LINE INSULATION TEST FRAME
MAINTENANCE AND CALIBRATION TESTS
STEP-BY-STEP SYSTEMS

1. GENERAL

1.01 This section covers the method of performing the maintenance and calibration tests on the line insulation test frame in step-by-step offices.

1.02 The tests covered are:

A. Short and Ring Ground Test: This test checks the ability of the test and control circuits to detect and register subscriber line insulation defects between the tip and ring conductors and between the ring conductor and ground.

B. Tip and Ring Ground Test: This test checks the ability of the test and control circuits to detect and register subscriber line insulation defects between the tip conductor and ground and between the ring conductor and ground.

C. Foreign EMF Test: This test checks the ability of the test and control circuits to detect and register subscriber line insulation defects between the tip conductor and battery and between the ring conductor and battery.

D. Off-hook Test: This test checks the ability of the control circuit to recognize whether an off-hook condition exists and to record it as an OK line if the line is off hook or as a trouble condition if the line is not off hook.

E. Calibration Check Test: This test checks that the test circuit is in calibration.

F. Calibration: This test provides the procedure for making calibration adjustments.

G. Pulse Generator Test: This test provides for checking the dial pulses generated by the control circuit.

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

2. APPARATUS

Test F

2.01 Screwdriver, KS-2631, 4-1/2 inches.

Test G

2.02 Pulse checking test set, J94723A (SD-96362-01).

2.03 Patching cord, one P3K cord, six feet long, equipped with two No. 310 plugs (3P15A cord).

3. PREPARATION

STEP	ACTION	VERIFICATION
	Preparation Before Using Line Insulation Test Frame for Tests A Through F	
1	Operate all switches to OFF position	
2	Operate RN1 key momentarily	All lamps extinguished
3	Operate MT key momentarily	MT lamp lighted MT1 lamp lighted in approximately 60 seconds

4. METHOD

STEP	ACTION	VERIFICATION
	A. Short and Ring Ground Test	
4	Operate TEST NO. 1 key momentarily	TEST NO. 1 lamp lighted
5	Refer to Table A Operate LR 1000Ω switch to lowest-numbered position for which lamp indications are shown for the TEST NO. 1 key for the particular range limits used in the office	
6	Operate MTS key momentarily	MTS lamp lighted and lamps lighted as shown in Table A
7	Operate MTR key momentarily	Lamps specified in Step 6 extinguished

Table A - Short and Ring Ground Test

Switch	Switch Position	Test No. 1-3 Keys (Range Limits in Thousands of Ohms)						
		Test No. 1 0-80	Test No. 1 0-160	Test No. 1 or 2 0-320	Test No. 2 0-640	Test No. 2 or 3 0-1250	Test No. 3 0-2500	Test No. 3 0-5000
		Lamp Indications						
LR 1000Ω	15	T0,RT3						
	30.1	T1,RT3	T0,RT3					
	59.7	T2,RT3	T1,RT3	T0,RT3				
	120	OK	T2,RT3	T1,RT3	T0,RT3			
	240		OK	T2,RT3	T1,RT3	T0,RT3		
	481			OK	T2,RT3	T1,RT3	T0,RT3	
	953				OK	T2,RT3	T1,RT3	T0,RT3
	1870					OK	T2,RT3	T1,RT3
	3740						OK	T2,RT3
	7480							OK
	OFF							
LT 1000Ω	15	T0,RT0						
	30.1	T1,RT1	T0,RT0					
	59.7	T2,RT2	T1,RT1	T0,RT0				
	120	OK	T2,RT2	T1,RT1	T0,RT0			
	240		OK	T2,RT2	T1,RT1	T0,RT0		
	481			OK	T2,RT2	T1,RT1	T0,RT0	
	953				OK	T2,RT2	T1,RT1	T0,RT0
	1870					OK	T2,RT2	T1,RT1
	3740						OK	T2,RT2
	7480							OK
	OFF							

