUITS EQUIPPED WITH SILICON STEEL TYPE REPEATING COILS

5.01 The information in Table B covers transmission test requirements for circuits in which 120CS, DS, ES, etc., repeating coils have been furnished in place of the 120C, D, E, etc., coils and where the circuit drawings have not been reissued to cover the substituted coils.

5.02 Because of a temporary shortage of nickel for use in permalloy core material, No. 120CS, DS, ES, FS, GS, HS, JS, KS and LS repeating coils having silicon steel cores may have been substituted for No. 120C, D, E, F, G, H, J, K and L repeating coils respectively, having permalloy cores. Some circuit drawings may not have been changed to cover the test requirements for the substituted coils.

5.03 In cases where No. 120 type silicon steel core coils have been furnished but their requirements are not specified on the circuit drawing, the requirements for individual apparatus losses shown in Table B for these coils should be employed. The maximum allowable circuit losses shown on circuit drawings, which have not been revised to cover the silicon steel core coils, should be increased by the correction values given in the last column of Table B. If minimum allowable circuit losses are shown on the circuit drawings, which have not been revised to cover the silicon steel core coils, they should be increased by the correction values given in the last column of Table B.

6. REPORTS

6.01 The required record of these tests should be entered on the proper form.

TABLE B

Individual Apparatus Losses and Circuit Loss Corrections
(1000-Cycle Loss Between 600-Ohm Lines)

Permalloy Core Repeating Coils		Substituted Silicon Steel Core Repeating Coils		
Code Numbers	Apparatus Losses-db	Code Numbers	Apparatus Losses-db	Corr. to be Added to Ckt. Losses-db
120C or 120H	Max. 0.4 Min. 0.2	120CS or 120HS	Max. 1.1 Min. 0.5	Max. 0.7 Min. 0.3
120D or 120J	Max. 0.7 Min. 0.4	120DS or 120JS	Max. 1.3 Min. 0.8	Max. 0.6 Min. 0.4
120E or 120K	Max. 0.6 Min. 0.3	120ES or 120KS	Max. 1.2 Min. 0.6	Max. 0.6 Min. 0.3
120F or 120L	Max. 1.3 Min. 0.9	120FS or 120LS	Max. 2.0 Min. 1.5	Max. 0.7 Min. 0.6
120G (1:1.5)	Max. 0.6 Min. 0.3	120GS (1:1.5)	Max. 1.2 Min. 0.6	Max. 0.6 Min. 0.3
120G (1:2.5)	Max. 1.3 Min. 0.9	120GS (1:2.5)	Max. 2.0 Min. 1.5	Max. 0.7 Min. 0.6