1600- OR 2000-CYCLE SINGLE FREQUENCY SIGNALING CIRCUIT SD-56202-01

TESTS

1. GENERAL

1.01 This section describes a method of testing the 1600 or 2000 cycle single frequency signaling circuits SD-56202-01 consisting of a signaling circuit J68602CH, and a blocking amplifier J68602CJ, using the test equipment SD-56137-01, the No. 2B or No. 2A signaling test set, and a 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 and the features tested are:

A. Sensitivity of Receiver

This test checks that:

(a) Ground is on the E lead when no signaling tone is being received.

(b) The receiver is not too sensitive.

(c) The receiver is sensitive enough.

(d) The saturation current of the V3 tube meets its requirement.

(e) The receiver sensitivity is properly reduced by operation of the S relay.

B. Pulsing Performance of Receiver

This test checks that:

(a) The receiver responds to long pulses.

(b) Short pulses are lengthened by the receiver.

(c) The receiver ignores speech currents or other currents which, for short intervals, simulate signaling tone.

(d) The receiver in the talking condition ignores signals lasting 100 milliseconds or less.

(e) The receiver in the talking condition responds to a rering signal lasting 120 milliseconds or more.

C. Guard Sensitivity

This test checks that the following conditions obtain in the receiver:

(a) The guard prevents false operation on frequencies other than the signaling tone frequency, when the receiver is in the talking condition.

(b) The guard of the receiver at the originating end is removed and the receiver becomes sensitive to all frequencies while "on-hook" supervision is being received. This prevents speech from affecting the guard and, thereby, causing false release of the receiver while awaiting subscriber answer.

(c) The guard sensitivity of the receiver at the terminating end is reduced while awaiting subscriber answer. This causes the receiver to respond quickly to incoming dial signals and yet remain relatively unaffected by noise and speech on an intercepted call.

(d) There is no guard action when the trunk is idle.

D. Transmitter Performance

This test checks that:

(a) The transmitter sends out low level signaling tone when ground is connected to the M lead.

(b) The transmitter does not send out signaling tone when battery connects to the M lead.

(c) Varistors VR10 and VR11 are not short circuited.

E. Momentary High Level Signaling Tone Test

This test checks that the HL relay operates properly to change the level of the transmitted signal.

F. Timing of CO Relay

This test checks that:

(a) The CO relay holds during the make interval of a slow dial with minimum percent break.

(b) The CO relay releases when the make interval of the dial is sufficiently long.

G. Timing of T Relay

This test checks that the T relay holds, under control of its associated gas tube timing circuit, on 60 i.p.m. supervisory signals and that it releases after a delay of from 1 to 2 seconds.

H. Timing of RR Relay

This test checks that when the signaling circuit is in the talking condition, the following occurs:

(a) The RR relay holds for 160 milliseconds. This extends the duration of the transmitted rering pulse.

(b) The RR relay releases within 190 milliseconds, which prevents undue lengthening of the rering pulse.

I. Gain Test of Voice Amplifier

This test checks that the voice amplifier has approximately zero gain at 1000 cycles.

J. Voice Amplifier Network Insertion Loss - Using No. 13A TMS

This test checks that the signaling frequency is properly blocked when the network associated with the voice amplifier is inserted in the transmission path.

K. Voice Amplifier Network Insertion Loss - Using 40B TMS

This test checks the same features as test J.

L. Gain Test of Blocking Amplifier

This test checks that the blocking amplifier has approximately zero gain at 1000 cycles.

M. Blocking Amplifier Network Insertion Loss Test - Using No. 13A TMS

This test checks that the signaling tone is properly blocked when the blocking amplifier network is inserted in the transmission path. This test is required only where the blocking amplifier is equipped with an F or an OF relay and an N filter.

N. Blocking Amplifier Network Insertion Loss Test - Using 40B TMS

This test checks the same features as test M.

1.04 These tests are made at the miscellaneous test equipment jacks of SD-56137-01, at the test jacks of the single frequency signaling bays, at the test jacks of the blocking amplifier bays, and at the test jacks of the blocking network bays.

1.05 The tests should preferably be made during periods of light traffic as they require the circuit to be out of service.

1.06 Tests L, M, and N require an assistant at the blocking amplifier or blocking network bays when these circuits are located away from the signaling circuit bay.

1.07 All relay covers should be in place during tests and during the heating periods specified in this section, unless otherwise specified.

1.08 Various values of signaling power or testing conditions are specified in this section. The value to be used is determined from the following, depending on the circuit transmission levels.

(a) +4 Line, -13 Line

"+4 Line" indicates that the signaling receiver connects to the circuit at a point where the transmission level is +4db.

"-13 Line" indicates that the associated signaling transmitter connects to the circuit at a point where the transmission level is -13db.

(b) +7 Line, -16 Line

"+7 Line" indicates that the signaling receiver connects to the circuit at a point where the transmission level is +7db.

"-16 Line" indicates that the associated signaling transmitter connects to the circuit at a point where the transmission level is -16db.

1.09 Where reference is made in this section to the 1600~ SEND or 2000~ SEND jacks, use whichever frequency corresponds to the receiver of the signaling unit under test, unless otherwise specified.