STEP	ACTION	VERIFICATION
8	Repeat Steps 5, 6, and 7 for the three remaining positions of the LR 1000 Ω switch associated with the TEST NO. 1 key	
9	Operate RN key momentarily	TEST NO. 1 lamp extinguished
10	Repeat Steps 4 to 9, inclusive, using the TEST NO. 2 and TEST NO. 3 keys	TEST NO. lamp corresponding to the operated TEST NO. key lights
11	Operate LR 1000Ω switch to OFF position	
12	Repeat Steps 4 to 10, inclusive, using the LT 1000Ω switch	
13	Operate LT 1000Ω switch to OFF position	
14a	If no other tests are to be made - Operate RN1 key momentarily	All lamps extinguished
	B. Tip and Ring Ground Test	
4	Operate TEST NO. 4 key momentarily	TEST NO. 4 lamp lighted
5	Refer to Table B Operate LR 1000Ω switch to lowest-numbered position for which lamp indications are shown for the TEST NO. 4 key for the particular range limits used in the office	
6	Operate MTS key momentarily	MTS lamp lighted and lamps lighted as shown in Table B
7	Operate MTR key momentarily	Lamps specified in Step 6 extinguished
8	Repeat Steps 5, 6, and 7 for the three remaining positions of the LR 1000Ω switch associated with the TEST NO. 4 key	

Table B - Tip and Ring Ground Test								
		Test No. 4-6 Keys (Range Limits in Thousands of Ohms)						
Switch	Switch Position	Test No. 4 0-80	Test No. 4 0-160	Test No. 4 or 5 0-320	Test No. 5 0-640	Test No. 5 or 6 0-1250	Test No. 6 0-2500	Test No. 6 0-5000
		Lamp Indications						
LR 1000Ω	15	T0,RT0						
	30.1	T1,RT1	T0,RT0					
	59.7	T2,RT2	T1,RT1	T0,RT0				
	120	OK	T2,RT2	T1,RT1	T0,RT0			
	240		OK	T2,RT2	T1,RT1	T0,RT0		
	481			OK	T2,RT2	T1,RT1	T0,RT0	
	953				OK	T2,RT2	T1,RT1	T0,RT0
	1870					OK	T2,RT2	T1,RT1
	3740						OK	T2,RT2
	7480							OK
	OFF							
LT 1000Ω	15	T0 or T1,RT3						
	30.1	T1,RT3	T0,RT3					
	59.7	T2,RT3	T1,RT3	T0,RT3				
	120	OK	T2,RT3	T1,RT3	T0,RT3			
	240		OK	T2,RT3	T1,RT3	T0,RT3		
	481			OK	T2,RT3	T1,RT3	T0,RT3	
	953				OK	T2,RT3	T1,RT3	T0,RT3
	1870					OK	T2,RT2	T1,RT3
	3740						OK	T2,RT3
	7480							OK
	OFF							

STEP	ACTION	VERIFICATION
9	Operate RN key momentarily	TEST NO. 4 lamp extinguished
10	Repeat Steps 4 to 9, inclusive, using the TEST NO. 5 and TEST NO. 6 keys	TEST NO. lamp corresponding to the operated TEST NO. key lights
11	Operate LR 1000Ω switch to OFF position	
12	Repeat Steps 4 to 10, inclusive, using the LT 1000Ω switch	
13	Operate LT 1000Ω switch to OFF position	
14a	If no other tests are to be made - Operate RN1 key momentarily	All lamps extinguished

C. Foreign EMF Test

4	Operate TEST NO. 7 key momentarily	TEST NO. 7 lamp lighted

STEP	ACTION	VERIFICATION
5	Refer to Table C Operate LR 1000Ω switch to lowest-numbered position for which a lamp indication is shown for the TEST NO. 7 key for the particular range limits used in the office	

Table C - Foreign EMF Test

Switch	Switch Position	Test No. 7-9 Keys (Range Limits in Thousands of Ohms)					
		Test No. 7 0-320	Test No. 7 0-640	Test No. 7 or 8 0-1250	Test No. 8 or 9 0-2500	Test No. 8 or 9 0-5000	Test No. 9 0-10000
		Lamp Indications					
LR 1000Ω	15						
	30.1						
	59.7	T0,RT0					
	120	T1,RT1	T0,RT0				
	240	T2,RT2	T1,RT1	T0,RT0			
	481	OK	T2,RT2	T1,RT1	T0,RT0		
	953		OK	T2,RT2	T1,RT1	T0,RT0	
	1870			OK	T2,RT2	T1,RT1	T0,RT0
	3740				OK	T2,RT2	T1,RT1
	7480					OK	T2,RT2
	OFF						OK
LT 1000Ω	15						
	30.1						
	59.7	T0,RT3					
	120	T1,RT3	T0,RT3				
	240	T2,RT3	T1,RT3	T0,RT3			
	481	OK	T2,RT3	T1,RT3	T0,RT3		
	953		OK	T2,RT3	T1,RT3	T0,RT3	
	1870			OK	T2,RT3	T1,RT3	T0,RT3
	3740				OK	T2,RT3	T1,RT3
	7480					OK	T2,RT3
	OFF						OK

