1A LINE CONCENTRATOR MODIFIED FOR MF SIGNALING AND WADS-CONTROL END TESTS

CONTENTS

1. GENERAL INFORMATION

1.1 Description

1.11 This section provides a method for testing various functional features of the following circuits:

SD-96536-01	1A Line Concentrator - Control Circuit - 100 Line Unit
SD-96557-01	Modification of 1A Line Conc. for DTWX
SD-95971-01	MF SIG CKT for 1A Conc. - Control End

1.12 The tests of this section are intended to apply only to the modified 1A Line Concentrator adapted for MF signaling for use in the Dial TWX Switching program. The standard 1A Line Concentrator is covered by the information in Section 905 of Handbook 59.

1.13 The procedures covered in this section are arranged to test the control end and the remote end of the concentrator as separate entities, with the connecting circuit being simulated in each case by test equipment. The tests are divided into three parts; optional strapping and cross connections, supplementary test operations, and functional operating tests.

1.14 Where both originating end and terminating end are tied together, operational and maintenance test information is provided in the following BSP sections:

Title	No.	Available
PRE-INSTALLATION TESTS	067-106-501	Issue 1, June 1962
CUTOVER PROCEDURES	067-106-201	Issue 1, June 1962
TROUBLE ANALYSIS	067-106-301	Issue 1, June 1962
SYSTEM TESTS	067-106-502	Issue 1, June 1962

2. RECORDS AND REQUIREMENTS

2.1 Records

2.11 The results of the tests of this section shall be recorded on forms ID-1313 and ID-1315. For further information on test records, see Section 3 of Handbook 50.

2.2 Requirements

2.21 The tests of this section cover the basic signaling and supervisory control functions of the 1A concentrator adapted for MF signaling; as described in the associated CD- sheets. The tests of the MF signaling circuit agree with the requirements of BSP 067-106-501.

3. TESTING EQUIPMENT

3.1 Test Sets

Amt	ITE	Description
1	4033B	Link Frame Test Set
1	4253 or 4253A	MF Key Pulsing Test Set (Optional - See Par. 8.123)
1	4325 or J24753A	Timing Test Set

3.2 Cords

Amt	ITE	Lgth	Cdrs	One End	Other End	With ITE
2	9962	12'	10	Jones Socket	10-ITE-2461 Sockets	4033B
1	9598	12'	2	310 Plug	310 Plug	4033B
1	9726 or 9301	12'	3	310 Plug	3-ITE-2461 sockets or Push-On Clips	Accessory Set
1	9601	12'	3	310 Plug	310 Plug	Accessory Set

3.3 Accessories

Amt	ITE or Code	Description	With ITE
1	R-9572	Receiver & Cords, Tester's	Accessory Set
1	ITE-4627	15-Point Jones Plug	Order from Hawthorne
12	ITE-4085	Push-On Clip	Accessory Set
As Req.	R-2231 or	Toothpick	" "
10	KS-16887-L1	Blocking Wedge	Order from Hawthorne

4. OPTIONAL STRAPPING AND CROSS-CONNECTION ASSIGNEMENTS

4.1 When used for DTWX data transmission, the modified 1A line concentrator and associated signaling circuits are mounted on frames within the central office

at each end. At the control end, leads from the MF Signaling Circuit are brought to a distributing frame and are cross connected to corresponding leads from the control circuit. At the control circuit, local shop wiring is run to a group of terminal strips at the top of the relay rack unit. Installer's cabling is run to a corresponding group of terminal strips located above the terminal strips containing the local wiring. Cross connections are required between the two sets of terminal strips to connect the installer cabling with the local circuit leads.

4.2 At the MF Signaling Unit, straps are required to assign the proper battery or ground connections for the signaling detection relays. In addition, straps are required at both the MF Signaling Unit and the control circuit to obtain the required compensating resistance on the loop signal leads.

4.3 MF Signaling Circuit - Control End

4.31 Locate the "K" terminal strip at the relay rack equipment of the MF Signaling Circuit per SD-95971-01. If straps are not previously connected from job drawing instructions, strap terminals as indicated in Table 1 or as required for the particular job conditions. The strapping information in Table 1 is for a single 100-line concentrator unit arranged for N or ON carrier facilities with no expectation of AC interference and minimum value of cable resistance. If all of these conditions do not apply, check Notes 303, 304 and 305 of SD-95971-01-D1.

4.32 Check continuity of leads from the unit "B" T.S. to the MDF as shown in the lower part of Table 1. Verify that leads are cross connected to the corresponding leads of the control circuit (SD-96536-01) at the distributing frame. These leads will connect to the terminals for the first group (GO) at the control circuit. If two 50-line units are provided, a second MF Signaling Unit will be equipped. In such a case, the "K" T.S. strapping will be different and the leads at the distributing frame for the second unit will cross connect to the leads for the second group (G1) at the control circuit.

4.4 Control Circuit - SD-96536-01

4.41 If job wiring information has not provided straps at the (A-H) terminal strip, connect straps as indicated in Table 2. All of these straps are connected on a single terminal strip which is designated (A-H) vertically and numbers (1-5) across.

4.42 At the top of the control circuit unit, local cabling terminates at a group of terminal strips running across the unit. Installer cabling terminates at a corresponding group of terminal strips located above the unit terminal strips. Precut jumpers are furnished to cross connect the upper and lower terminal strips. Terminal strips and lead terminations are shown on wiring drawings T-96557-11 and T-96536-11 & 12.

TABLE 1

STRAPPING REQUIREMENTS FOR MF SIG UNIT - CONTROL END

Connect Lead	To Lead	"K" T.S. Strap Term.	SD-95971-01 Reference	Functional Purpose
GO	GRD	26-36	B1-loc. C4	Ground TSO lead
SG1	GRD	36-46	B1-loc. E4	" RSO lead
SB0	SB4	54-55	B1-loc. E5	Bat. and ground on
SB4	SB6	45-55	B1-loc. E5	TS1 lead
B1	SB5	34-35	B1-loc. F5	Bat. and ground on
SB5	SB7	25-35	B1-loc. F5	RS1 lead
E1	E2	13-23	B3-loc. D0	N or ON Carrier Pad
E3	E6	14-33	B3-loc. D0	" " " " "
A4	A5	42-52	B5-loc. B0	1406 ohms on D1 lead
B4	B5	41-51	B5-loc. B0	1406 ohms on D2 lead

Connect Lead	To Lead	"K" T.S. Term	Carrier Option: Output Level	Functional Purpose
E1	E2	13-23	-22 dbm	N Carrier Pad Resistance
E3	E6	14-33		
E1	E4	13-43	-30 dbm	K, O. ON, L Carrier Pad
E5	E6			

Connect At MDF	To Control Ckt Lead at MDF	"B" T.S. Appearance Term.	SD-95971-01 Reference	Functional Purpose
TSO	TSO	43	B1-loc. B9	Complete path TSO lead
RSO	RSO	33	B1-loc. D9	" " RSO "
TS1	TS1	23	B1-loc. E9	" " TS1 "
RS1	RS1	13	B1-loc. F9	" " RS1
D1	D1	52	B5-loc. B0	Complete path D1 lead
D2	D2	42	B5-loc. B0	" " D2 "

NOTE: For 100-line unit, cross connect to Group 0 leads for Control Circuit. For two 50-line units, use Groups 0 and 1. Each group requires a separate MF Signaling Circuit.