1.10 The No. 13A transmission measuring set and the 40B transmission measuring system are referred to in this section as TMS.

1.11 The No. 2A and No. 2B signaling test sets are referred to in this section as No. 2A test set or No. 2B test set.

1.12 Adjustments specified in this section should not be attempted during periods of power supply irregularities.

1.13 Adjustment of the signaling test set for increasing values of per cent break must be made slowly, otherwise the pulsing rate may drop suddenly to half that indicated by the PULSES PER SECOND meter. This condition will be indicated by the rate of vibration of the PERCENT BREAK meter pointer being half that of the pointer on the PULSES PER SECOND meter. When this occurs, normal operation is restored by turning the ADJ % BK control fully counterclockwise and then turning it slowly clockwise to produce the desired per cent break.

1.14 Lettered Steps: The letters a, b, c, etc., are added to a step number to indicate that the step covers an action which may or may not be required depending on local conditions. The condition under which a lettered step or series of steps are made is given in the ACTION column, and all steps in the same test governed by the same condition are designated by the same letter. Where a condition does not apply, the associated steps should be omitted.

2. APPARATUS

2.01 The apparatus required for each test is shown in the following list. The details for each item are covered in the indicated paragraphs.

2.02 No. 2A signaling test set - J64730A (SD-56134-01) or No. 2B signaling test set - J64730B (SD-56134-02).

2.03 No. 13A transmission measuring set, or 40B transmission measuring system or equivalent.

2.04 Test equipment on bay, including voice amplifier, pads and attenuator, keyer circuit, and jacks as shown on SD-56137-01.

2.05 P4H cord, 6 feet long, equipped with two No. 327A plugs (4P18D cord) (for patches between pairs of test jacks).

Note: Shorter cords such as the No. 4P18B cord (4 feet), and the No. 4P18A cord (2 feet) may be used where desired.

2.06 P2A cord, 6 feet long, equipped with two No. 347A plugs (red shells) (2P1D cord) (for patching between M jack of No. 2A or No. 2B test set and Misc M jack of keyer, or EQ M jack or between EQ M jack and 48V jack). Omit one cord in tests A, B, H, J, or K when 48V jack is not provided.

2.07 P2A cord, 6 feet long, equipped with two No. 347B plugs (black shells) (2P3B cord) (for patches between E jack of No. 2A or No. 2B test set and EQ E jack).

2.08 P3K cord, 12 feet long, equipped with two No. 310 plugs (3P15B cord) (for patches between MA jack of No. 2A or No. 2B test set and DC jack of signaling unit, between RR jack of test set and DC jack of signaling unit, or between 60 (i.p.m.) jack and R jack of signaling unit).

2.09 W2CA cord, 5 feet 6 inches long, equipped with a No. 327A plug (2W36A cord) (for connecting the No. 13A TMS to E TST, M TST jacks or to SEND IMW jack). Omit this cord when using 40B TMS.

2.10 W1H cord, 10 feet long equipped with a No. 347B plug, and a No. 360A tool (1W8A cord) and a KS-6278 tool (to connect 48 volt battery to EQ M jack). Omit this cord when 48V jack is provided.

2.11 No. 52A head telephone set.

2.12 No. 310 plug with tip and ring short circuited (for use in R jack of signaling unit).

2.13 No. 258D plug (red) (for use in P jack of No. 2A or No. 2B test set, or in DC jack of signaling unit).

2.14 No. 165D plug (red) (for disconnecting signaling receiver from line.)

Apparatus	Number Required for Tests													
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)
Signaling test set (2.02)	1	1	1	1	1	1	1	1	-	-	-	-	1	1
TMS (2.03)	1	1	-	1	-	-	-	-	1	1	1	1	1	1
Test equipment (2.04)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Patching cord (2.05)	4	4	7	3	2	2	1	-	2	4	4	2	6	5
Patching cord (2.06)	2	2	1	1	1	1	1	2	-	1	1	-	1	1
Patching cord (2.07)	1	1	1	1	-	-	-	-	-	-	-	-	-	-
Patching cord (2.08)	1	-	-	-	-	-	1	1	-	-	-	-	-	-
Testing cord (2.09)	1	1	-	1	-	-	-	-	1	1	-	1	1	-
Testing cord (2.10)	1	1	-	-	-	-	-	1	-	1	1	-	-	-
Operator head set (2.11)	-	-	-	-	1	1	1	-	-	-	-	-	-	-
Short circuited plug (2.12)	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Dummy plug (2.13)	-	-	-	-	-	-	-	-	-	1	1	-	-	-
Dummy plug (2.14)	-	-	-	-	-	-	2	2	-	-	-	-	2	2

