INSTALLATION AND MAINTENANCE
TESTS AND REQUIREMENTS
SWITCHED SPECIAL SERVICE CIRCUITS

CONTENTS PAGE

1. GENERAL

1.01 This section provides installation and maintenance tests information and requirements for switched special services. Typical switched special services are:

(a) Foreign Exchange Lines (FX)

(b) Wide-Area Telecommunications Service (WATS) Lines (WO, WX)

(c) Off-Premises Extension Lines (OP)

(d) Secretarial Lines (SL)

(e) PBX Station Lines (On and OFF Premises).

Trunks

(a) PBX to Central Office

(b) Long Distance Trunks (LT)

(c) Foreign Exchange Trunks (FT)

(d) WATS Trunks (WI, WS)

(e) PBX Tie Trunks.

A brief description of these circuits is given in Section 311-100-100.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 Installation tests are required to be made before lines and trunks are placed in service.

The principal reason for making the tests on a preservice basis are:

(a) To ensure that all the various elements making up a circuit are in proper alignment

(b) To verify that the circuit meet the transmission and operational requirements for which they are designed.

1.04 Circuits not meeting the requirements after normal corrective action is taken should be investigated for wiring and installation errors, equipment troubles, etc. All tests ***must*** be made and all test requirements ***must*** be met before the circuits are placed in service.

1.05 ***Any circuit failing to meet its requirements will not be turned up for service.***

1.06 The **designated control office responsibility** has the overall responsibility for circuits meeting their requirements before they are placed in service. This responsibility includes verifying the completion of tests and adjustments made at other locations as well as at the control office. Office responsibilities for special service circuits are outlined in Section 660-005-011.

1.07 The term "circuit records" will be used throughout this section to denote the trunk or circuit order records, such as the Work Order Record and Details (WORD) document from the Trunks Integrated Record Keeping System (TIRKS), and the circuit layout record (CLR), or equivalent.

1.08 The testing personnel should be thoroughly familiar with sections in the following categories:

(a) All sections defining the codes and abbreviations used on circuit record

(b) All sections giving methods and procedures for tests and adjustments at the specific test location

(c) All sections giving methods and procedures for reporting completion.

1.09 The circuit records and the appropriate testing procedures must be understood and followed exactly when special services are measured so that errors such as the following are avoided:

(a) Not applying the correct levels of test signal when connecting test equipment to a circuit

(b) Not using test equipment having the proper impedance

(c) Not providing or allowing for test pads as specified on the circuit records.

2. EXPLANATIONS OF TERMS USED IN INSTALLATION AND MAINTENANCE TESTING

A. ICL

2.01 ***Inserted Connection Loss (ICL):*** The 1004-Hz transducer loss between the originating and terminating outgoing switch appearances for a trunk and between the line-side switch appearance and the customer station for a line. All trunk inserted connection losses are specified with the proper terminating impedances for each end of the facility (600- or 900-ohms), depending on the nominal impedance of the CO, or PBX to which the trunk connects. Lines should be considered as terminated at the CO with the proper corresponding nominal impedance and with 600 ohms at the customer station end.

B. EML

2.02 ***Expected Measured Loss (EML):*** A calculated loss quantity which specifies the end-to-end 1004-Hz transducer loss that one would expect to measure on a terminated test connection between two readily accessible manual or remote test points, such as switched access associated with the Switched Access Remote Test System (SARTS) for remote, centralized testing from a Special Service Center (SSC). The EMLs are always calculated with the proper terminating impedance (600- or 900-ohms) at each end of the circuit as with ICL.

C. AML

2.03 ***Actual Measured Loss (AML):*** The actual measured 1004-Hz transducer loss between the same two access points for which the EML is computed. The AML is recorded at the time of measurement and later compared to the EML for the measured circuit. The loss measurement connection, including test pads in the milliwatt

supply (or equivalent) and transmission measuring set (TMS) access arrangements, is often referred to as the AML connection.

2.04 ***Circuit transmission loss objectives are specified in terms of ICL because this eliminates terminating connection losses peculiar to a specific circuit loss measurement.*** The ICLs of individual circuits can be summed directly to obtain the overall loss objective for a connection composed of several circuits in tandem.