TABLE 2

STRAPPING REQUIREMENTS FOR CONTROL CIRCUIT

Connect Lead	To Lead	T.S. on Misc.	Connect Term.	SD-96536-01 Reference	Functional Purpose
A2	A3	A	2-3	B3-loc. C1	650 ohms on TS0 lead
B2	B3	B	2-3	B3-loc. D1	650 ohms on RS0 lead
C2	C3	C	2-3	B3-loc. G2	" " " TS1 "
D2	D3	D	2-3	B3-loc. H2	" " " RS1 "
	(Group 1 leads) - (equipped but not cross connected)				
E2	E3	E	2-3	B3-loc. A1	650 ohms on TS0 lead
F2	F3	F	2-3	B3-loc. B1	" " " RS0 "
G2	G3	G	2-3	B3-loc. E1	" " " TS1 "
H2	H3	H	2-3	B3-loc. F1	" " " RS1 "

TABLE 3

JUMPERS AT CONTROL CIRCUIT - SD-96536-01

Lead	From Upper T.S. "A"	To Lower T.S. "A"
TB(00-19)	00-19	00-19
48	20	20
47	21	21
46	22	22
AR,LK	23	23
TO	24	24
RO	25	25
R1	26	26
OFT	30	30
ST	31	31
A4	33	33
G	34	34
R	35	35
DL	37	37
MJ	39	39
R(TEL)	40	40
R1(TEL)	41	41
R(SP)	42	42
S(SP)	43	43
D2(1)	44	44
D1(1)	45	45
D2(0)	46	46
D1(0)	47	47
T(TEL)	50	50
T1(TEL)	51	51
T(SP)	52	52
RSO(0)	60	60
RS1(0)	61	61
TSO(0)	70	70
TS1(0)	71	71
RSO(1)	62	62
RS1(1)	63	63
TSO(1)	72	72
TS1(1)	73	73
TBS Grd	79	79
"V" Grd	78	78
Grd(A-G)	80-86	80-86
48V(A-N)	100-112	100-112
48V "V"	118	118
48V TBS	119	119
WADS NETWORK LEADS		
TGB1	93	93
TGB0	92	92
CPT	91	91

TABLE 3 (Cont'd)

Lead	From Upper T.S. "A"	To Lower T.S. "A"
LINES 00-47 50-97 (T,R,S)	LINES 00-47 50-97 (Hold open until after test)	LINES 00-47 50-97
TRUNKS 00-19 (T,R)	TRUNKS 00-19 (Hold open until after test)	TRUNKS 00-19

4.43 Using the precut jumpers provided, cross connect upper and lower terminal strip leads as outlined in Table 3. Leave LINES and TRUNKS cross connections open until after tests of this section are completed.

4.44 Verify that LINE circuits 48, 49, 98 and 99 are not equipped with cross connections. These line circuits are connected by test jacks from the upper to the lower terminal strips.

4.45 At the "A" T.S., at the top of the frame, verify that terminals 89 and 90 are strapped together and connected to relay rack ground. For WADS application, check that center conductor of shielded cable carrying "CPT" tone is connected to terminal 91, and shield is connected to terminal 90.

4.46 WADS Modification

4.461 At the control circuit relay unit, verify that the bottom mounting plate is equipped with two 278A type terminal strips designated "WO" and "W1". Verify that the TGO (A-E) capacitors are mounted on the 278A T.S. designated "WO" and the TG1 (A-E) capacitors are on the "W1" T.S.

4.462 Test for presence of ground and verify connection of ground lead at terminal 89 of the upper frame terminal strip "A". Check for ground at terminal 23 of T.S. "WO" and W1" at the bottom mounting plate of the control circuit relay unit.

5. FUSING

5.1 MF Signaling Circuit - SD-95971-01

5.11 If fuses are not previously installed, check (A) and (B) fuse posts for absence of false battery and ground. Resistance ground will be present on the (C) fuse post from the normally operated AC, OT and ABC relays. Using a voltmeter or test receiver, check at location indicated for 48V battery when the designated fuse is installed:

CAPACITY	POTENTIAL	TEST FOR VOLTAGE AT
1-1/3 AMP	48V SIG(A)	Lower wdg term. RO relay
1-1/3 AMP	48V SIG(B)	Lower wdg term. T1 relay
1-1/3 AMP	48V SIG(C)	Lower wdg term. CT relay

5.2 Control Concentrator Circuit - SD-96536-01

5.21 Fuses are shop mounted in the control circuit and do not require removal for testing. The 20A fuse should be removed while connections are being made to the central office 48V supply. Verify that direct ground is not present on the 20A battery terminal.

5.22 In the modification for DTWX, an additional fuse and associated ground are required to feed the TL(-) keys and lamps. Verify that the (V) fuse battery and ground leads are terminated at the upper terminal strip on the control bay. If job information does not indicate assignment of this fuse, connect battery lead to terminal 118 and ground lead to terminal 78 at the upper terminal strip. Install fuse at the associated fuse location.

6. TIMING TESTS

6.1 The signaling features of the 1A concentrator adapted for MF conversion are dependent on critical timing characteristics of a number of control relays. Timing tests are required at the MF Signaling Circuits at the Control End. Timing requirements of the control circuit unit are verified during shop tests and will require job verification only if trouble indications point to inaccurate timing adjustments.

6.2 In the modification for the DTWX program, a special timing requirement is applied to the TM1 relay of the concentrator control circuit. This relay will require job verification.

6.3 MF Signaling Circuit - SD-95971-01

6.31 Timing tests are required for seven relays in this circuit. Use the Timing Test Set ITE-4325 on the maintenance test set per J24753A for these tests. Make calibration test of the test set per TM0-4325, Paragraph 3.3.

6.32 Using an ITE-9598 cord, connect 48V battery and ground to the 48V jack on the test set. Using an ITE-9303 cord, connect one end to the (TST 1) jack of the test set. Connect leads at the other end of the cord as shown for the tests of the individual relays as indicated in the associated column of Table 4.

6.33 Set SEND key, REC SW and MIL-SEC switch at the settings shown for each relay in Table 4. Block relays and insulate contacts as shown in Table 4.

6.34 Operation Tests

6.341 For each relay under test, perform additional preparations as indicated in the associated paragraph. For each test, hold the TST key to the OPR position for at least 5 seconds. Verify that the meter reading is as shown for each relay.

6.342 ABC Relay

6.3421 Block relays nonoperated as outlined in Table 4. After operating TST key to OPR position check that meter reading indicates as follows:

MIN: 70 MIL-SEC
MAX: 74 MIL-SEC

6.3422 If reading is not obtained initially, adjust ABC potentiometer and repeat test until proper reading is obtained. After test, remove block from MC1 relay.

6.343 CT Relay

6.3431 Block nonoperated relays if not previously blocked from test of ABC relay, and insulate contact 3 of CK relay, as outlined in Table 4. In addition, connect ground to contact 12B of relay CT with an ITE-9547 cord equipped with alligator clips. After operating TST key to OPR position, check that meter reading indicates as follows:

MIN: 58 MIL-SEC
MAX: 62 MIL-SEC

6.3432 If reading is not obtained initially, adjust CT potentiometer and repeat test until proper reading is obtained. After test remove blocks from RO, R1, and R4 relays and remove insulator from CK relay. Remove ground from CT relay contact.

6.344 OT Relay

6.3441 Block relays and insulate contacts as shown in Table 4. In addition, remove GB relay from socket during timing tests. After operating TST key to OPR position, check that meter reading indicates as follows:

MIN: 18.6 MIL-SEC
MAX: 19.4 MIL-SEC

6.3442 If reading is not within limits initially, adjust OT potentiometer and repeat test until proper reading is obtained. After test, replace GB relay in its socket and remove blocks and insulator from relays.

TABLE 4

TIMING SET TEST SETUP FOR

MF SIGNALING CIRCUIT - SD-95971-01

Relay Under Test	Block Relays or Insulate Contacts	Connect ITE-9303			Test Set Preparation			
		Black (BK)	Red (RD)	White (WH)	SEND Key	REC SW Start	REC SW Stop	MIL-SEC Switch
ABC	Block nonoperated relays MC1, R0, R1,R4	Grd	Contact 5 on R0 relay	Upper 1 winding terminal relay R10	BK	48V	GRD	0-100
CT	Block nonoperated relays R0,R1,R4. Insulate Contact 3 of CK relay	Grd	1 Upper Wdg. of CT relay	Contact 12 of CT relay	BK	OC	GRD	0-100
OT	Block nonoperated XM1A,XM2A,GBA. Insulate 6B of GBA relay. Block operated relay T1	Grd	Contact 6 of GBA relay	Contact 5 of T1 relay	MK	OC	GRD	0-20
RLSA	Block operated GBA,T11,RRA	Grd	1 Upper Wdg. of RLSA	Upper Wdg. of MC3	BK	48V	GRD	0-100
RST	Block nonoperated relay T10. Insulate 8B contact on relay T10	Grd	Contact 8 on relay T10	Contact 1 on relay T10	MK	GRD	OC	0-100
XM1	Block nonoperated XM1A,XM2A,AC. Insulate 6B of AC	Grd	Upper wdg. of TR1	Upper wdg. of XM1A	MK	GRD	48V	0-100
XM2	Block nonoperated XM1A,XM2A,AC. Insulate 6B of AC relay	Grd	Upper wdg. term. TR1	Upper wdg. term. XM2A	BK	GRD	48V	0-500

6.345 RLSA Relay

6.3451 Block operated relays as shown in Table 4. After operating TST key to OPR position, check that meter reading indicates as follows:

MIN: 91 MIL-SEC
MAX: 99 MIL-SEC

6.3452 If reading is not within limits, adjust RLSA potentiometer and repeat test until proper reading is obtained. After test, remove blocks from relays and momentarily operate RLSA relay manually to clear the circuit.