3. PREPARATION

STEP	ACTION	VERIFICATION
	Initial Preparation of No. 2A or No. 2B Signaling Test Set	
1	Set all lever keys to normal	
2	Set SCALE SEL switch to PPS	
3	At the miscellaneous test equipment jacks - Plug TST BAT B (−24 +130) and TST BAT A (−48) cords into TST BAT B and TST BAT A jacks	After 1 minute PULSES PER SECOND meter reads other than 0
4a	When using No. 2B test set - Operate CONT PLS key to DIAL PLS	PERCENT BREAK meter reads 0 on black scale (See step 6c)
5b	When using No. 2A test set - Operate PPS key to DIAL SUPV	PERCENT BREAK Meter reads 0 on black scale
6c	If requirement of steps 4a or 5b is not met - Adjust pointer adjustment screw of PERCENT BREAK meter to obtain 0 reading	
7	Insert No. 258D plug into P jack of test set	PERCENT BREAK meter reads 100 on black scale
	Note: Repeat steps 7, 8d, and 9 if test extends beyond 30 minutes.	
8d	If requirement of step 7 is not met - Unlock CAL % BK control and adjust to obtain reading of 100. Relock CAL % BK control, taking care not to change 100 reading.	
9	Remove No. 258D plug	
10a	When using No. 2B test set - Restore CONT PLS key	
11b	When using No. 2A test set - Restore PPS key	
	Initial Preparation of TMS	
1a	When using No. 13A TMS - Connect power and calibrate TMS	
2a	At the miscellaneous test equipment jacks in the signaling bays nearest the signaling equipment involved - Connect TMS to the left hand vertical jacks of MISC E TST, M TST jacks	
3b	When using 40B TMS - At toll test board - Patch TMS to REC jack of testing trunk which terminates at the miscellaneous test equipment jacks nearest the signaling equipment involved	
	Initial Preparation of Keyer	
1	At the miscellaneous test equipment jacks - Patch M jack of test set to MISC M (keyer) jack	

STEP	ACTION	VERIFICATION
2	Patch MISC 1600~ SEND or 2000~ SEND jack to MISC KEYER IN jack	
3	Operate TWD L key of test set to ON HK	
4a	When using No. 13A TMS - Patch MISC KEYER OUT jack to MISC E and M jack	
5b	When using 40B TMS - Patch MISC KEYER OUT jack to MISC REC jack	
6	Adjust P1 potentiometer of keyer to obtain a TMS reading of −19 dbm for −13 Line, or −22 dbm for −16 Line	
7	Operate TWD L key of test set to OFF HK	No. 13A TMS reads lower power than −45 dbm 40B TMS reads lower power than −35 dbm
8	Remove patches and restore keys	

Preparation for all Tests

1	Remove signaling circuit from service	

Additional Preparation for Tests A, B, C, D, J, K, M, N (Adjustment of Test Amplifier)

2a	When using No. 13 A TMS - At the miscellaneous test equipment jacks - Patch MISC 1600~ SEND or 2000~ SEND jack to MISC E and M jacks	Record TMS reading
3a	Remove cord from MISC E and M jacks and insert in MISC ATT IN jack	
4b	When using 40B TMS - At the miscellaneous test equipment test jacks - Patch MISC 1600~ SEND or 2000~ SEND jack to MISC REC jack of testing trunk used	Record TMS reading
5b	Remove cord from MISC REC jack and insert in MISC ATT IN jack	
6	Set attenuator to 30 db	
7	Patch MISC ATT OUT jack to MISC AMP IN jack	
8a	When using No. 13A TMS - Patch MISC AMP OUT jack to MISC E and M jacks	
9b	When using 40B TMS - Patch MISC AMP OUT jack to MISC REC jack of testing trunk	
10	Adjust test amplifier to obtain a reading on the TMS within 0.1 db of that recorded in step 2a or 4b Note: Noise level of amplifier should be lower than −85 dbm when the input is terminated in 600 ohms	
11	Remove cord from MISC 1600~ SEND or 2000~ SEND, ATT IN, ATT OUT, AMP IN, AMP OUT, and E and M, or REC jacks	

STEP	ACTION	VERIFICATION
4. METHOD		
	A. Sensitivity of Receiver	
12	At the test jacks - Patch E jack of No. 2A or No. 2B test set to EQ E jack	
13	At the miscellaneous test equipment jacks - Patch M jack of test set to MISC M (keyer) jack	
14	Patch MISC 1600~ SEND or 2000~ SEND jack to MISC KEYER IN jack	
15	Patch MISC KEYER OUT jack to MISC ATTEN IN jack	
16	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
17a	When using No. 13A TMS - Patch MISC AMP OUT jack to MISC E and M jacks	
18b	When using 40B TMS - Patch MISC AMP OUT jack to MISC REC jack	
19	On No. 2A or No. 2B test set - Operate TWD L key to ON HK	
20	At the miscellaneous test equipment - Adjust attenuator controls to obtain a reading on the TMS of −27 ±0.1 dbm for +4 Line or −24 ±0.1 dbm for +7 Line	
Non-Operate, High Sensitivity		
21	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	
22a	When using No. 13A TMS - Remove cord from MISC E and M jacks and patch MISC AMP OUT jack to LINE REC jack	L lamp extinguished on No. 2B test set, or lighted on No. 2A
23b	When using 40B TMS - Remove cord from MISC REC jack and patch AMP OUT jack to LINE REC jack	L lamp extinguished on No. 2B test set, or lighted on No. 2A
24	On No. 2A or No. 2B test set - Operate TWD L key to ON HK	L lamp extinguished on No. 2B test set, or lighted on No. 2A
25c	If the requirements of 22a, 23b, or 24 are not met - Adjust potentiometers P2 and P3 in accordance with Section 179-217-701	
Operate, High Sensitivity		
26	At the miscellaneous test equipment - Reduce attenuator setting obtained in step 20 by 3 db	
27	Set SCALE SEL key to 20MA	
28	Insert short circuited No. 310 plug into R jack of signaling unit	
29	On No. 2A or No. 2B test set - Patch MA jack to DC jack of signaling unit	MILLIAMPERES DC meter of No. 2A or No. 2B test set reads between 6 and 8 ma on the 0-20 scale