2.05 ***Installation and maintenance loss objectives and requirements are specified in terms of EML and AML because these are defined as a terminated test connection between specified test access points.***

2.06 In the definitions given above, ICL is used to design circuits. EML and AML are used for installation and maintenance testing.

D. Two-Wire Cable Facility

2.07 A 2-wire cable layout uses the same cable pair for both directions of transmission. A 2-wire cable segment of a trunk is that portion assigned to a VF cable pair, including 2-wire repeaters which may be used at intermediate offices and at either or both termials.

E. Four-Wire Cable Facility

2.08 A 4-wire cable layout uses separate VF cable pairs for each direction of transmission. A 4-wire cable segment of a trunk is that portion assigned to two VF cable pairs, including both intermediate and terminal telephone repeaters.

F. Single-Link Carrier Channel Facility

2.09 A single-link carrier channel facility is a facility that operates over a single-carrier system between VF terminals, such as C, H, J, K, N, O, ON, T, or similar systems, or that operates from channel bank to channel bank (voice to voice) over L or R carrier without any intermediate group connectors.

G. Multiple-Link Carrier Channel Facility

2.10 A multiple-link carrier channel facility is a facility that operates over more than one carrier system interconnected at group frequencies, that is, that contains one or more group connectors.

H. Multifacility Trunk

2.11 A multifacility trunk is a trunk that has more than one class of facility, such as:

(a) Two-wire cable, 4-wire cable, open wire, or carrier channel

(b) Two or more carrier channels in tandem, interconnected on a VF basis

(c) Two or more 4-wire cable segments in tandem with 4-wire terminating sets at the point of interconnection.

3. APPLICATION OF INSTALLATION AND MAINTENANCE TESTS

3.01 The term "installation and maintenance tests" is used in this section to indicate the transmission and operational tests required on all types of switched special service circuits when circuit orders authorize a new circuit or an addition to an existing circuit group or when circuit orders authorize rearrangements of equipment or facilities, or both, assigned to existing circuits.

3.02 The need for making a given test depends upon whether the equipment components or facilities have been in use previously and whether the equipment components have been used as spares or with other equipment that has been tested periodically.

3.03 Preliminary tests and adjustments are not necessarily required on equipment components that have been in service immediately before their installation in the present layout. If rearrangements in layouts of current trunks involve 4-wire terminating sets or trunk equiipment, or both, however, additional tests are required.

4. TRANSMISSION TESTING ARRANGEMENTS

4.01 Switched special service circuits should be measured under the same condition for which the EML was computed. The EML and other

transmission objectives as calculated and placed on the circuit records assume that the measurements are made from specific points in a circuit.

4.02 The specific points from where these measurements are made are called access points. These access points are jacks, Switch Maintenance Access System (SMAS) connector or "shoes" that give a test desk access to metallic facilities at the main distributing frame.

4.03 Test access for transmission tests can also be found at amplifiers, equalizers, 4-wire term set inputs and outputs, carrier terminals, and test board locations. At these access locations, impedance matching of the test equipment is often not required since the nominal input impedance of the test equipment is normally 600 ohms. Impedance matching is usually required when testing at the following circuit access locations: cable pair appearances, station sets, telephone sets, key telephone set (KTS) terminals, demarcation strips or terminals, and at most distributing frame appearances.

4.04 SARTS 1A is an operation support system for remotely accessing and testing special service circuits. This system has centralized test locations and remotely located testing capabilities that permit a testperson to access and test circuits between or from either of two Switched Maintenance Access System (SMAS) access points without assistance.

4.05 The SARTS 1A, as a stand-alone system, centralizes special service testing activities and alleviates most test activity coordination problems. When SARTS 1A becomes functionally interfaced with CMS 3A, both systems will be mutually enhanced and together will have the ability to combine centralized testing with mechanized administrative record keeping.

4.06 Figure 1 illustrates remote testing of a typical special service circuit. (RTS 1A/SMAS 4A and RTS 5A/SMAS 5A far-ends are illustrated.) The tester at the TP 52A, by using the KD, verifies circuit status and controls testing of the total special service circuit from access points assigned to each circuit. For transmision or other tests requiring simultaneous use of two access points on the same circuit, the two points may be selected and tests made between them.