6.346 RST Relay

6.3461 Block nonoperated relay T10 and insulate contact 8B as shown in Table 4. Using an ITE-9547 cord equipped with alligator clips or an ITE-9425 cord equipped with push-on clips, connect ground to contact 10F of relay RRA. After operating TST key to OPR position, checks that meter reading indicates as follows:

MIN: 48 MIL-SEC
MAX: 52 MIL-SEC

6.3462 If reading is not within limits, adjust RST potentiometer and repeat test until required reading is obtained. After test, remove block and insulator from relay T10 and disconnect ground from RRA relay. Manually operate relay RLSA momentarily to clear circuit after test.

6.347 XM1 Relay

6.3471 Block nonoperated and insulate relays as shown in Table 4. After operating TST key to OPR position, check that meter reading indicates as follows:

MIN: 55 MIL-SEC
MAX: 75 MIL-SEC

6.3472 If reading is not within limits, change strapping at XM1 capacitors and repeat test until required reading is obtained. After test, leave relays blocked and insulator in place for the test of the XM2 relay.

6.348 XM2 Relay

6.3481 If relays are not blocked from previous test of XM1 relay, block relays and insulate contact as

shown in Table 1. After operating TST key to OPR position, check that meter reading indicates as follows:

MIN: 165 MIL-SEC
MAX: 225 MIL-SEC

6.3482 If reading is not within limits change strapping at XM2 capacitors and repeat test until required reading is obtained. After test, remove blocks and insulator from relays shown in Table 4.

6.4 Concentrator Control End TM1 Relay - SD-96536-01

6.41 Prepare Timing Test Set as outlined for previous tests. At the control circuit, block nonoperated relay AT. Insulate contact 6F of relay TM2 and contact 8B of relay G1.

6.42 Connect ITE-9303 cord leads as follows:

BK to ground
RED to upper winding terminal of TM1 relay
WH to upper winding terminal of AT relay

6.43 Set controls on test set as follows:

SEND KEY	REC SW	MIL-SEC SW
BK	START-48V STOP-GRD	0-5000

6.44 After holding test key to the OPR position for 10 seconds, check that time elapsed is within the following requirements:

MIN: 2200 MIL-SEC
MAX: 4500 MIL-SEC

6.45 If reading is not within limits check values of TM1 and TC1 resistors for accuracy and check TM1 capacitor for open or short. Since no potentiometer is provided for this relay, the only means of varying the timing is to replace components.

7. SUPPLEMENTARY TESTS

7.1 MF Signaling Circuit - SD-95971-01

7.11 Mark Counter

7.111 At the MF Signaling Circuit, manually operate and release relay MA three times and observe results after each operation as shown below. If contacts on MA relay bunch (Make before break), sequence will not function properly. If fast manual operation does not eliminate bunching, it may be necessary to operate relay electrically. To operate relay electrically, connect ground with any convenient cord to the upper winding terminal of relay MA.

7.112 Test Sequence

MA Relay	Observe Relays	
	Operate	Release
Operate	MC1	
Release	MC1,MC2	
Operate	MC1,MC2,MC3	
Release	MC2,MC3	MC1
Operate	MC3	MC1,MC2
Release	MC1,MC3	MC2

7.113 After completing test, momentarily operate relay RLSA and observe that relays MC1, MC2 and MC3 are released.

7.12 MF Signal Output

7.121 Using a voltmeter or test receiver connected to high resistance ground, verify that there is no 48V potential at the relay contacts shown below. The false presence of 48V battery will damage the oscillator supply circuit. Check each of the following contacts for presence of a single MF tone as indicated. For this test the actual frequency need not be verified, but the relative change in pitch should be checked as the tests proceed from the lowest to the highest tone:

MF Tone or Frequency No.	(Test Rec. Conn.to HRG) Check at Relay
700(0)	T4 Relay, contact 2F
900(1)	T1 " " "
1100(2)	T2 " " "
1300(4)	T5 " " "
1500(7)	T8 " " "
1700(10)	XM2A " " "

7.122 Block nonoperated relay MC1 in the MF Signaling Circuit. Block nonoperated relays R0 and R1 in the Control Circuit Remove relay ABC from its socket at the MF Signaling Circuit. Using the test setup shown in Figure 1, connect the MF output of the Signaling Circuit (jack J6) to the input of the MF Receiving Circuit or to the input jack J2 of ITE-4253.

7.1221 The nominal output level at the J6 jack of the MF Signaling Circuit is -22 dbm for two frequencies using the strapping recommended for N carrier termination. Since this level is also the minimum input level for the MF Receiver Circuit, the receiver may not respond to the output tones of the Signaling Circuit. If the level is found to be too low to activate the receiver properly, change the test connection to the J7 jack of the MF Signaling Circuit. This will provide a higher output level but will not check the output pad resistances.

7.123 If the test setup is not available for these tests. exact identification of MF signals may be postponed until operation tests are performed. For this arrangement, simply connect a test receiver across the T and R leads of the cord connected to the J6 jack of the MF Signaling Circuit.

7.124 In performing tests of MF Signaling Circuit tone output. both MF Signaling Circuits must be tested when "S" Option is specified in the Control Circuit.

7.125 When testing the MF Signaling Circuit associated with Group O, block operated relay G(O) and connect a shorting strap across resistor S2 (3760 ohms) in the control circuit. Release relay G(O) and disconnect shorting strap after test.

7.126 When testing the MF Signaling Circuit associated with Group 1, block operated relay G(1) and connect a shorting strap across resistor S1 (3760 ohms) in the control circuit. Release relay G(1) and disconnect shorting strap after test.

7.127 Perform test operations as outlined in Table 5. Verify that the T(-) relay operates and output tones are detected as shown for each test.

TABLE 5

MF SIG CKT TONE OUTPUT TESTS - SD-95971-01

Test No.	Test Operations	Observe Results	
		Relay Operates	Check Tone Output
1	Block operated RLSA relay.	GBA & T11 operate.	1 & 10 (900 & 1700)
2	Remove block from RLSA, block operated RRA.	T11 releases, T10 operates. GBA operated.	0 & 10 (700 & 1700)
3	Remove block from RRA, operate and release MA	T10 releases, T9 operates with MA	2 & 7 (1100 & 1500)
4	Remove block from MC1 and momentarily operate MC3	MC1,MC3,S1A,S2A,S3A,S4A, GBA, T8 operate	1 & 7 (900 & 1500)
5	Block nonoperated relays S3A, S4A	S1A,S2A,T1 & GBA operate, T8 releases.	0 & 1 (700 & 900)
6	Release S4A, block nonoperated S2A	S1A,S4A,T2 & GBA operated, T1 releases.	0 & 2 (700 & 1100)
7	Release relay S2A	S1A,S2A,S4A,T3 & GBA operated, T2 releases.	1 & 2 (900 & 1100)
8	Block nonoperated S1A and S4A	S2A,T4 & GBA operated, T3 releases.	0 & 4 (700 & 1300)
9	Release S4A and S3A	S2A,S3A,S4A,T5 & GBA operated, T4 releases.	4 & 7 (1300 & 1500)
10	Block nonoperated S3A	S2A,S4A,T6 & GBA operated, T5 releases.	2 & 4 (1100 & 1300)
11	Block nonoperated S2A, release 53A	S3A,S4A,T7 & GBA operated, T6 releases.	0 & 7 (700 & 1500)
12	Release S2A & 1A, momentarily operate RLSA	RLSA locks up, then releases MC1,MC3,S1A,S2A,S3A,S4A,T7 release.	None

If the MF Receiver is used, tones may be identified by observing operation of digit registration relays in receiver with can cover removed. During these tests, all the S(-)A relays are electrically energized and must be blocked down manually to obtain the proper combinations.

7.128 After completing tests of Table 5, manually release relay RLSA and check that it remains released. Remove blocks from relays RO and R1 in the control circuit.