STEP	ACTION	VERIFICATION
30d	If the requirement of step 29 is not met - Adjust potentiometers P2 and P3 in accordance with Section 179-217-701	
31	**Reduce attenuator setting used in step 26 by 1 db**	**L lamp lighted on No. 2B test set, or extinguished on No. 2A test set**
	Maximum Saturation Current of Receiver	
32	**Reduce attenuator setting of step 31 by 21 db**	**MILLIAMPERES DC meter reads between 9.7 and 11.0 on the 0-20 scale**
33e	If requirement of step 32 is not met - Adjust potentiometers P2 and P3 in accordance with Section 179-217-701	
34	**Restore SCALE SEL switch to PPS**	
	Operate, Low Sensitivity	
35	**Remove patching cord from MA and DC jacks**	
36	**Remove No. 310 plug from R jack**	
37	Set attenuator to 30 db, with the 0.1 DB ATTEN set on 2 db and the DB control on 28 db	
38f	**When 48V jack is provided - Patch EQ M jack to MISC 48V jack**	
	Note: Connect cord to EQ M jack first to avoid blowing fuse	
39g	**When 48V jack is not provided - Connect EQ M jack to source of −48 volt battery**	
	Note: See note in step 38f.	
40	**Reduce attenuator setting slowly in 0.1 db steps using alternately the 0.1 DB and the 2DB ATTEN controls as required, until the L lamp lights on No. 2B test set, or is extinguished on No. 2A test set**	
41a	**When using No. 13A TMS - Remove cord from LINE REC jack and patch MISC AMP OUT jack to MISC E and M jacks**	**TMS reads −12 ±2.0 dbm for +4 Line or − 9 ±2.0 dbm for +7 Line**
42b	**When using 40B TMS - Remove cord from LINE REC jack and patch MISC AMP OUT jack to MISC REC jack**	**TMS reads −12 ±2.0 dbm for +4 Line or − 9 ±2.0 dbm for +7 Line**
43	**Remove cord first from 48V jack or from −48 volt battery and then from EQ M jack**	
44	**Remove patches and restore keys**	
	B. Pulsing Performance of Receiver	
12	**At the test jacks - Patch E jack of No. 2A or No. 2B test set to EQ E jack**	
13	**At the miscellaneous test equipment jacks - Patch M jack of test set to MISC M jack (keyer)**	
14	**Patch MISC 1600~ SEND or 2000~ SEND jack to MISC KEYER IN jack**	
15	**Patch MISC KEYER OUT to MISC ATTEN IN jack**	

STEP	ACTION	VERIFICATION
16	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
17a	When using No. 13A TMS - Patch MISC AMP OUT jack to MISC E and M jacks	
18b	When using 40B TMS - Patch MISC AMP OUT jack to MISC REC jack	
19	On No. 2A or No. 2B test set - Operate TWD L key to ON HK	
20	Insert a short circuited No. 310 plug into R jack of signaling unit	
21	At the test equipment in the signaling bays - Adjust attenuator controls to obtain a reading on the TMS of −2 ±0.2 dbm for +4 Line, or +1 ±0.2 dbm for +7 Line	
22	Operate TWD L key of No. 2A or No. 2B test set to OFF HK	
23	Remove patching cord from MISC E and M jacks or MISC REC jack and patch MISC AMP OUT to LINE REC jack	
24	On No. 2A or No. 2B test set - Adjust ADJ PPS control to obtain a reading of 10 on the 0-20 scale of PULSES PER SECOND meter	
25	Set ADJ % BK switch to M	
Operate, Long Pulses		
26	Adjust ADJ % BK control to obtain a reading of 70 on black scale of PERCENT BREAK meter	
27	Operate PLS key to LINE	
28	Operate MEAS % BK key to LINE	PERCENT BREAK meter reads between 57 and 70 on red scale
29c	If requirement of step 28 is not met - Adjust potentiometer P6 in accordance with Section 179-217-701	
30	Restore PLS and MEAS % BK keys	
Operate, Short Pulses		
31	Adjust ADJ % BK control to obtain a reading of 45 on black scale of PERCENT BREAK meter	
32	Operate PLS key to LINE	
33	Operate MEAS % BK key to LINE	PERCENT BREAK meter reads between 48 and 63 on red scale
34d	If requirement of step 33 is not met - Adjust potentiometer P6 in accordance with Section 179-217-701	
35	Restore PLS and MEAS % BK keys Remove plug from R jack	