5. PRELIMINARY TESTS REQUIRED ON EQUIPMENT COMPONENTS AND FACILITIES

5.01 Before any tests are made between trunk terminals, it must be verified that suitable service and acceptance tests have been made on the appropriate elements, such as cable or open-wire facilities and line and office equipment, including telephone repeaters, signaling equipment, carrier telephone systems, etc.

5.02 Tables A through F list the preliminary tests required for equipment components and facilities assigned to new installations and for current installations involving rearrangements or additions to existing trunk groups.

5.03 The loop parameters are given to provide minimum circuit noise and to ensure that adequate signaling conditions are present. The loop must be free from foreign voltages (FEMF), resistive faults, and it must be balanced. The requirements are given in Table A.

6. OVERALL TESTS REQUIRED

A. General

6.01 Overall tests ***must*** be performed before circuits are placed in service. This is to ensure that any circuit likely to be switched into the network will meet overall service objectives.

6.02 The installation and maintenance test procedures are covered in Section 311-600-ZZZ. The following tests are described in Section 311-100-100.

B. Common Tests

6.03 Certain tests are required in installation and maintenance. The following tests are typical for special service circuits. The tests are divided into groups according to transmission and signaling applicability. Perform the proper test as indicated on the circuit records.

Transmission Tests:

- Multimeter Tests
- 1004-HZ Loss Test
- Gain-Slope Measurement

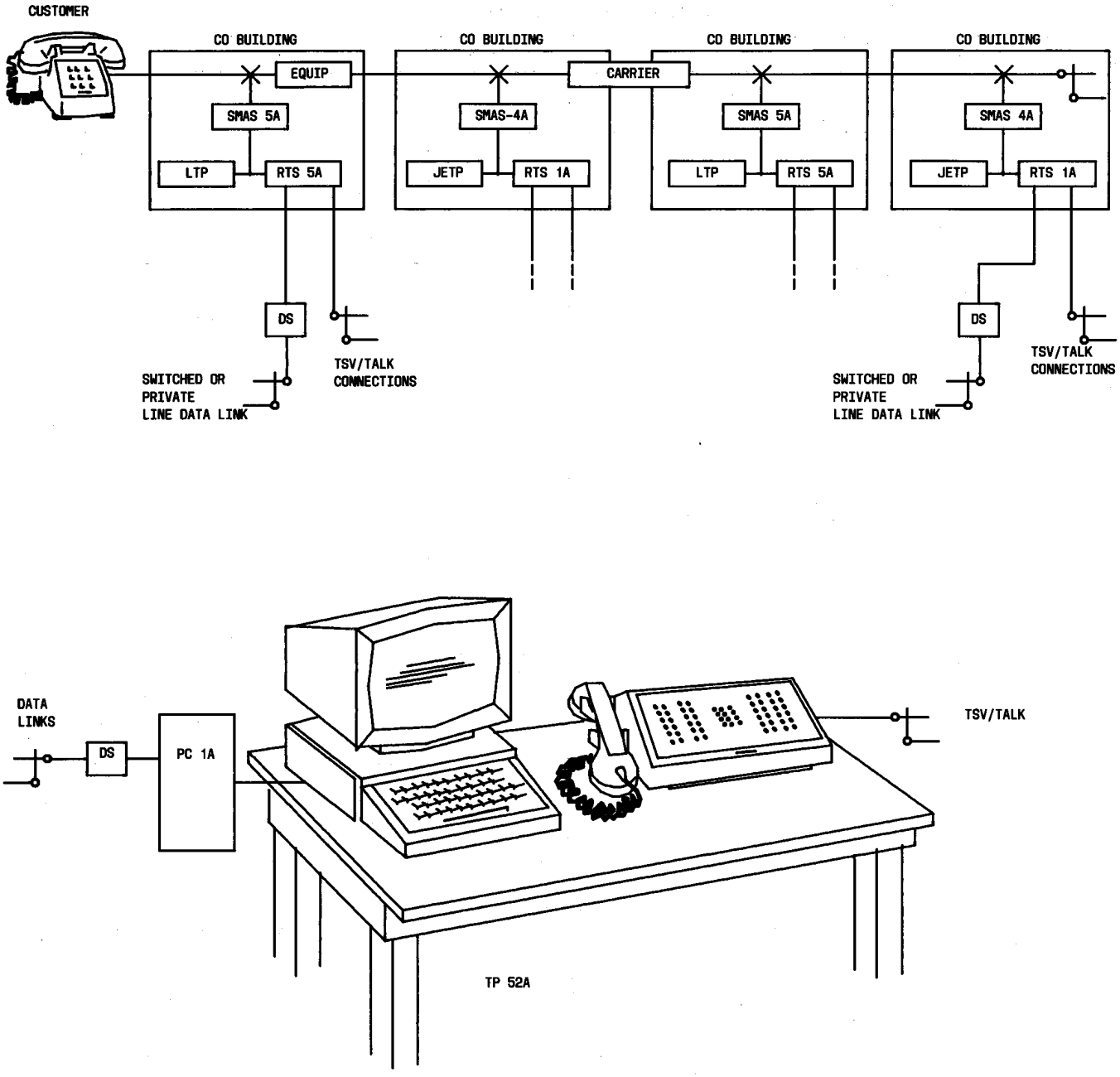

Fig. 1—SARTS 1A One Person Remote Testing

- Message Circuit Noise Test
- Balance Tests (Echo and Singing Return Loss).

Signaling Tests:

- Multimeter Tests
- E&M Lead Signaling Tests
- Overall Pulsing Tests
- Listening and Operational Tests.

6.04 ***When transmission and noise measurements are being made on a***

TABLE A

SUMMARY OF PRELIMINARY TESTS TO BE MADE ON EQUIPMENT COMPONENTS AND FACILITIES

TYPE OF TEST	PROCEDURE	REFERENCES	TEST REQUIREMENTS
DC Tests on Cable Pairs	Make required tests for opens, shorts, grounds, leakage, and for even voltages.	Table B	See Table C
Repeater Tests and Repeater Gains	Verify that required tests have been made and that each repeater gain has been adjusted to its required value.	Table D	The maximum allowable deviation in repeater gain from that originally indicated on circuit records shall not exceed ±1.0 dB.
Singing Point Tests	Verify that required tests have been made on all 4-wire to 2-wire terminating arrangements employing hybrid-type transformers.	Table D	As covered in sections containing testing methods