6	Operate MTS key momentarily	MTS lamp lighted and lamps lighted as shown in Table C
7	Operate MTR key momentarily	Lamps specified in Step 6 extinguished
8	Repeat Steps 5, 6, and 7 for the three remaining positions of the LR 1000Ω switch associated with the TEST NO. 7 key	
9	Operate RN key momentarily	TEST NO. 7 lamp extinguished

STEP	ACTION	VERIFICATION
10	Repeat Steps 4 to 9, inclusive, using the TEST NO. 8 and TEST NO. 9 keys	TEST NO. lamp corresponding to the operated TEST NO. key lights
11	Operate LR 1000Ω switch to OFF position	
12	Repeat Steps 4 to 10, inclusive, using the LT 1000Ω switch	
13	Operate LT 1000Ω switch to OFF position	
14a	If no other tests are to be made - Operate RN1 key momentarily	All lamps extinguished
	D. Off-hook Test	
4	Operate TEST NO. 1 key momentarily	TEST NO. 1 lamp lighted
5	Operate OHO key momentarily	TO relay operated momentarily OHO, OK lamps lighted
6	Operate MTR key momentarily	OHO, OK lamps extinguished
7	Operate OHNO key momentarily	OHNO, TO, RTO lamps lighted
8	Operate MTR key momentarily	OHNO, TO, RTO lamps extinguished
9	Operate RN key momentarily	TEST NO. 1 lamp extinguished
10a	If no other tests are to be made - Operate RN1 key momentarily	All lamps extinguished
	E. Calibration Check Test	
4	Allow a minimum of 10 minutes before starting test	
5	Operate TEST NO. 5 key momentarily	TEST NO. 5 lamp lighted
6	Operate LR 1000Ω switch to CAL position	
7	Operate CAL 1000Ω switch to 160-OP-TO position	
8	Operate MTS key momentarily	MTS, TO lamps lighted Disregard RT-lamps for this test If T1 lamp is lighted - Proceed to Test F
9	Operate MTR key momentarily	MTS, TO lamps extinguished
10	Operate CAL 1000Ω switch to 160-NO-T1 position	
11	Operate MTS key momentarily	MTS, T1 lamps lighted If TO lamp is lighted - Proceed to Test F
12	Operate MTR key momentarily	MTS, T1 lamps extinguished
13	Operate CAL 1000Ω switch to 320-OP-T1 position	
14	Operate MTS key momentarily	MTS, T1 lamps lighted If T2 lamp is lighted - Proceed to Test F
15	Operate MTR key momentarily	MTS, T1 lamps extinguished

STEP	ACTION	VERIFICATION
16	Operate CAL 1000Ω switch to 320-NO-T2 position	
17	Operate MTS key momentarily	MTS, T2 lamps lighted If T1 lamp is lighted - Proceed to Test F
18	Operate MTR key momentarily	MTS, T2 lamps extinguished
19	Operate CAL 1000Ω switch to 640-OP-T2 position	
20	Operate MTS key momentarily	MTS, T2 lamps lighted If OK lamp is lighted - Proceed to Test F
21	Operate MTR key momentarily	MTS, T2 lamps extinguished
22	Operate CAL 1000Ω switch to 640-NO-OK position	
23	Operate MTS key momentarily	MTS, OK lamps lighted If T2 lamp is lighted - Proceed to Test F
24	Operate MTR key momentarily	MTS, OK lamps extinguished
25	Operate LR 1000Ω switch to OFF position	
26a	If no other tests are to be made - Operate RN1 key momentarily	All lamps extinguished
	F. Calibration	
4	Allow a minimum of 10 minutes before starting test	
5	Operate TEST NO. 5 key momentarily	TEST NO. 5 lamp lighted
6	Operate LR 1000Ω switch to CAL position	
7	Operate CAL 1000Ω switch to CAL-160 position	
8	Operate MTS key momentarily	MTS and either TO or T1 lamps lighted Disregard RT- lamps for this test
9a	If TO lamp is lighted - Rotate AGC potentiometer very slightly in a counterclockwise direction	
10a	Operate MTR key momentarily	MTS, TO lamps extinguished
11a	Repeat Steps 8, 9, and 10 until a change from the TO to T1 lamp occurs Note: If the AGC potentiometer reaches its adjustment limit before the change occurs, a wiring change is required in the line insulation test circuit. In this case, remove "N" wiring, if provided, or change wiring from "S" to "R" and then repeat test starting at Step 8.	
12a	Operate MTS key momentarily	MTS, T1 lamps lighted