STEP	ACTION	VERIFICATION
	Non-Operate, Short Pulses	
36	Adjust ADJ % BK control to obtain a reading of 25 on black scale of PERCENT BREAK meter Note: On certain test sets, it may be necessary to set ADJ % BK switch to S instead of M, in order to read 25 percent break	
37	Operate PLS to LINE	L lamp extinguished on No. 2B test set, or lighted on No. 2A test set
38	Restore PLS key	
	Non-Operate, Rering Condition	
39	Adjust ADJ PPS control to obtain a reading of 4 on 0-20 scale of PULSES PER SECOND meter	
40	Set ADJ % BK switch to L	
41	Adjust ADJ % BK control to obtain a reading of 40 on black scale of PERCENT BREAK meter	
42e	When 48V jack is provided - Patch EQ M (sig) to MISC 48V jack Note: Connect cord to EQ M jack first to avoid blowing fuse	
43f	When 48V jack is not provided - Connect EQ M jack to source of -48 volt battery Note: See note in step 42e	
44g	When using No. 2B test set - Operate CONT PLS key to DIAL PLS, PLS key to LINE,and MEAS % BK key to LINE	
45h	When using the No. 2A test set - Operate PPS key to DIAL SUPV, PLS key to LINE and MEAS % BK key to LINE	
46	Wait 3 seconds, then dial digit 1	Pointer of PERCENT BREAK meter does not kick
47	Repeat step 46 at least 3 times, allowing minimum of 3 seconds between steps	Same as step 46
48i	If requirements of steps 46 and 47 are not met - Adjust P4 potentiometer in accordance with Section 179-217-701	
49	Restore PLS,MEAS % BK,and CONT PLS or PPS keys	
	Operate, Rering Condition	
50	Adjust ADJ % BK control to obtain a reading of 48 on black scale of PERCENT BREAK meter	
51g	When using No. 2B test set - Operate CONT PLS key to DIAL PLS, PLS key to LINE, and MEAS % BK key to LINE	
52h	When using No. 2A test set - Operate PPS key to DIAL SUPV, PLS key to LINE, and MEAS % BK key to LINE	
53	Wait 3 seconds, then dial digit 1	Needle of PERCENT BREAK meter kicks
54	Repeat step 53 at least 3 times, allowing minimum of 3 seconds between steps	Same as step 53

STEP	ACTION	VERIFICATION
55j	If requirement of steps 53 and 54 are not met - Adjust P4 potentiometer in accordance with Section 179-217-701	
56	Remove cord first from 48V jack or −48 volt battery and then cord from EQ M jack	
57	Remove patches and restore keys	

C. Guard Sensitivity

Talking Condition

12	At miscellaneous test equipment jacks - Patch MISC 1600~ SEND or 2000~ SEND jack to MISC KEYER IN jack	
13	Patch MISC KEYER OUT jack to MISC PAD IN A in all cases except that of +7 Line in combined +4 Line and +7 Line offices, in which case patch to MISC PAD IN B jack	
14	Patch MISC 8 or 14 db OUT jack to MISC AMP IN jack	
15	Patch MISC SEND IMW jack to MISC ATTEN IN jack	
16	Patch LINE REC jack to MISC MIX C jack	
17	Patch EQ E jack to E jack of No. 2A or No. 2B test set	
18	Patch EQ M jack to M jack of No. 2A or No. 2B test set	
19	Operate TWD L key of No. 2A or No. 2B test set to OFF HK	
20	At the miscellaneous test equipment - Turn attenuator controls fully clockwise	
21	Patch MISC ATTEN OUT jack to MISC MIX A jack	L lamp extinguished on No. 2B test set, or lighted on No. 2A
22	Patch MISC AMP OUT jack to MISC MIX B jack	L lamp remains extinguished on No. 2B test set, or lighted on No. 2A
23	Turn 2 DB ATTEN control slowly counter-clockwise until L lamp is lighted on No. 2B test set, or extinguished on No. 2A	Attenuator controls reads: 20.5 ± 5.5 db for +4 Line, or 17.5 ± 5.5 db for +7 Line

Awaiting Subscriber Answer - Receiver at Originating End

24	Turn both controls of attenuator fully clockwise	L lamp remains lighted on No. 2B test set, or extinguished on No. 2A
25	Remove cord from AMP OUT and MIX B jacks	Same as step 24

Awaiting Subscriber Answer - Receiver at Terminating End

26	Operate TWD L key of No. 2A or No. 2B test set to ON HK	
27	At the miscellaneous test equipment jacks - Remove cord from MISC MIX A jack	L lamp extinguished on No. 2B test set, or lighted on No. 2A
28	Insert cord in MISC MIX A jack	L lamp remains extinguished on No. 2B test set or lighted on No. 2A
29	Remove cord from MISC 8 or 14 db OUT jack and insert into MISC 20 or 26 db OUT jack	