7.13 Test Line Keys

7.131 At the MF Signaling Circuit, operate key L49. Observe that TEST lamp lights. Block normal relay AC and observe that relay TR1 operates and XM1A operates momentarily. Block operated relay TR1, unblock relay AC, then release L49 key. Remove block from TR1 relay and check that TR1 remains operated. Manually release relay AC momentarily and check that TR1 releases and TEST lamp is extinguished.

7.132 Operate key L99. Observe that TEST lamp lights. Block normal AC relay and check that relay TR2 operates and XM1A operates momentarily. Block operated relay TR2. unblock relay AC, then release L99 key. Remove block from TR2 relay and check that TR2 remains operated. Manually release relay AC momentarily and check that TR2 releases and TEST lamp is extinguished.

7.2 Control Circuit - SD-96536-01

7.21 Sequence Control

7.211 Block nonoperated relays RL1 and RL2 at the Control Circuit. Manually operate and release relay M in sequence and observe that relays operate as indicated below. If relay contacts bunch (make before break) on M relay, it may be necessary to operate relay electrically if fast manual operation does not give desired results.

M Relay	Relays Operate
Operate	W1
Release	W1,Z1,Z1A
Operate	W2
Release	W2,Z2,Z2A
Operate	W3
Release	W3,Z3,Z3A
Operate	W4
Release	(All above relays remain operated except W4)

7.212 Release relays RL1 and RL2. Relay RL1 will operate electrically. Observe that relays W1, W2, W3, Z1, Z1A, Z2, Z2A, Z3 and Z3A release.

7.22 Operate key TO. Check that relay TO operates and COK lamp lights. Release key and observe that TO releases and lamp is extinguished. Operate key T1 and observe that relay T1 operates and lamp COK lights. Release key and check that T1 relay releases and lamp is extinguished.

7.23 SL Relay Chain

7.231 At the control circuit, momentarily operate each SL(-) relay, one at a time, in turn, and check that the associated LA(-) and LB(-) relays, one pair at a time, operate while the SL(-) relay is operated:

SL(-) Relay	LA(-) Relay	LB(-) Relay
00-08	00	00-08
09-17	01	00-08
18-26	02	00-08
27-35	03	00-08
36-44	04	00-08
45-49	05	00-04
50-58	06	09-17
59-67	07	09-17
68-76	08	09-17
77-85	09	09-17
86-94	10	09-17
75-99	11	09-13

7.24 At the test jack strip mounted at the side of the control circuit, operate key TL0. Check that TL0 lamp lights. Block normal relay AC in the MF Signaling Circuit and check that TEST lamp does not light at the MF Signaling unit. At the control circuit test jack strip, operate key GO. Verify that relay TR1 operates and TEST lamp lights at the MF Signaling unit. Release key TL0 at the jack strip and unblock relay AC at the MF Signaling unit. Check that relay TR1 is released and TL0 and TEST lamps are extinguished. Release key GO at the test jack strip.

7.25 At the test jack strip, operate key TL1. Check that TL1 lamp lights. Block normal relay AC in the MF Signaling Circuit. Check that relay TR2 does not operate. At the control circuit jack strip, operate key GO. Verify that relay TR2 operates and TEST lamp lights at the MF Signaling unit. At the jack strip, release key TL1 and unblock relay AC at the MF Signaling unit. Check that relay TR2 is released and lamps TL1 and TEST are extinguished. Release key GO at the test jack strip.

7.26 The tests described above cover a single MF unit for one 100-line concentrator. If a second unit is furnished, repeat the tests using the G1 key.

7.3 Trunk Load Control

NOTE: Test methods call for blocking operated a number of hold magnets. The magnetic latching hold magnets may remain operated after mechanical blocking is removed. If this happens, the hold magnets must be manually released after testing.

7.31 Group 0

7.311 At the Control Circuit, block operated or block closed the off-normal springs of hold magnet 0 at switch B(0). At switch C(0), block operated hold magnets 0-4 one at a time until relay DP0 operates. Verify that it takes either 3, 4, or 5 operated hold magnets to operate DP0 relay. Release hold magnet 0. Relay DP0 releases.

7.312 Operate the lowest number magnet which has not been operated yet, and check that DP0 operates. Release magnet 1. DP0 releases. Continue the process up to magnet 9, checking that it takes the same number of magnets to operate DP0. Then remove blocks from hold magnets at switch C(0) and hold magnet 0 at switch B(0).

7.32 Group 1

7.321 At the Control Circuit, block operated or block closed the off-normal springs of hold magnet 9 at switch B(1). At switch C(1), block operated hold magnets until relay DP1 operates. In the same manner as 7.311 and 7.312, check all hold magnets on switch C(1) and verify that it takes the same number of magnets to just operate relay DP1. After test, remove blocks from switches B(1) and C(1).

7.33 In the above tests, the TLC0 or TLC1 relay is operated when three to five (depending on manufacturing tolerances) hold magnets are off-normal on the (C) crossbar switch. Since the operation of these polar relays is difficult to observe directly, the operation of the DP(-) relays is observed, since the operate path of the DP(-) relay is controlled by a make contact of the TLC(-) relay.

7.34 (Special Condition When an Incomplete Group of Trunks is Assigned in Service): If the operating company has assigned an incomplete group of trunks in which the number is less than the number of hold magnets required to activate the trunk load control feature, it will be necessary to disable this feature after completing installation tests so that service disconnect calls can be made. The trunk load control feature may be bypassed by strapping out the wiring terminals for the armature and make contact of the TLC(0) and TLC(1) relays.

7.4 Trunk Overflow

NOTE: Test methods call for blocking operated a number of hold magnets. The magnetic latching hold magnets may remain operated after mechanical blocking is removed. If this happens, the hold magnets must be manually released after testing.

7.41 Using flat toothpicks or KS-16887-L1 Relay Blocking Wedges, block operated hold magnets 0-9 at crossbar switch A(0). Observe that relay TGB0 operates. Release one hold magnet and check that TGB0 releases. Remove blocks from all other hold magnets.

7.42 Block operated hold magnets 0-9 at crossbar switch A(1). Observe that relay TGB1 operates. Release one hold magnet and check that TGB1 releases. Remove blocks from all other hold magnets.

7.5 Overflow Tone

NOTE: In performing the tests of Paragraph 7.5 and Tables 6 and 7, overflow tone may be audible at a low level at the line circuits indicated as being cut off. This is a feedback tone caused by cable induction. Trouble is indicated only if the feedback tone and signal tone are heard at the same level.

7.51 Group 0

7.511 Block operated relays TGB0 and LB00. Then block operated and release relays as shown in Table 6 and test for presence of low tone interrupted at a 60 IPM or 120 IPM rate at the ring lead of the line circuit indicated. Verify that tone is cut off one line and is present on succeeding line as indicated.

TABLE 6

Test No.	Test Operation: Block Operated Relay	Test Operation: Release Relay	Observe Results: Overflow Tone Present At	Observe Results: Overflow Tone Cut Off At
1	SL 45		Line 45-R	
2	SL 36		Line 36-R	Line 45-R
3	SL 27	SL 45	Line 27-R	Line 36-R
4	SL 18	SL 36	Line 18-R	Line 27-R
5	SL 09	SL 27	Line 09-R	Line 18-R
6	SL 00	SL 18	Line 00-R	Line 09-R
7		SL (00, 09)		Line 00-R

7.512 After completing tests of Paragraph 7.51 remove blocks from relays TGB0 and LB00.

7.52 Group 1

7.521 Block operated relays TGB1 and LB09. Then block operated and release relays as shown in Table 7 and test for presence of low tone interrupted at a 60 IPM or 120 IPM at the ring conductor of the line circuit indicated. Verify that tone is cut off each line as it is connected to the succeeding line. Use test receiver connected to ground to check for tone.

TABLE 7

Test No.	Test Operation: Block Operated Relay	Test Operation: Release Relay	Observe Results: Overflow Tone Present At	Observe Results: Overflow Tone Cut Off At
1	SL 95		Line 95-R	
2	SL 86		Line 86-R	Line 95-R
3	SL 77	SL 95	Line 77-R	Line 86-R
4	SL 68	SL 86	Line 68-R	Line 77-R
5	SL 59	SL 77	Line 59-R	Line 68-R
6	SL 50	SL 68	Line 50-R	Line 59-R
7		SL 59 SL 50		Line 50-R

7.522 After completing tests of Paragraph 7.52 remove blocks from relays TGB1 and LB09.

7.6 Call Progress Tone Signals - WADS APPLICATION ONLY

7.61 When using the 1A Concentrator for data service, the overflow tone must be of a type that can be detected by the data machine circuits. Ordinary low tone signals are not suitable for this purpose. For WADS applications, a special tone is provided and is designated as the Call Progress Tone.

