

QUIK-CHEK TEST SET
CMC 707

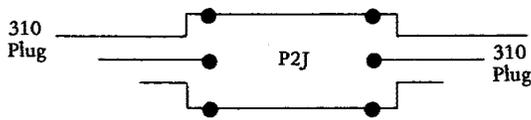
1. GENERAL

1.01 This section provides instructions on the use and operation of the QUIK-CHEK Test Set. This set shall be used for determining repairs that are necessary on PBX, CDO, and large step-by-step offices. (See Fig. 4.)

1.02 The CMC 707-A Quik Chek Test Set is used in testing the operation of the local switches and trunks in Step-by-Step Offices. It tests operation of the "A" relay, the release of the "B" on either test or readjust values, "C" release and rotary speed test. It will test polarity of the switch and trunks, and any digit absorbing features. The operator can monitor wiper and switch noise, observe tones and announcements, and talk over circuits when required. Complete loop and leak tests can be made. (See Divisions 3, 4, & 5.)

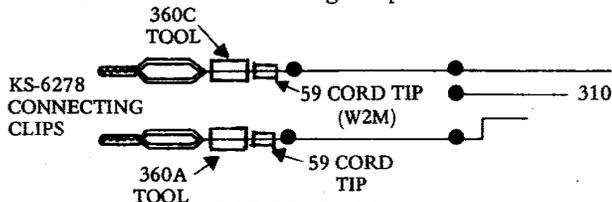
1.03 CORDS REQUIRED

(a) Power cord: Cord 2P9A is a 2-conductor cord, 9 feet long, each end equipped with a 310 plug:



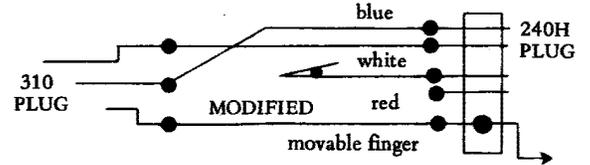
2P9A CORD
Fig. 1

For offices and dial PBXs equipped with battery and ground clip-on terminals, use a 2W12A cord assembly. Equip one end with KS-6278 connecting clips.



2W12A CORD
Fig. 2

(b) Test cord: Assembly 3P35A is a 3-conductor cord, 10 feet long, one end equipped with a 310 plug and the other end equipped with a 240 H plug:



3P35A ASSEMBLY
Fig. 3

1.04 CONNECTIONS

- (a) Insert the 310 plug of the power cord into the "BATT" jack on the face of the QUIK CHEK and connect the other end to 48V C.O. battery.
- (b) Insert the 310 plug of the test cord into the "TEST" jack of the QUIK CHEK and the 240 H plug into the switch test jack.

1.05 TEST SET ARRANGEMENT (See Fig. 4)

(a) DIGIT SWITCH - at lower left corner of the face plate and numbered "1-10", "C", and "CAL". Pulses supplied correspond to the digit selected. "C" provides continuous pulsing, "CAL" is used to calibrate the set.

(b) FUNCTION SWITCH - at lower right corner of face plate, provides for the following test settings:

- (1) A OPR. ("A" relay, operate)
- (2) A SOAK
- (3) A N.O. ("A" relay, nonoperate)
- (4) B RLS. ("B" relay, release)
- (5) C RLS. ("C" relay, release & ROT. & rotary speed test)
- (6) POLARITY-MON.
- (7) LP 1400 ohms, 10 or 12 PPS, 68.5%
- (8) LK, A, 10 or 12 PPS, 60.5%
- (9) LP 1200 ohms, 10 or 12 PPS, 68.5%
- (10) LK B, 10 or 12 PPS, 60.5%
- (11) LP 750 ohms, 10 or 12 PPS, 68.5%
- (12) LK 16 K, 10 or 12 PPS, 60.5%

(c) "TEST" and "RLS" (release buttons) - located between DIGIT AND FUNCTION SWITCHES.

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(d) RECEIVER-TRANSMITTER - used to check tones and recorded announcements. A "TALK" button and "VOLUME" control give the QUIK CHEK an amplified push-to-talk circuit.

(e) MILLIAMMETER with 2 controls for setting the values of current to margin "A" relay.

(f) "10 PPS-12PPS" Either 10 or 12 pulses per second can be supplied the switch under test. (B and C relay tests must be made using 12 PPS.)

(g) POLARITY - white lamp for STRAIGHT, red for REVERSE.

(h) "BATT" and "TEST" jacks in top of panel provide patching arrangements to C.O. battery and the switch under test.

(i) 750 MS (test value "B" release) functions only with FUNCTION SWITCH in "B RLS." Push to operate switch.

2. TESTS

2.01 PRELIMINARY:

(a) Insert the POWER and TEST cords as outlined in paragraph 1.04.

(b) Turn the FUNCTION SWITCH to the "A SOAK" position. Push "TEST" button. Turn FUNCTION SWITCH to the "A OPR" position, push the "TEST" button and adjust the MILLIAMMETER reading to the test value (15.1), readjust value (14.8) or other desired value by turning the "OPR. ADJ" knob. Release "TEST" button.