STEP	ACTION	VERIFICATION
30	Patch MISC AMP OUT jack to MISC MIX B jack	L lamp remains extinguished on No. 2B test set, or lighted on No. 2A
31	Turn 2 DB ATTEN control slowly counter-clockwise until L lamp is lighted on No. 2B test set, or extinguished on No. 2A	Attenuator controls reads 25.5 ± 5.5 db for +4 Line, or 22.5 ± 5.5 db for +7 Line
32	Turn attenuator controls fully clockwise	L lamp remains lighted on No. 2B test set, or extinguished on the No. 2A
33	Remove cord from AMP OUT and MIX B jacks	L lamp remains lighted on No. 2B test set, or extinguished on No. 2A
34	Remove patches and restore keys	

D. Transmitter Performance

Low Level Signaling Tone

12	At the test jacks - Patch M jack of test set to EQ M jack	
13	Patch LINE TRS jack of signaling circuit to MISC AMP IN jack	
14	Remove relay can cover and block CO relay operated	
15a	When using No. 13A TMS - Patch MISC AMP OUT jack to MISC E and M jacks	
16b	When using 40B TMS - Patch MISC AMP OUT jack to MISC REC jack	
17	Operate TWD L key of No. 2A or No. 2B test set to ON HK	TMS reads: −2.8 ± 1.0 dbm for −13 Line, or −5.9 ± 1.0 dbm for −16 Line

Suppressed Signaling Power

18	Operate TWD L key to OFF HK	No. 13A TMS reads −45 dbm or lower power 40B TMS reads lower power than −35 dbm
19	Restore CO relay and replace can cover	

Varistors VR10 and VR11

20	Remove patch made in steps 15a or 16b	
21	Patch E jack of No. 2A or No. 2B test set to EQ E jack	
22	Insert No. 165D plugs in each jack of LINE REC jacks	
23	Operate TWD L key of No. 2A or No. 2B test set to ON HK	L lamp extinguished on No. 2B test set, or lighted on No. 2A test set
24	Operate TWD L key to OFF HK	L lamp remains extinguished on No. 2B test set, or lighted on No. 2A test set, without flicker in both cases
25	Operate TWD L key to ON HK	Same as step 24
26	Repeat steps 24 and 25 several times	L lamp does not flicker
27	Remove patches, and restore keys	

STEP	ACTION	VERIFICATION
	E. Momentary High Level Signaling Tone Test	
2	At the test jacks - Patch M jack of No. 2A or No. 2B test set to EQ M jack	
3	Patch LINE TRS jack to MISC MON IN jack	
4	Plug telephone set in MISC MON OUT jack	Listen for tone in receiver
5	Operate TWD L key of No. 2A or No. 2B test set to OFF HK	Tone heard in receiver is greatly reduced
6	Operate TWD L key to ON HK	Tone in receiver increases momentarily and then decreases noticeably in loudness
7	Remove patches, telephone set, and restore keys	
	F. Timing of CO Relay	
2	At the test jacks - Patch M jack of No. 2A or No. 2B test set to EQ M jack	
3	Patch LINE TRS jack to MISC MON IN jack	
4	Plug head telephone set in MISC MON OUT jack	
5	Patch MISC 1600~ SEND or 2000~ SEND jack to LINE REC jack	
Hold		
6	On No. 2A or No. 2B test set - Adjust ADJ PPS control to obtain a reading of 8 on the 0-20 scale of the PULSES PER SECOND meter	
7	Set ADJ % BK switch to M	
8	Adjust ADJ % BK control to obtain a reading of 32 on black scale of PERCENT BREAK meter	
9	Operate TWD L key to OFF HK	
10	Operate PLS key to LINE	Listen in receiver for "clean" pulses of tone
Release		
11	Turn ADJ PPS control slowly counterclockwise to reduce reading of PULSES PER SECOND meter until tone pulses heard in receiver are no longer clean but have slight irregularity at beginning of each pulse	PULSES PER SECOND meter reads 7.5 or lower on 0-20 scale
12	Remove patches, telephone set, and restore keys	
	G. Timing of T Relay	
2	At the test jacks - Insert No. 165D plugs in both LINE REC jacks	
3	Patch M jack of No. 2A or No. 2B test set to EQ M jack	

STEP	ACTION	VERIFICATION
4	Patch LINE TRS jack to MISC MON IN jack	
5	Connect head telephone set to MISC MON OUT jack	
6	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	
7	Adjust ADJ PPS control to obtain a reading of 10 on the 0-20 scale of the PULSES PER SECOND meter	
8	Set ADJ % BK switch on M	
9	Adjust ADJ % BK control to obtain a reading of 50 on the black scale of the PERCENT BREAK meter	
Hold and Release		
10	Operate PLS key to LINE	Pulses heard in receiver are at rate of about 5 per second
11	Patch 60 (i.p.m.) jack to R jack of signaling unit	Pulses heard in receiver are at rate of about 10 per second. Note: Pulses will be at rate of 5 per second if T relay fails to hold over 60 i.p.m.
12	Remove cord from 60 (i.p.m.) jack	After about 2 seconds, pulses heard in receiver change to rate of about 5 per second
13	Remove patches and plugs, telephone set, and restore keys	