7.62 The basic Call Progress Tone is a frequency shifted high tone which varies between 2025 cycles and 2225 cycles at a 20 cycle rate. The net audible effect is that of a warbling high pitched tone very similar to a cricket's chirp. The CPT Overflow Tone is the basic tone interrupted at a 120 IPM rate.

7.63 From job records, determine whether the 1A Concentrator under test is assigned for WADS usage. If the circuit has a WADS designation, perform the tests of Paragraphs 7.511, 7.522 with the exception that the overflow tone to be checked at the ring conductor of the line circuit shall be the CPT Overflow Tone.

7.7 Dial Tone Speed Register Control (If Equipped)

7.71 Using a voltmeter or test receiver connected to ground, verify that resistance battery (226 ohms to -48V) is present on the R lead to the dial tone speed register control circuit as follows:

R Lead for	Upper Frame T.S. "A"
Group 0	Term. 25 (R0)
Group 1	Term. 26 (R1)

7.72 Block operated relay TGB0 and check that battery is removed from R0 lead. Release TGB0 relay and check battery is reconnected to R0 lead.

7.73 Block operated TGB1 relay (if equipped) and check that battery is removed from R1 lead. Release TGB1 relay and check that battery is reconnected to the R1 lead.

7.74 After completing tests, disconnect voltmeter or test receiver.

7.8 TM1 Recovery Time Modification (SD-96557-01, ISS. 4AR)

7.81 Verify that TC4 resistor (226 ohm, KS-8512) is equipped at the terminal strip at the bottom of the control relay unit. Using a voltmeter, test for -48V at one side of the resistor. This resistor is wired in parallel with the TC1 resistor to increase charging rate of the TM capacitor between calls (see SD-96557-01-B2, FS4).

8. FUNCTIONAL OPERATION TESTS

8.1 Functional Layout

8.11 At the control end, the MF Receiver which normally furnishes the input signal to the MF Signaling Circuit is connected to the output end of the signaling circuit if the ITE-4253A, MF Key

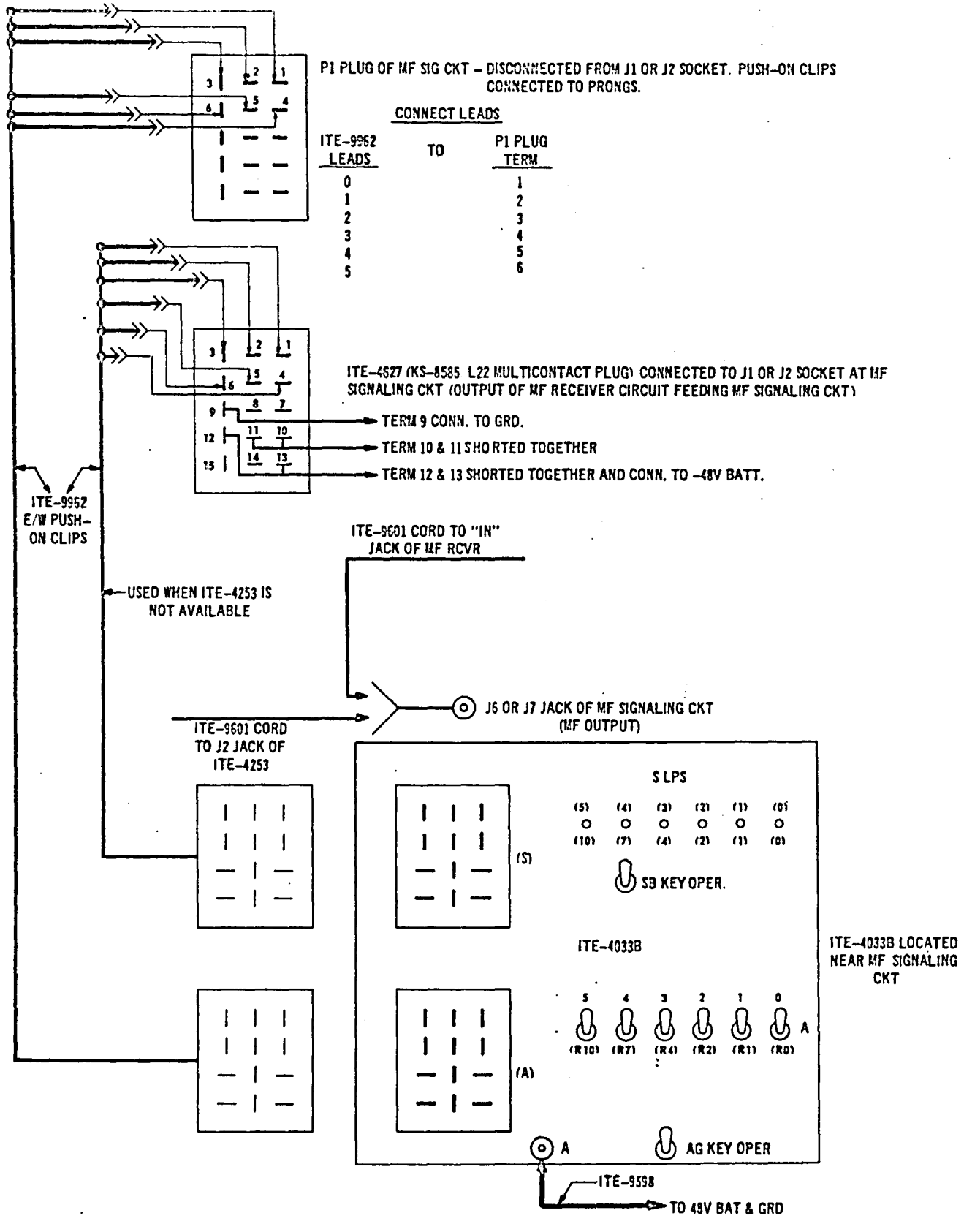

FIG. 1 TEST SETUP FOR OPERATION TESTS AT CONTROL END LOCATION

Pulsing Test Set, is not used instead. The ITE-4033B, Link Frame Test Set, is used at the input end of the signaling circuit to simulate the functions of the remote end.

8.12 Test Setup

8.121 At the MF Signaling Circuit, disconnect the P1 plug from the J1 or J2 multicontact socket. At the ITE-4033B, connect the socket of an ITE-9962 cord into the (A) plug on the test set. Insert ITE-4085 Push-On Clips into the ITE-2461 sockets of six leads at the other end of the cord and connect to theprongs of the P1 plug as shown below: (See Figure 1)

ITE-9962 Cord Lead	P1 Plug Terminal	Relay Winding Connection
0(A0)	1	R0
1(A1)	2	R1
2(A2)	3	R2
3(A3)	4	R4
4(A4)	5	R7
5(A5)	6	R10

8.122 At ITE-4033B, operate key AG and check that all (A) keys are normal. Using an ITE-9598 cord, connect 48V battery and ground to the (A) jack of the test set.

8.123 If the MF Receiver Circuit has been checked out and is in operating condition, the MF output of the concentrator control circuit may be connected to the input of the MF Receiver and the DC output of the receiver may be used to light indicating lamps in the ITE-4033B test set. If the receiver is not in operating condition. the ITE-4253A, MF Key Pulsing Test Set. may be used to receiver the MF signals from the signaling circuit.

8.124 MF Signals Detected With Local MF Receiver (See Figure 1)

8.1241 At the MF Signaling Circuit, connect an ITE-4627, 15-point blank multicontact Jones plug to the J1 or J2 socket for the working MF Receiver. Using an ITE-9962 cord. connect ITE-4085 Push-On Clips to the first six ITE-2461 sockets at one end of the cord. Connect the push-on clips to the wiring terminals of the ITE-4627 as shown in Figure 1. Connect sockets 0-5 to the terminals numbered 1-6 of the multicontact plug. Connect the socket end of the ITE-9962 cord to the (S) multicontact plug on ITE-4033B. Operate key SB on the test set. (See Figure 1).