Return the FUNCTION SWITCH TO "A SOAK" position. Push "TEST" button to soak the "A" relay. Release "TEST" button. Turn FUNCTION SWITCH to the "A N.O." position. Push the "TEST" button and adjust the meter to the test value (13.9), readjust value (14.4) or other desired value by turning the "N.O. ADJ" knob. Release "TEST" button.

The QUIK CHEK SET is ready for routine use.

(c) NOTE: If a subscriber is encountered during any test through mis-dialing or plugging into a busy switch, the QUIK-CHEK operator may converse with him by turning the Function Switch to the "Polarity & Monitor" setting and operating the "Talk" button.

3. STEP-BY-STEP TESTS

3.01 This covers the tests which may be made with the QUIK CHEK TEST SET (Model CMC 707A) on Step-by-Step switches in all types of Step-by-Step offices, including C.D.O.'s, Centrex, and PBX's.

3.02 The tests are as follows:

(a) "A" Relays: This is a QUIK CHEK of "A" Relays using the current flow TEST values specified in the circuit requirement tables.

(b) "B" Relay Release: This is a QUIK CHEK of the "B" Relay releasing time.

(c) "C" Relay Release and Rotary-Selectors: This is a QUIK CHEK of the "C" Relay releasing time, cut in, and rotary stepping.

(d) Polarity: This is a QUIK CHEK of the continuity and polarity of switches and selector level trunks.

(e) Digit Absorbing: This is a QUIK CHEK of the digit absorbing features of selectors.

(f) Loop Pulsing: This is a QUIK CHEK method of making loop pulsing tests on selectors and connectors.

(g) Leak Pulsing: This is a QUIK CHEK method of making leak pulsing tests on selectors and connectors.

3.03 If it is found necessary to monitor and/or talk on a connection, set the "FUNCTION" switch on "POLARITY & MON." position. Monitor with the "TALK" key normal. To talk, the "TALK" key is held operated. The speaker is disconnected while talking. The "TALK" key is non-locking.

3.04 Local procedures should apply in busying out switches, trunks, etc.

3.05 Records of troubles found and other reports should be made as required locally.

3.06 The QUIK CHEK Test Set should be checked and calibrated periodically. See "CALIBRATION-QUIK CHEK TEST SET".

4. EQUIPMENT AND APPARATUS REQUIRED

4.01 One QUIK CHEK Test Set, Model CMC 707A.

4.02 One two conductor cord equipped as follows:

- (a) Where BATT jacks are available, use 2P9A Cord (see Fig. 1 Paragraph 1.03a).
- (b) Where BAT jacks are not available use cord 2W12A 9' long with a 310 plug at one end. At the other end equip the tip

and sleeve with 360C and 360A tools with KS-6278 connecting clips (see Fig. 2 Paragraph 1.03a) (Cord, 2W12A).

4.03 One 3 conductor (P3H) test cord, 10 feet long, equipped with a 310 plug at one end, and a 240H plug at the other (3P35A Cord Assembly, Modified Locally) see Fig. 3, Paragraph 1.03b.



Fig. 4

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5. PREPARATION ALL TESTS

STEP	ACTION	VERIFICATION
1	Insert the 310 plug of one end of the 2 conductor 2P9A cord into the "BATT" jack of the QUIK CHEK Test Set. Then insert the 310 plug at the other end of cord into the "BAT" jack in the bay. <i>Note:</i> If a "BAT" jack is not available, use the 2W12A cord equipped with the KS-6278 connecting clips (Fig. 2). Clip the tip cord to a convenient source of -48V battery, and the sleeve to ground.	
2	Insert the 310 plug of the 3 conductor (3P35A) cord into the "TEST" jack of the QUIK CHEK Test Set.	

6. METHOD

(A) "A" RELAY TEST

3	Set the "FUNCTION" switch to "A OPR" position. Insert the 240-H plug into the test jack of the switch under test.	
4	Operate the "TEST" key and adjust the "OPR ADJ." rheostat until the meter reads the milliamps specified for the operate test requirement.	
5	Set the "FUNCTION" switch on "A N.O." position, operate the "TEST" key, adjust the "N.O. ADJ" rheostat until the meter reads the milliamps specified for the non-operate test requirement.	
6	With the "NO" and "OPR" settings adjusted as in Steps 4 and 5 operate the "FUNCTION" switch to "A SOAK" position. Operate the "TEST" key momentarily. Then set the "FUNCTION" switch to "A N.O." position, and again operate the "TEST" key momentarily.	Note that the "A" Relay does operate when the "TEST" key is operated in the "A SOAK" position but does not operate in the "A N.O." position.
7	Operate the "FUNCTION" switch to "A OPR" position, operating the "TEST" key momentarily.	Note that the "A" Relay operates.
8	Remove the 240-H plug from the test jack of the switch and insert it in the next switch to be tested; or if preferred, make other desired tests on the same switch.	
9	Repeat steps 5, 6, 7 and 8 until all switches have been tested.	
10	Remove the 240-H plug from last switch tested.	