H. Timing of RR Relay

2	At the test jacks - Insert No. 165 plugs in both LINE REC jacks	
3a	When 48V jack is provided - Patch EQ M jack to MISC 48V jack Note: Connect to EQ M jack first to avoid blowing fuse.	
4b	When 48V jack is not provided - Connect EQ M jack to −48 volt battery Note: See note in step 3a	
5	Wait 6 minutes for RR relay to warm	
6	Remove cord first from 48V jack or −48 volt battery and then from EQ M jack	
7	Patch M jack of No. 2A or No. 2B test set to EQ M jack	
8	Patch RR jack of test set to DC jack of signaling unit	
RR Relay Holds Over 160 milliseconds Break		
9	On signaling test set - Adjust ADJ PPS control to obtain a reading of 4 on the 0-20 scale of the PULSES PER SECOND meter	

STEP	ACTION	VERIFICATION
10	Set ADJ % BK switch to L	
11	Adjust ADJ % BK control to obtain a reading of 64 on the black scale of the PERCENT BREAK meter	
12	Turn ADJ PPS control fully counterclockwise Note: Disregard change in reading of PERCENT BREAK meter	
13	Set SCALE SEL control to 20V	
14	Operate PLS key to LINE	Pointer of VOLTS DC meter kicks regularly
15c	If requirement of step 14 is not met - Adjust RR relay by means of potentiometer P5 in accordance with Section 179-217-701	
RR Relay Releases on 190 milliseconds Break		
16	Set SCALE SEL control to PPS	
17	Restore PLS key	
18	Adjust ADJ PPS control to obtain a reading of 4 on the 0-20 scale of the PULSES PER SECOND meter	
19	Adjust ADJ % BK control to obtain a reading of 76 on the black scale of the PERCENT BREAK meter	
20	Turn ADJ PPS control fully counterclockwise Note: Disregard change in reading of PERCENT BREAK meter	
21	Set SCALE SEL switch to 20V	
22	Operate PLS key to LINE	Pointer of PULSES PER SECOND meter remains steadily near 0 on 0-20 scale
23d	If requirement of step 22 is not met - Adjust RR relay by means of potentiometer P5 in accordance with Section 179-217-701	
24	Remove patches and restore keys	

I. Gain Test of Voice Amplifier

2	At the test jacks - Patch M jack of No. 2B or No. 2A test set to EQ M jack	
3	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	
4a	When using No. 13A TMS - At the miscellaneous test equipment jacks - Patch MISC SEND IMW jack to MISC E and M jacks	TMS reads 0 ± 1.0 dbm. Record actual reading
5a	Remove cord from MISC E and M jacks and insert in LINE REC jack	
6a	Patch EQ REC jack to MISC E and M jacks	TMS reads within 0.1 db of value recorded step 4a
7b	If requirement of step 6a is not met - Adjust potentiometer P1 in accordance with Section 179-217-701	

STEP	ACTION	VERIFICATION
8c	When using 40B TMS - At the miscellaneous test equipment jacks - Patch MISC SEND 1MW jack to MISC REC jack	TMS reads 0 ± 1.0 dbm Record actual reading
9c	Remove cord from MISC REC jack and insert in LINE REC jack	
10c	Patch EQ REC jack to MISC REC jack	TMS reads within 0.1 db of value recorded in step 8c
11d	If requirement of step 10c is not met - Adjust potentiometer P1 in accordance with Section 179-217-701	
12	Remove patches	

J. Voice Amplifier Network Insertion Loss - Using No. 13A TMS

12	At the miscellaneous test equipment jacks - Patch MISC 1600~ SEND or 2000~ SEND jack to MISC ATTEN IN jack	
13	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
14	Patch MISC AMP OUT jack to MISC E and M jacks	
15a	When 48V jack is provided - Patch EQ M jack to MISC 48V jack Note: Connect to EQ M jack first to avoid blowing fuse	
16b	When 48V jack is not provided - Connect EQ M jack to −48 volt battery Note: See note in step 15a	
17	Adjust attenuator controls to obtain a reading of +4 ± 0.1 dbm on the TMS. Record actual reading.	
Filter Out		
18	Remove cord from MISC E and M jacks and insert in LINE REC jack	
19	Insert No. 258D plug in DC jack of signaling unit	
20	Patch EQ REC jack to MISC E and M jacks	TMS reads within ± 0.1 db of value recorded in step 17
Filter In		
21	Remove No. 258D plug from DC jack of signaling unit	TMS reads lower power than −30 dbm
22	Remove cord first from 48V jack, or disconnect it first from −48 volt battery, and then remove cord from EQ M jack	
23	Remove patches and restore keys	