STEP	ACTION	VERIFICATION
13	Rotate AGC potentiometer very slightly in a clockwise direction	
14	Operate MTR key momentarily	MTS, T1 lamps extinguished
15	Repeat Steps 8, 13, and 14 until a change from the T1 to T0 lamp occurs Note: If the AGC potentiometer reaches its adjustment limit before this change occurs, a wiring change is required in the line insulation test circuit. In this case, change "R" option to "S" option, if not already provided, or add "N" wiring and then repeat test starting at Step 8.	
16	Operate CAL 1000Ω switch to CAL-320 position	
17	Operate MTS key momentarily	MTS and either T1 or T2 lamps lighted
18b	If T1 lamp is lighted - Rotate M potentiometer very slightly in a counterclockwise direction	
19b	Operate MTR key momentarily	MTS, T1 lamps extinguished
20b	Repeat Steps 17, 18, and 19 until a change from the T1 to T2 lamp occurs	
21b	Operate MTS key momentarily	MTS, T2 lamps lighted
22	Rotate M potentiometer very slightly in a clockwise direction	
23	Operate MTR key momentarily	MTS, T2 lamps extinguished
24	Repeat Steps 17, 22, and 23 until a change from the T2 to T1 lamp occurs	
25	Operate CAL 1000Ω switch to CAL-640 position	
26	Operate MTS key momentarily	MTS and either T2 or OK lamps lighted
27c	If T2 lamp is lighted - Rotate H potentiometer very slightly in a counterclockwise direction	
28c	Operate MTR key momentarily	MTS, T2 lamps extinguished
29c	Repeat Steps 26, 27, and 28 until a change from the T2 to OK lamp occurs	
30c	Operate MTS key momentarily	MTS, OK lamps lighted
31	Rotate H potentiometer very slightly in a clockwise direction	
32	Operate MTR key momentarily	MTS, OK lamps extinguished
33	Repeat Steps 26, 31, and 32 until a change from the OK to T2 lamp occurs	
34	Perform Test E, calibration check test Start at Step 7	

STEP	ACTION	VERIFICATION
	G. Pulse Generator Test	
1	Operate RN1 key momentarily	All lamps extinguished
2	Operate SCALE key on pulse checking test set to position 20	
3	Connect P jack of pulse checking test set to P jack on frame by means of patching cord	Pulse generator in control circuit operates
4	Operate lever key on pulse checking test set to PPS position and read pulsing speed in pulses per second	
5	Operate lever key on pulse checking test set to PCB position and read per cent break of pulses	
6	Find point corresponding to this per cent break and pulsing speed on chart in Fig. 1 This point should lie within the area enclosed by line designated PR	

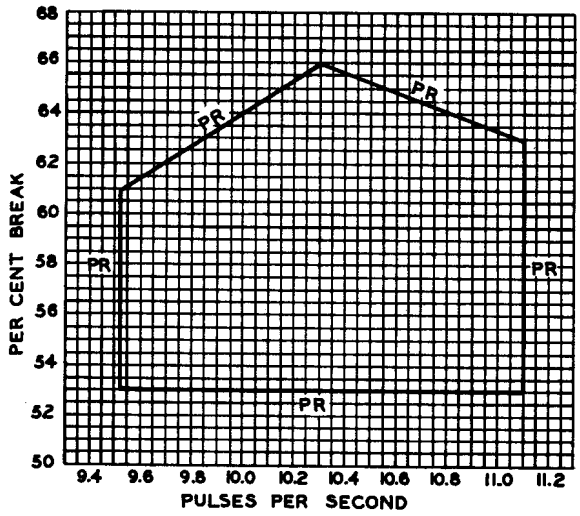

Fig. 1 - Per Cent Break and Pulsing Speed Limits for Pulse Generator in Control Circuit