SF Signaling Circuits	(1) Verify that "out-of-service" tests have been made. (2) Verify that compromise networks have been correctly wired and adjusted on SF units with built-in 4-wire terminating circuits (See Test 3).	Table E	As covered in sections containing testing methods
Carrier System Tests	Verify that the following preservice tests have been made on the system: (1) Initial lineup (2) Overall channel noise measurements (3) Channel net gain measurements (4) When multifacility circuits are involved, adjustment of transmission level at intermediate offices (5) CGA or CGC action and indications.	Table F	As covered in sections containing testing methods
Measurement of Office Wiring and Equipment Losses		660-450-502	Transmission levels in each direction of transmission should be adjusted to within ±0.13 dB by changing the T and R pads in external 4-wire terminating sets or by repeater gain adjustments on trunks equipped with D2 channel banks or F- and G-type signaling circuits. The transmission levels in each direction of transmission should be adjusted to within ±1.0 dB by adjusting the T and R pad values in the association attentuators. See notes 1, 2, and 3.

Note 1: The maximum allowable deviation in the adjusted value of plug-in pads (89-type resistors), repeater gains, or attenuator values (D2 channel banks and F-type signaling circuits) from that originally indicated on the circuit or trunk layout record cards must not exceed ±1.0 dB. The adjusted values should be recorded on the circuit records and on locally prepared records in each office making the change. These values are then treated as the new specified values.

Note 2: On trunks that use early types of E-type signaling circuits with built-in 4-wire terminating circuits, the loss in the transmitting direction of transmission is approximately 16.0 dB and is *not* adjustable. In the receiving direction of transmission, the level adjustment is made on a VF amplifier contained in the signaling circuit.

Note 3: Trunks equipped with F-type signaling units and external 4-wire terminating gets may be trimmed to within ±0.1 dB by the combined use of the F-signaling pads and terminating set pads (dependent upon local practices).

trunk, the circuit must be in the off-hook condition at both terminals in order to remove SF signaling tone, to disable the SF signaling unit filter, and to place the circuit in the condition in which it is normally used.

6.05 Tables G through K list the overall tests required of all switched special service circuits. The tests are required to ensure that each complete circuit meets the requirements for which it was designed and that each circuit is adjusted satisfactorily before it is placed in service.