STEP	ACTION	VERIFICATION
	K. Voice Amplifier Network Insertion Loss - Using 40B TMS	
12	At the miscellaneous test equipment jacks - Patch MISC 1600~ SEND or 2000~ SEND jack to MISC ATTEN IN jack	
13	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
14	Patch MISC AMP OUT jack to MISC REC jack	
15a	When 48V jack is provided - Patch EQ M jack to MISC 48V jack Note: Connect to EQ M jack first to avoid blowing fuse	
16b	When 48V jack is not provided - Connect EQ M jack to −48 volt battery Note: See note in step 15a	
17	Adjust attenuator controls to obtain a reading of +4 ± 0.1 dbm on the TMS. Record actual reading	
18	Remove cord from MISC REC jack and insert in LINE REC jack	
19	Insert No. 258D plug in DC jack of signaling unit	
20	Patch EQ REC jack to MISC REC jack	TMS reads within ± 0.1 db of value recorded in step 17
21	Remove No. 258D plug from DC jack	TMS reads lower power than −30 dbm
22	Remove cord first from 48V jack, or disconnect it first from −48 volt battery, and then remove cord from EQ M jack	
23	Remove patches and restore keys	
	L. Gain Test of Blocking Amplifier	
2a	When using No. 13A TMS - At blocking amplifier bay - Patch MISC SEND IMW jack to TMS	TMS reads 0 ± 1.0 dbm. Record actual reading
3a	Remove patch between TMS and SEND IMW jack	
4a	Connect TMS to BLKG AMP OUT jack	
5b	When using 40B TMS - At blocking amplifier bay - Patch MISC SEND IMW jack to MISC REC jack	Same as in step 2a
6b	Remove cord from SEND IMW jack and insert it in BLKG AMP OUT jack	
7	Patch MISC SEND IMW jack to BLKG AMP IN jack	TMS reads within 0.1 db of value recorded in step 2a or 5b
8	If requirement of step 7 is not met - Adjust P potentiometer in accordance with Section 179-217-701	
9	Remove patches	

STEP	ACTION	VERIFICATION

M. Blocking Amplifier Network Insertion Loss - Using No. 13A TMS

Note: This test required only where blocking amplifier is equipped with an F or an OF relay and an N filter

12	At the test jacks of signaling unit associated with blocking amplifier - Patch M jack of No. 2A or No. 2B test set to EQ M jack	
13	Patch MISC ATTEN IN to MISC 1600~ SEND jack when a 200F blocking network is used, or to MISC 2000~ SEND jack when a 200E network is used	
14	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
15	Patch MISC AMP OUT jack to MISC SEND jack	
16	Connect MISC REC jack to IN terminals on TMS	
17	Insert No. 165D plugs in both LINE REC jacks	
18a	When test trunks to toll test board (designated MISC SEND and REC) are multipled at both the signaling and the blocking amplifier bays - At the jacks in the blocking amplifier bay - Patch MISC SEND jack which is multiple of test trunk used in step 15, to MISC REC jack which is multiple of test trunk used in step 16	
19b	When test trunks to toll test board (designated MISC SEND and REC) are not multipled at both the signaling and the blocking amplifier bays - At toll test board jack appearance of TMS - Patch SEND jack of signaling bay test trunk to SEND jack of blocking amplifier bay test trunk	
20b	Patch REC jack of signaling bay test trunk to REC jack of blocking amplifier bay test trunk	
21b	At the jacks in the blocking amplifier bay - Patch MISC SEND jack to MISC REC jack	
22	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	
23	At miscellaneous test equipment of signaling circuit associated with blocking amplifier - Adjust attenuator controls to obtain a reading of +4 ± 0.1 dbm on TMS. Record actual reading	

STEP	ACTION	VERIFICATION
Filter Out		
24	At the jacks in the blocking amplifier bay - Remove cord from MISC REC jack and insert in BLKG AMP IN jack	
25	Patch BLKG AMP OUT jack to MISC REC jack	TMS reads within ± 0.1 dbm of value recorded in step 22
Filter In		
26	On No. 2A or No. 2B test set - Operate TWD L key to ON HK	TMS reads −30 dbm or lower value of power
27	Remove patches and restore keys	

N. Blocking Amplifier Network Insertion Loss Test - Using 40B TMS

Note: This test required only where blocking amplifier is equipped with an F or an OF relay and an N filter

12	At the test jacks of signaling circuit associated with blocking amplifier - Patch M jack of No. 2A or No. 2B test set to EQ M jack	
13	Patch MISC ATTEN IN jack to MISC 1600~ SEND jack when a 200F blocking network is used, or to MISC 2000~ SEND jack when a 200E network is used	
14	Patch MISC ATTEN OUT jack to MISC AMP IN jack	
15	Patch MISC AMP OUT jack to MISC SEND jack	
16	Insert No. 165D plugs in both LINE REC jacks	
17	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	
18	At toll test board jack appearance of TMS - Patch SEND jack of signaling bay test trunk to SEND jack of blocking amplifier bay test trunk	
19	At the jacks in the blocking amplifier bay - Patch MISC SEND jack to MISC REC jack	
20	At miscellaneous test equipment of signaling unit associated with the blocking amplifier - Adjust attenuator controls to obtain a reading of +4 ± 0.1 dbm. Record actual reading	
21	On No. 2A or No. 2B test set - Operate TWD L key to OFF HK	

STEP	ACTION	VERIFICATION
Filter Out		
22	At the jacks in the blocking amplifier bay - Remove cord from MISC REC jack and insert in BLKG AMP IN jack	
23	Patch BLKG AMP OUT jack to MISC REC jack	TMS reads within ± 0.1 dbm of value recorded in step 20
Filter In		
24	On No. 2A or No. 2B test set - Operate TWD L key to ON HK	TMS reads −30 dbm or lower value of power
25	Remove patches and plugs. Restore keys	