8.1242 Using an ITE-9601 cord, connect J6 jack of MF Signaling Circuit to the "IN" jack of the MF Receiving Circuit. Verify that "Q" option strap (Term. 11 & 12 at T.S. A) is removed at the MF Receiver Circuit.

8.1243 At the ITE-4627 Jones plug, strap together terminals 10 and 11 with bare strap wire. Then strap together terminals 12 and 13 and connect to 48V battery with an ITE-9547 cord equipped with insulated alligator clips. Using a second ITE-9547 cord, connect terminal 9 to ground. Check that relays KP1 and KP2 are operated in MF Receiver Circuit.

8.1244 With the above test setup, signals from the remote end are simulated by operating of A(-) keys in ITE-4033B to cause operation of R(-) relays in the MF Signaling Circuit. When the signaling circuit and concentrator control circuit function to send MF Signals to the remote end, the output signal is patched into the local MF receiver. The resultant DC output is connected to the S(-) lamps in the test set to indicate the tones received. If signal level from J6 jack is too low, change test connection to J7 jack at MF Signaling Circuit.

8.125 MF Signals Detected with ITE-4253A, MF Key Pulsing Test Set.

8.1251 If the ITE-4253A is to be used, locate the test set near the MF Signaling Circuit. Using an ITE-9601 cord, connect jack J6 of the signaling circuit to jack J2 of the test set.

8.1252 Connect the power cord of ITE-4253A into the nearest 110V AC receptacle and turn on power switch. Set SA and SR switches at position 11 (unconnected). Set SEL selector switch at KP position.

8.1253 When MF tones are transmitted to the test set, frequency indicating lamps will light, showing the frequencies received. If lamps do not light or all lamps light while tones are received, adjust BIAS ADJ potentiometer on ITE-4253A until the desired 2 out of 6 lamps light. See Section 32 of Handbook 50 for description of the MF receiving circuit of ITE-4253A.

8.13 Test Operations

8.131 At the MF Signaling Circuit, remove the ABC mercury type tube from its socket and store upright in a protected place.

8.132 Connect to the G(O) MF Signaling Circuit for calls in Group O and connect to the G(1) MF Signaling Circuit for calls in Group 1. For all tests, block operated relays R2 and R4 in the MF Signaling Circuit not being used for test to maintain proper idle indications in the control circuit.

8.133 Perform the tests of Tables 8, 9 and 10 to simulate service request, terminating and disconnect call features. After completing tests, check that no relays are blocked and all R(-) relays are normal in the MF Signaling Circuit. Leave relay ABC disconnected for the following tests.

TABLE 8

TEST OF SERVICE REQUEST CALL FEATURES

AT CONTROL END

Test No.	Test Operation			Observe Results	
	At ITE-4033	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
1	Operate keys A2,A3			Relays R2,R4,S2A,S4A operate	Relays S2A. S4A operate
2	Release keys A2,A3			R2,R4 release	No change
3	Operate keys A1,A2	Block operated relay TM1 during operate interval to stop cycling. Block nonoperated relay RL1		Relays R1,R2,S1A, S2A,S4A,MA,GBA.MC1, T9,AC operate	Relays S1A, S2A,S4A.M, CG0.CGA0.HSK0. HS00.CCK.GO. SR0.SRP0 operate
4	Release keys A1,A2			Relays R1,R2 release	
5	Operate keys A1,A5			Relays R1.R10 operate, MA,GBA.T9 release MC2.CK.CT operate	M releases. RK2.W1,Z1.Z1A operate.
6	Release keys A1,A5	Block nonoperated B0,B1,B3		Relays R1,R10 release CK,CT release. MA. GBA,MC3,T9 operate	RK2 releases. M,SB1,SB2 operate
7	Operate keys A2,A3			Relays R2,R4,S2A, S4A operate	S2A.S4A.B4. BA4 operate
8		Remove blocks from B0,B1,B3			Relays B0,B1. B3 do not operate
9	Release keys A2,A3			Relays R2,R4 release	
10	Operate keys A1,A5	Block nonoperated relay ABC		Relays R1,R10,CK.CT operate. Relays MA, MC1,T9.GBA release	RK2.Z2,Z2A,W2. MK operate Relays M, S2A. S4A release.
11	Release keys A1,A5	Block nonoperated A0 relay		Relays R1,R10,CK,CT, MC2 release. Relays MA,GBA,T9 operate	RK2 releases. Relays M,W3 operate.
12	Operate keys A2,A3			Relays R2,R4,S2A, S4A operate	Relays S2A, S4A.CCK,A3 operate
13	Release keys A2,A3	Remove block from A0		Relays R2,R4 release	Relay A0 remains nonoperated.
14	Operate keys A1,A5			Relays R1.R10.CK operate. Relays S2A,S4A,MA,GBA,T9 release. MC1 operates	Relays S2A, S4A.M.MK.CCK release. Relays RK2.Z3. Z3A operate
15	Release keys A1,A5			Relays R1.R10.CK release	RK2 releases
16		Block operated relay HMK			Relays M.MK, SB1,SB2 operate
17		Block operated relay HSK0. Manually operate and release, in turn, relays			
18		HS01	(700) and (1100) lps or S0 and S2 lps light	Relays S4A,T2 operate	Relay S4A operates
19		HS02	(700) and (1500) lps or S0 & S4 lps light	S3A,S4A,T7 operate	S3A,S4A oper-
20		HS03	(700) and (1300) lps or S0 & S3 lps light	S2A,T4 operate	S2A operates

(Cont'd)

TABLE 8 (Cont'd)

Test No.	Test Operation			Observe Results	
	At ITE-4033	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
21		HS04	(1100) and (1300) lps or S2 & S3 lps light	S2A,S4A,T6 operate.	S2A,S4A operate.
22		HS05	(1300) & (1500) lps or S3 & S4 lps light	S2A,S3A,S4A,T5 operate.	S2A,S3A,S4A operate.
23		HS06	(700) & (900) lps or S0 & S1 lps light	S1A,S2A,T1 operate.	S1A,S2A operate.
24		HS07	(900) & (1100) lps or S1 and S2 lps light	S1A,S2A,S4A,T3 operate.	S1A,S2A,S4A operate.
25		HS08	(900) & (1500) lps or S1 & S4 lps light	S1A,S2A,S3A,S4A,T8 operate.	S1A,S2A,S3A, S4A operate.
26	Operate keys A1,A5	Release HS08	(1100) & (1500) lps or S2 & S4 lps light	Relays R1,R10,CK operate.	RK2 operates.
27		Remove block from RL1.	All lps out	Relays MA,GBA,T9, MC1,MC3 released.	RL1 operates. Relays M,SB1, SB2, MK and W4 release.
28	Release keys A1,A5	Remove block from HSK0 relay.		Relays R1,R10,CK release.	Relays CG), CGA0,G0,HS00, HSK0,RK2,SR0 and S(-)A release.
29		Block nonoperated relay AT. Remove blocks from ABC,HMK and TM1 relays. Manually release RL1 if locked up.			Relays HMK,TM1 & RLI release. Relay ABC should remain nonoperated.
30	Operate keys A2,A3	Remove block from relay AT.		Relays R2,R4,S2A, S4A operate.	Relays S2A, S4A,TM1 operate.
31	Release keys A2,A3			Relays R2,R4 release.	
32	Operate keys A3,A4 (Group 1)	Block operated relay TM1 to stop cycling. Block nonoperated relay RL1.		Relays R4,R7,S3A,MA, GBA,MC1,T9,AC operate.	Relays S3A, CG1,CGA1,M, CCK,HS10,HSK1, G1,SR1,SRP1, W1 operate.
33	Release keys A3,A4			Relays R4,R7 release.	
34	Operate keys A1,A5			Relays R1,R10,CK,CT, MC2 operate. Relays MA,GBA,T9,S2A,S3A, S4A release.	Relays RK2,Z1, Z1A operate. Relays M,CCK, S2A,S3A,S4A release.
35	Release keys A1,A5	Block nonoperated B0,B1, relays.		Relays R1,R10,CK,CT release. Relays MA, GBA,T9,MC3 operate.	Relay RK2 released. Relays M,SB1, SB2, W2 operate.
36	Operate keys A1,A2			Relays R1,R2,S1A, S2A,S4A operate.	Relays S1A, S2A,S4A,B7, BA7 operate.