6.06 ***Any circuit failing to meet its requirements should not be turned up for service.***

TABLE B

INFORMATION ON TESTING CABLE FACILITIES

SUBJECT	SECTION
Cable Testing Voltmeter and Wheatstone Bridge Testing	660-807-500
Exchange Area Cables Completion Tests	330-300-500

TABLE C

LOOP PARAMETERS

TEST (NOTE 1)	MARGINAL	FAULT
AC FEMF (V)	15-25	>25
AC FEMF (MA)	<3	>3
AC Impedance (Ohms)	<25K-45K (tip-ring)	>45K (tip-ring)
DC FEMF (V)	8-20	>20
DC Resistance (Ohms)	Note 2	Note 2
Longitudinal Balance (dB)	40-60	<40

Note 1: Based on local test desk or an automated loop testing system, ie, mechanized loop testing (MTL).

Note 2: Must be established locally.

7. FORMS AND RECORDS

7.01 Figure 2 shows a form which can be used to record installation tests. The form is always completed by the designated control office for each circuit order. The noncontrol offices prepare the appropriate form for its own office, completing the items required for that office.

7.02 The WORD document from the TIRKS furnish a test detail form. Companies using WORD should refer to Section 682-400-010 for the description and objectives of the documents.

TABLE D

TRUNK RECORDS AND CIRCUIT ORDER TESTING INFORMATION
VOICE-FREQUENCY TELEPHONE REPEATERS

TYPE OF TELEPHONE REPEATER	SECTION	
	CIRCUIT LAYOUT RECORD CARD CODES AND ABBREVIATIONS	INITIAL LINEUP AND CIRCUIT ORDER TEST INFORMATION
Codes for Repeater Data	682-100-012	
Signaling and Transmission Systems Compatibility Information		179-100-301
Amplifier-Type Repeaters		
MFT (Metallic Facility Terminal)		332-9XX-XXX
V3		332-103-300
V4		332-104-500
E-Type (Negative Impedance) Repeaters		332-200-XXX
E-Type Repeaters		
E6 Repeater Lineup on Nonloaded Cable		311-240-501
E7 Repeater Lineup		332-207-301
EML Calculations for E-Repeatered and Nonrepeatered 2-Wire Trunks		682-000-101
Test Equipment		
2D and 2E Singing Point Test Sets (SP measurement for VF)		103-106-105
4A Signaling Test Set		179-360-501
54C Return Loss Measuring Set (VF ckts)		103-106-110
2G Repeater Test Set (Measures gain of E1 repeater)		103-107-100
E Repeater Test Set (E1, E2, & E3)		103-107-105
KS-20501 Return Loss Measuring Set (ERL, SRL, SRL-HI)		103-106-115
Singing Point Tests		
Singing Point Tests		332-015-300
Singing Point Tests on VF trunks		332-015-500

TABLE E

TRUNK RECORDS AND CIRCUIT ORDER TESTING INFORMATION SIGNALING EQUIPMENT

TYPE OF EQUIPMENT	SECTION	
	CIRCUIT LAYOUT RECORD CARD CODES AND ABBREVIATIONS	TEST INFORMATION
Codes for Signaling Equipment	682-100-015	
Signaling Equipment Losses at 1 kHz		304-207-100
Signaling and Transmission Systems Compatibility Information		
General		179-100-304
E-Type Signaling System		179-100-304
F-Type Signaling System		179-100-306
Overall Signaling Arrangements and Testing		
Overall Dialing—Trunk Pulsing—(From Testboard)		333-122-603
Overall Dialing—Trunk Pulsing—(From Test Jack)		333-122-605
Overall Dial Pulsing Tests—General		333-121-500
Applications of the 2B or 2B-1 Test Sets and Pulse Repeating Adapter		333-122-501
Dial Pulsing Tests on Trunks		333-123-500
Pulsing Requirements		333-124-500
Single Frequency Signaling System Signaling Tests		
Types E and F, Using 4A Signaling Test Set (J94743)		179-302-502
Test Extenders		
E-Type Test Extender		179-313-101
Test Extender for use With FWA, FWB, and FWC Units		179-362-101
Test Extender for use With Metallic Terminal Units		234-111-020
Test Extender for use With Metallic Facility Terminal		332-910-102
Test Extender for use With CPFT		332-610-500
Overall Tests on Trunks Employing SF Signaling		660-403-504