(Cont'd)

TABLE 8 (Cont'd)

Test No.	Test Operation		Observe Results		
	At ITE-4033B	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
37	Release keys A1,A2	Remove blocks from B0,B1 relays		Relays R1,R2 release	B0 and B1 remain nonoperated
38	Operate keys A1,A5	Block nonoperated relay ABC		Relays R1,R10,CK, CT operate. Relays MC1,S1A,S2A,S4A,MA, T9,GBA release.	Relays RK2,Z2. Z2A.W2,MK operate. Relays M,SB1, SB2.S1A.S2A. S4A released.
39	Release keys A1,A5			Relays MA,GBA,T9 operate. Relays CK, CT,MC2,R1,R10 released.	Relay RK2 releases. Relays M.W3 operate.
40	Operate keys A0,A3			Relays R0,R4.S2A, operated	Relays S2A.A2, CCK operate
41	Release keys A0,A3			Relays R0,R4 release	
42	Operate keys A1,A5			Relays R1,R10,CK, MC1 operate. Relays S2A,MA,GBA,T9 release	Relays RK2.Z3. Z3A operate. Relays S2A.M. MK.CCK release
43	Release keys A1,A5			Relays R1,R10,CK release	RK2 releases
44		Block operated HMK			Relays M,MK, SB1,SB2 operate
45		Block operated HSK1 relay. Manually operate and release, in turn, relays:			
46		HS11	(700) and (1100) lps or S0 & S2 lps light	Relays S4A,T2 operate	Relay S4A operates
47		HS12	(700 & (1500) lps or S0 & S4 lps light	Relays S3A,S4A,T7 operate	Relays S3A. S4A operate
48		HS13	(700) & (1300) lps or S0 & S3 lps light	Relays S2A,T4 operate	Relay S2A operates
49		HS14	(1100 & (1300) lps or S2 & S3 lps light	Relays S2A,S4A,T6 operate	Relays S2A. S4A operate
50		HS15	(1300) & (1500) lps or S3 & S4 lps light	Relays S2A,S3A,S4A, T5 operate	Relays S2A. S3A,S4A operate
51		HS16	(700 & (900) lps or S0 & S1 lps light	Relays S1A,S2A,T1 operate	Relays S1A. S2A operate
52		HS17	(900) & (1100) lps or S1 & S2 lps light	Relays S1A,S2A,S4A, T3 operate	Relays S1A. S2A,S4A operate
53		HS18	(900) & (1500) lps or S1 & S4 lps light	Relays S1A,S2A,S3A, S4A,T8 operate	Relays S1A. S2A,S3A,S4A operate

(Cont'd)

TABLE 8 (Cont'd)

Test No.	Test Operation		Observe Results		
	At ITE-4033B	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
54	Operate keys A1,A5	Release HS18	(1100) & (1500) lps or S2 & S4 lps light	Relays R1,R10,T9,CK operate	Relay RK2 operates
55	Block non-operated T11 relay in MF SIG CKT.	Remove block from RL1 relay	All lps out	MA,GBA,T9,MC1,MC3 released. RLSA operates.	RL1 relay operates. Relays M,MK, SB1,SB2 S-A, released
56	Release keys A1,A5	Remove block from HSK1 relay		CK releases	Relays CG1, CGA1,G1,HS10, HSK1,RL1,W(-) and Z(-) released.
57	Remove block from T11 relay			Relay T11 operates and releases. RLSA releases.	
58		Block non-operated relay AT. Remove blocks from relays HMK, ABC and TM1			HMK & TM1 release.
59		Remove block from relay AT.			RL1 & AT operates with TM1 nonoperated

TABLE 9

TEST OF TERMINATING CALL FEATURES AT CONTROL END

NOTE: To prevent overheating of AT and RL1 relay windings, relay TM1 or relays R2 and R4 in signaling circuit maybe left blocked operated ONLY IF WRITTEN NOTICE IS SUBMITTED TO TELEPHONE COMPANY SIGNED BY JOB SUPERVISOR AND CONSPICUOUS TAG IS FASTENED TO RELAY RACK LOCATION. In normal operation, R2 and R4 relays are held operated by idle circuit tones.

Test No.	Test Operation		Observe Results		
	At ITE-4033B	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
1	Operate keys A2,A3			Relays R2,R4,S2A, S4A operate. Relay AC releases	Relays S2A, S4A operate. Verify that no hold magnets are operated in crossbar switches
2	(Group "0") Call	Block non-operated RR1 and RR2. Then block operated SL10.			Relay LA01, LB01,G0,TER0 operate. TM1 operates and releases, cycling control ckt.
2A	(Group "1") Call	Block non-operated RR1 and RR2. Then block operated SL60.			Relays LA07, LB10,G1,TER1
3		Block operated TM1 during operate interval			Control circuit stops cycling.

(Cont'd)

TABLE 9 (Cont'd)

Test Operation				Observe Results	
Test No.	At ITE-4033B	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
4		Remove block from RR1		Relays S2A,S4A released. Relays RRA and T10 operate momentarily, then release.	Relay RR1 operates. Relays S2A,S4A release
5	Release keys A2, A3 (Group "0")	Remove block from RR2	(900) & (1100) lps or S1 & S2 lps	Relays G3A,S1A. S2A,S4A,MC1,MC3. T3 operate. Relays R2,R4 release.	Relays RR2,M. CCK,CGO,W1. CTAO,S1A,S2A. S4A operate
5A	Release keys A2,A3 (Group "1")	Remove block RR2	(1300) & (1500) lps or S3, & S4 lps.	Relays GBA,S2A. S3A,S4A,MC1,MC3 TS operated. Relays R2,R4 release.	Relays RR2,M. CCK,CGO,W1. CGA1,S2A,S3A. S4A operate.
6	Operate keys A1,A5 (Group "0")		All lps out	Relays R1,R10,CK operate. Relays S1A,S2A,S4A,GBA, T3 release	Relays RK2,Z1. Z1A operate. Relays M,S1A. S2A,S4A release.
6A	Operate keys A1,A5 (Group "1")		All lps out	Relays R1,R10,CK operate. Relays S2A,S3A,S4A,GBA T5 release	Relays RK2,Z1. Z1A operate. Relays M,S2A. S3A,S4A,released.
7	Release keys A1,A5		(700) & (1100) lps or S0 & S2 lps light	Relays R1,R10, release. Relays S4A,GBA,T2 operate	RK2 releases. Relays SB1,M, W2,S4A operate
8	Operate keys A1,A5			Relays R1,R10,CK operate. Relays S3A,S4A,GBA,T2 release.	RK2 operates. S3A,S4A release. Z2,Z2A operate
9	Release keys A1,A5		(700) & (1500) lps or S0 & S4 lps light	Relays R1,R10,CK release. Relays S3A,S4A,GBA,T7 operate.	RK2 releases. Relays SB1,M. W3,S3A,S4A operate.
10	(Group"0")	Block nonoperated relay AT. Remove block from SL10 and TM1	All lps out	Relays S3A,S4A,GBA. T7 released. RLSA operates momentarily	Relays SB1,M. W3,S3A,S4A release RL1 operates and locks
10A	(Group "1")	Block nonoperated relay AT. Remove Block from SL60 and TM1.	All lps out	Relays S3A,S4A,GBA T7 released. RLSA operates momentarily	Relays SB1,M. W3,S3A,S4A, release. RL1 operates and locks
11		Remove block from relay AT.			RL1 and AT are operated with TM1 nonoperated.

TABLE 10

NOTE: To prevent overheating of AT and RL1 relay windings, relay TM1 or relays R2 and R4 in signaling circuits may be left blocked operated ONLY IF WRITTEN NOTICE IS SUBMITTED TO TELEPHONE COMPANY SIGNED BY JOB SUPERVISOR AND CONSPICUOUS TAG IS FASTENED TO RELAY RACK LOCATION In normal operation, R2 and R4 relays are held operated by idle circuit tones.