TABLE F

TRUNK RECORDS AND CIRCUIT ORDER TESTING INFORMATION
CARRIER TELEPHONE SYSTEMS

TYPE OF CARRIER SYSTEM	SECTION	
	CIRCUIT LAYOUT RECORD CARD CODES AND ABBREVIATIONS	TEST INFORMATION
J	795-200-000	
K and L Tandem	795-200-000	356-021-500
N	682-200-019	362-011-300
O	795-244-222	362-101-300
ON Carrier Units and Channel Groups	682-200-018	362-101-300
T	795-244-222	365-100-300
L-Type Carrier		
Assignment of Control Offices and Operating Responsibilities—L-Carrier Sections, L Units, Message Unit Radio, Line Pilot Sections, Mastergroups, Supergroups, Groups, and Channel Groups	682-000-015	
L1		358-010-300
L3		359-010-300
L4		359-001-011
L5		359-300-500
Adjustment of Transmission Levels of Multifacility Trunks—Intermediate Offices		660-450-504
Channel Net Gain Characteristics		660-450-505
Multiplex Terminal Equipment—Group to Group Pilot—Frequency and Noise Out-of-Service Testing		356-020-507

TABLE G

SUMMARY OF OVERALL INSTALLATION TESTS TO BE MADE BETWEEN CIRCUIT TERMINALS

TYPE OF TEST	PROCEDURE	REFERENCES	TEST REQUIREMENTS
Signaling Tests	Make overall signaling tests on all circuits	Table E	As covered in sections containing test methods
Overall Pulsing Tests	Make overall pulsing tests on dial pulsing circuits.	Table E	As covered in sections containing test methods
Listening and Operational Tests	Make operational test when order involves new or rearranged circuit by placing test calls to subscriber		All signaling devices (bells, lamps, etc) operate and that audible ringing tone is returned. Ringing is tripped when the station is answered Request a return call to a test number circuit talks satisfactory
1004-Hz Loss Measurements	Make measurements in both directions of transmission between circuit terminals using frequency of 1004 Hz at 1 milliwatt.		±1.0 dB of EML on circuit records operation of the switchable 2 dB pad in 4-wire trunk is to be verified. See balance test for references.
Gain-Slope Measurement	Make measurements in both directions of transmission between circuit terminals using frequencies of 404 and 2804 Hz at 1 milliwatt.		See Table H
Message Circuit Noise Tests	Make noise measurements from both ends of the circuits.		See Table I
Balance Tests	Make ERL and SRL measurements. Terminal balance is required at PBXs where 4-wire tie trunks designed at VNL are terminated. Through balance is required at tandem PBXs where 4-wire tie trunks designed at VNL are switched together.		DIMENSION® PBX, see Table J. Other PBX, see Table K. Operation of the switchable 2 dB pad in 4-wire tie trunk is to be verified.

Note: It is the responsibility of the control office to place the circuit in service (paragraph 1.06).

TABLE H

GAIN-SLOPE REQUIREMENTS FOR SWITCHED SPECIAL SERVICE CIRCUITS (NOTE)

CIRCUIT		ALLOWABLE DEVIATION FROM 1004 Hz	
		404 Hz	2804 Hz
Lines		−1.0 to +5.0 dB	−1.0 to +7.5 dB
Trunks		−1.0 to +3.0 dB	−1.0 to +4.5 dB
Non-Tandem Tie Trunk*	PBX to TSTBD	−1.0 to +4.0 dB	−1.0 to +5.0 dB
	TSTBD to TSTBD	−1.0 to +3.5 dB	−1.0 to +4.0 dB
	Overall	−2.0 to +8.0 dB	−2.0 to +10.0 dB
Tandem Tie Trunk*	PBX to TSTBD	−0.6 to +1.5 dB	−0.6 to +2.3 dB
	PBX to TSTBD	−0.5 to +1.5 dB	−0.5 to +2.2 dB
	Overall	−1.0 to +3.0 dB	−1.0 to +4.0 dB

Note: Frequency response is expressed in dB loss relative to 1004 Hz. Therefore, frequencies with losses higher than the 1004-Hz loss are + deviations and frequencies with losses lower than the 1004-Hz loss are — deviations.