	Test Operation			Observe Results	
Test No.	At ITE-4033A	At Control Ckt	At ITE-4253 or ITE-4033B	At MF SIG Ckt	At Control Ckt
1	Operate keys A2,A3			Relays R2,R4,S2A,S4A operate	Relays S2A,S4A TM1 operate. RL1 and AT release.
2	(Group "0")	Block operated DP0 relay. Block operated TM1 during operate interval		S4A releases.	Relays DO,GO, TSTO, DIS (00-06) operate. S4A releases.
2A	(Group "1")	Block operated DP1 relay. Block operated TM1 during operate interval		S2A releases.	Relays DI,GI, TST1, DIS (10-16) operate. S2A releases.
3	(Group "0")	Block nonoperated RR1,RR2, RL1. Block operated HS02			Relay HSK0 operates. TST0 released
3A	(Group "1")	Block nonoperated RR1,RR2, RL1. Block operated HS12.			Relay HSK1 operates. TST1 released
4	(Group "0")	Remove block from RR1		RRA,T10,GBA operate momentarily then release. MC1,MC3 operate. S2A, released	RR1 operates. S2A, released
4A	(Group "1")	Remove block RR1		RRA,T10,GBA operate momentarily then releases. MC1,MC3 operate. S4A released.	RR1 operates. S4A released
5	Release keys A2,A3 (Group "0")	Remove block from RR2	(700) & (1300) lps or S0 & S3 lps light	GBA,T4,S2A operate. R2,R4 release	RR2,M,W1,S2A relays operate
5A	Release keys A2,A3 (Group "1")	Remove block from RR2	(1100) & (1300) lps or S2 & S3 lps light	GBA,S4A,T6 operate R2,R4 release	RR2,M,W1,S4A relays operate
6	Operate keys A1,A5		All lps out	Relays R1,R10,CK operate. Relays S2A, T4,GBA release. (Group "0") or S4A T6,GBA release (Group "1")	RK2,Z1,Z1A operate. Relays M,S2A release.
7	Release keys A1 and A5.	Block nonoperated relay AT. Remove blocks RL1,TM1,HS02 and DP0.		All relays released	RL1 operates & locks DO,GO, DIS (00-06) release
8		Remove block from relay AT.			RL1 and AT are operated with TM1 nonoperated.

9. MISCELLANEOUS TESTS

9.1 Leads to Traffic Usage or Concentrator Trunk Usage Recorder

9.11 At the control circuit, momentarily operate each TB(-) relay, one at a time, in turn. While each relay is operated, check that the associated TB(00-19) terminal is grounded at the upper "A" T.S., terminals 00-19.

9.2 Leads to LIT Control Ckt.

9.21 At the control circuit, momentarily operate each LA(00-11) relay, one at a time, in turn. While each relay is operated, check that terminal 24 of the upper "A" terminal strip is grounded. If concentrator tests interfere with LIT frame, block nonoperated associated (LC) relay in LIT frame until tests are completed.

9.3 Fuse Alarms

9.31 Insert an operated fuse into the PF fuse socket at the control circuit. Check that red FA lamp and aisle pilot light and audible alarm sounds. In most offices, fuse alarm is associated with the major audible alarm. If alarm sending circuit is used, check that sending circuit relay operates associated with lead A4 (T.S. A, term 33 at the control bay). Remove operated fuse and replace with a good fuse. Check that FA lamp and aisle pilot are extinguished and audible alarm is silenced. Check that alarm sending relay is released.

9.32 At the relay rack containing the MF Signaling Circuit, insert an operated fuse into the C fuse socket. Check that fuse alarm is activated as described above.

9.4 Service Alarms

9.41 Block nonoperated relays RL1, AT and TM1 at the control circuit. Check that relay SAL operates, lamp AL (white) lights and office alarm sounds. Release relay AT and observe that it operates and relay SAL remains operated. If alarm sending circuit is used, check that relay operates in sending circuit associated with lead 48 (T.S. A, term 20 at the control bay).

9.42 Momentarily operate AR key at the control bay and check that SAL releases, AL lamp is extinguished and audible alarm is silenced. If alarm sending circuit is used, operate alarm release key momentarily at the sending circuit or alarm transfer circuit and observe that SAL is released as described above. Check that sending circuit relay is released.

9.43 Block relay RK2 operated and momentarily manually release relay AT. Observe that relay CAL operates and locks, lamp AL (white) lights and office alarm sounds. If alarm sending circuit is used, check that relay operates in sending circuit associated with lead 46 (T.S. A, term 22 at the control bay).

9.44 Momentarily operate AR key at the control bay or at alarm sending or alarm transfer unit. Check that CAL is released, lamp AL is extinguished. and audible alarm is silenced. If alarm sending circuit is used, check that associated sending circuit relay is released.

9.45 Release relay RK2 and block operated relay CCK. Manually release relay AT momentarily. Observe tha RAL operates and locks, lamp AL (white) lights and office alarm sounds. If alarm sending circuit is used, check that relay operates in sending circuit associated with lead 47 (T.S. A, term 21 at the control bay).

9.46 Momentarily operate AR key at the control bay or at the alarm sending or alarm transfer circuit. Check that RAL is released, lamp AL is extinguished, and audible alarm is silenced. If alarm sending circuit is used, check that associated sending circuit relay is releas

9.47 Release relay CCK and check that no alarm relays operate. Remove block from relay TM1 and check that it remains released. Remove block from relay RL1 and check that it operates.

9.5 At the MF signaling Circuit, block operated relays R2 and R4. At the control circuit, check that relay TM1 operates and relays AT and RL1 release. Remove blocks from relays R2 and R4 and check that TM1 releases and AT and RL1 operate.

9.6 Replace the ABC tube into its socket at the MF Signaling Circuit. Observe that relays R2 and R10 operate. Insert P1 plug into J2 socket and check that relays KP1 and KP2 operate in the standby MF Receiver Circuit. Remove P1 plug from J2 socket and plug into J1 socket. Check that relays KP1 and KP2 are released in the standby circuit and are operated in the regular MF Receiver Circuit. Leave P1 plug connected to J1 socket.

9.7 Test Jacks

9.71 At the terminal strips at the top of the control bay, verify continuity of T, R and S leads from the upper to the lower terminal strips for line circuits 48, 49, 98, and 99. Verify that no cross connections are run for these circuits.

9.72 At the test jack strip mounted on the control bay, insert an ITE-9601 cord into the T and R test jack for line 48. Verify that continuity is cut off for the T and R leads between the terminal strips and sleeve of cord is grounded. Check that there is continuity from the T and R of the unconnected end of the test cord to the T and R terminals for line 48 at the lower terminal strip. Disconnect cord from T and R jack and plug into S jack for line 48. Check that there is no continuity for the S lead from the upper to the lower terminal strip for line 48 and sleeve of cord is grounded. Verify that there is

continuity from the R of the test cord to the S terminal of line 48 at the lower terminal strip. Then disconnect test cord from jack for line 48.

9.73 Repeat the tests of Paragraph 9.72 for line circuits 49, 98 and 99.

9.8 Lines and Trunks

9.81 Verify continuity of leads for LINES (00-99) and TRUNKS (00-19) from the upper frame terminal strip to the distributing frame at which the cable terminates. Test for crosses, reverses and transposition of leads.

9.9 Miscellaneous Jacks

9.91 SP jack

9.911 Insert an ITE-9601 cord into the SP jack of the control bay. Verify continuity of T, R and S leads from the unconnected end of the cord to the distributing frame appearance of the leads. If the cross connection has been run in and connected, check continuity to the adjacent frame appearance of the SP jack. Test leads for crosses and reverse while checking continuity. Disconnect cord after test.

9.92 TEL jacks

9.921 Insert the plug of a telephone set (ITE-9650 or equivalent) into the TEL jacks of the control bay. Insert a second telephone set into an adjacent frame appearance of the TEL circuit and verify transmission and audibility from each end. If no transmission is obtained, verify that cable leads from terminals 40, 41, 50 and 51 at the upper terminal strip on the control bay are run to the nearest working appearance of the frame line telephone circuit or are cross-connected to the working frame line at the distributing frame. Disconnect telephone sets after test.

9.93 Test Battery Supply

9.931 Using a test receiver or voltmeter, check test battery terminals for 48V and ground as designated. Using a test receiver or volt-ohmmeter check HRG terminal for high resistance or 12,000 ohms to ground.

9.932 Insert an ITE-9598 cord into the frame48V jack. Check that 48V battery is present on the tip of the unconnected cord plug, and ground is present on the sleeve of the plug. Disconnect cord after test.

→Arrowed lines indicate new or changed information.

Superintendent, Installation Engineering

Reason for Reissue:
To add reference to BSP test information and correct key references in Tables 9 & 10. Replaces Section 906 dated 9-20-62.