*The overall limits must always be met. The sectional limits (PBX to TB or TB to TB) need not be met as long as the overall limits are met.

TABLE I

C-MESSAGE NOISE LIMITS FOR
SWITCHED SPECIAL SERVICES AND PBX CIRCUITS

Circuit Order Requirement and Maintenance Limit / Immediate Action Limit	
Use for circuits consisting solely of repeatered or non-treated loop plant.	
Plants Derived From Loop Plant Facilities (Voice Frequency Cable)	
Lines from Customer Station to serving CO or PBX: FX, Off-Premises Extension (OP), (SL) Secretarial, PBX On- and Off-Premises, WATS (WO, WX)	Measured at Customer Station 36 / 20 dBrnC
Trunks from Customer Location to serving CO: PBX-CO, FT, WATS (WI, WS) Long Distance (LT) PBX Tie Trunks (using loop plant facilities)	Measured at PBX 36 / 20 dBrnC

EXAMPLES OF USE OF NOISE OBJECTIVES FOR TRUNK PLANT IN SECTION 660-403-500, ISSUE 5

Note: Use tables of Sec. 660-403-500 for circuits with one or more links of trunk plant facilities (voice frequency or carrier).

Trunk EML 3.5 dB ICL 3.5 dB
Circuit Mileage 26 miles
Facility Lengths* N2 CXR 22 miles Cable 4 miles (N2 CXR is Compandored).
Noise limits 25/36 (From Table for voice frequency metallic facilities which gives higher noise values than table for analog carrier (CXR)-terrestrial-compandored at 26 miles, 3.5 dB EML.)

Trunk EML 5.0 dB ICL 3.5 dB
Circuit Mileage 110 miles
Facility Length* D3 CXR 40 miles A6 CXR 70 miles
Noise limits 30/34 (From Table for analog carrier (CXR)-terrestrial-noncompandored at 110 miles, 5.0 dB EML which gives higher noise values than table for digital carrier at 5.0 dB EML.)

Trunk EML 3.5 dB ICL 3.5 dB
Circuit Mileage 54 miles
Facility Length* N1 CXR 27 miles D1 CXR 27 miles
Noise Limits 25/30 (Either analog CXR-terrestrial-compandored or digital carrier tables give same values.)

*Individual facility mileages are not used in determining noise limits, only the overall circuit mileage and the facility types.

TABLE J

DIMENSION(R) PBX BALANCE REQUIREMENTS

THROUGH BALANCE TEST MEASUREMENT REQUIREMENTS				ERL (dB)		SRL (dB)	
	TO		2-dB SWITCH PAD	REQT (NOTE 1, 2)	IMED ACTION (NOTE 1, 2)	REQT (NOTE 1, 2)	IMED ACTION (NOTE 1, 2)
FROM TRUNK UNDER TEST	CONNECTED CIRCUIT	TERMINATION					
VNL Designed 4-Wire Tie Trunk	VNL Designed 4-Wire Tie Trunk	4-Wire Legs Terminated in 600 Ohms	Out on Both Trunks	27	20	23	16
TERMINAL BALANCE TEST MEASUREMENT REQUIREMENTS							
FROM	TO		SWITCH PAD				
	CIRCUIT UNDER TEST	TERMINATION					
VNL Designed 4-Wire Tie Trunk	4-Wire Tie Trunk, 4-Wire FX Trunk, or WATS Trunk (Long Haul)	Balance Termination at Distant PBX or CO	OUT at Near End IN at Distant End	22	15	16	11
	2-Wire Tie Trunk (Short Haul)	Balance Termination at Distant PBX	OUT *	18	10	13	6
	PBX-CO Trunks FX Trunks (FT) DID Trunks WATS Trunks Toll SWBD Trunks (LT)	Balance Termination at Class 5 or Toll Office	OUT *	18	10	13	6
			IN	12	8	10	6
	PBX Balance Test Termination	600 Ohm + 2.16 μF	IN	24	18	20	14
	Off-Premises Stations	Station Off-Hook (600 or 900 Ohms)	IN	12	8	10	6
	On-Premises Stations	Station Off-Hook (600 Ohms)	IN	16	8	10	6

Note 1: The switched special services must have ERL and SRL measurements equal to or greater than the requirement given. If the requirement is not met, this should be referred to the transmission engineer to determine if corrective action is necessary.

Note 2: Engineering practices state this value as a distribution (ie, median and minimum), but for installation and maintenance limits these are stated as (requirements and immediate action).

* The 2-dB pad should not be switched out where the loss of the connected facility is less than 2 dB.

TABLE K

PBX BALANCE REQUIREMENTS

THROUGH BALANCE TEST MEASUREMENT REQUIREMENTS					ERL (dB)		SRL (dB)	
FROM TRUNK UNDER TEST	TO		2-dB SWITCH PAD	PBX IMP	REQT (NOTE 1, 2)	IMED ACTION (NOTE 1, 2)	REQT (NOTE 1, 2)	IMED ACTION (NOTE 1, 2)
	CONNECTED CIRCUIT	TERMINATION						
VNL Designed 4-Wire Tie Trunk	VNL Designed 4-Wire Tie Trunk	4-Wire Leg Terminated in 600 Ohms	Out on Both Trunks	600 or 900 Ohms	27	20	23	16
TERMINAL BALANCE TEST MEASUREMENT REQUIREMENTS								
FROM	TO		2-dB SWITCH PAD	PBX IMP				
	CIRCUIT UNDER TEST	TERMINATION						
VNL Designed 4-Wire Tie Trunk	4-Wire Tie Trunk, 4-Wire Fx Trunk, or 4-Wire WATS Trunk (Long Haul)	Balance Termination at Distant PBX or CO	OUT at Near End IN at Far End	600 or 900 Ohms	22	15	16	11
	2-Wire Tie Trunk (Short Haul)	Balance Termination at Distant PBX	OUT *	600 or 900 Ohms	18	10	13	6
	PBX-CO Trunks FX Trunks (FT) DID Trunks (DI) WATS Trunks Toll SWBD Trunks (LT)	Balance Termination at Class 5 or Toll Office	OUT *	600 or 900 Ohms	18	10	13	6
			IN		12	8	10	6
	PBX Balance Test Termination	600 Ohm + 2.16 μF	IN	600 Ohms	24	18	20	14
		900 Ohm + 2.16 μF	IN	900 Ohms	24	18	20	14
	OFF Premises Stations	Station Off-Hook	IN	600 or 900 Ohms	12	8	10	6
	ON Premises Stations	Station Off-Hook	IN	600 Ohms	16	8	10	6
				900 Ohms	12	8	10	6

Note 1: The switched special services must have ERL and SRL measurements equal to or greater than the requirement given. If the requirement is not met, this should be referred to the transmission engineer to determine if corrective action is necessary.

Note 2: Engineering practices state this value as a distribution (ie, median and minimum), but for installation and maintenance limits these are stated as (requirements and immediate action).

* The 2-dB pad should not be switched out where the loss of the connected facility is less than 2 dB.

ORDER NO _____ PLANT TEST DATE _____ DATE DUE _____

CIRCUIT NO _____ DATE COMP. _____

TYPE OF TEST	* PLACE A CHECKMARK IN THE COLUMN FOR TEST TO BE MADE					RECORD TEST RESULTS FOR MAINTENANCE PURPOSES		REMARKS
	* TESTS TO BE MADE	DATE	BY	TESTS COMPLETED DATE	TESTS COMPLETED BY	TRANSMIT	RECEIVE	
DC TESTS (MULTIMETER)								
CAPACITY								
RESISTANCE								
FEMF								
CROSSES								
GROUND								
REPEATER TESTS (NOTE 2)								
GAIN								
BUILDOUT								
LOSS MEASUREMENTS								
1004 HZ								
GAIN-SLOPE TEST								
404 HZ.								
2804 HZ.								
MESSAGE NOISE dBRNCO								
RETURN LOSS (NOTE 1)								
SINGING (SRL)								
ECHO (ERL)								
PULSING TESTS-GENERAL								
SF-SIGNALING (NOTE 2)								
CARRIER LINEUP (NOTE 2)								
OPERATION TESTS								
LISTENING TEST								
PLACED IN SERVICE								

NOTES:
1. REQUIRED WHEN THERE IS 4W TO 2W INTERFACE
2. TESTS ARE REQUIRED IF CIRCUIT CONTAINS THIS EQUIPMENT

Fig. 2—Example of Form for Recording Test Results