STEP	ACTION	VERIFICATION
(B) RELAY RELEASE TEST		
3	Operate the "FUNCTION" switch to "B RLS" position. The "B" relay can be checked at either the 500 millisecond re-adjust value or the 750 millisecond test value.	
4	Operate "DIGIT" switch to "C" position for continuous pulsing.	
5	Operate the "PPS" switch to "12 PPS" position.	
6	Insert the 240-H plug into the test jack of the switch under test.	
7 (A)	<p>500 Millisecond Test (The "B" release value is 500 milliseconds pulsed continuously when the "FUNCTION" switch is in the "B RLS" position.)</p>	<p>The switch steps to the 1st level; does NOT cut in; and releases; continuing as long as the 240-H plug remains in the test jack.</p>
	Operate the "TEST" key momentarily.	
7 (B)	<p>750 Millisecond Test Operate the "TEST" key momentarily and hold the "TALK" button in the operate position. (This changes the release value to 750 milliseconds.) The Talk circuit is operative only when the "FUNCTION" switch is in the "POLARITY & MONITOR" position.</p>	<p>The switch steps to the 1st level; does NOT cut in; and releases; continuing as long as the 240-H plug remains in the test jack.</p>
8	Remove the 240-H plug from the switch under test and insert it in the test jack of the next switch to be tested. Or proceed to "C RLS & ROT" test on same switch.	<p>The switch steps to the 1st level; does NOT cut in; and releases; repeating as long as the 240-H plug remains in the test jack.</p>
9	Repeat step 8 until all switches have been tested; operate the "RLS" key; and remove the 240-H plug from the last switch tested.	<p>The switch returns to normal and the pulsing in the test set stops.</p>
(C) "C" RELAY RELEASE AND ROTARY TEST SELECTORS		
3	Operate the "FUNCTION" switch to "C RLS & ROT" position.	
4	Operate the "DIGIT" switch to "C" position for continuous pulsing.	
5	Operate the "PPS" switch to "12 PPS" position.	
6	Insert the 240-H plug into the test jack of the switch under test.	
7	Place the movable finger of the 240-H plug so that it will make good contact with the sleeve wiper terminal just below the test jack springs. On some switches clip lead ground must be used instead of the movable finger.	

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STEP	ACTION	VERIFICATION
8	Operate the "TEST" key momentarily.	The switch steps to the 1st level; cuts in; rotates to at least the 8th rotary step; and releases. Repeating as long as the 240-H plug remains in the test jack.
9	Remove the 240-H plug from the switch under test and insert it in the test jack of the next switch to be tested, or leave it in the same switch and make the "POLARITY" test.	The switch steps to the 1st level, cuts in, rotates to at least the 8th rotary step, and releases; repeating as long as the 240-H plug remains in the test jack.
10	After all switches have been tested, operate the "RLS" key and remove the 240-H plug from the last switch.	The switch returns to normal and the pulsing in the test set stops.

(D) POLARITY TEST OF TRUNKS FROM SELECTOR LEVELS

3	Operate the "FUNCTION" switch to the "POLARITY & MON" position.	
4	Operate the "DIGIT" switch to the number which corresponds to the level to be tested.	
5	Operate the "PPS" switch to position "10" or "12", whichever is appropriate.	
6	Insert the 240-H plug into the test jack of the switch under test.	The switch is seized.
7	Operate the "TEST" key momentarily.	The switch steps up and cuts in on the level indicated by the "DIGIT" switch.
	Flip the switch across the trunks.	White lamp burning indicates a straight line, red lamp a reversed line.
	<i>Note:</i> If the switch fails to step, this is usually an indication that the lamp has burned out. Replace it.	
8	Operate "RLS" key momentarily.	The switch restores to normal.
9	Repeat steps 4, 7 and 8 until all levels have been tested.	
10	Remove 240-H plug and repeat steps 4, 6, 7, 8, 9 until all trunks in all shelves have been tested.	Switch restores to normal.
11	Remove 240-H plug from last switch.	Switch restores to normal.

(E) DIGIT ABSORBING TEST

3	Operate "FUNCTION" switch to "POLARITY & MON" position.
4	Operate "DIGIT" switch to the number which corresponds to the level to be tested.

STEP	ACTION	VERIFICATION
5	Operate "PPS" switch to position "10" or "12", whichever is appropriate.	
6	Insert the 240-H plug into the test jack of the switch under test.	Switch is seized.
7	Operate the "TEST" key momentarily.	The switch steps to the level indicated by the "DIGIT" switch and: (1) If digit absorbed - the switch releases. (2) If unlocked - the switch cuts in to 1st idle trunk.
8	Repeat step 7 until all digit absorbing features on all digit absorbing levels have been tested.	
9	Operate "RLS" key and remove the 240-H plug from the switch under test.	Switch restores to normal.
10	Repeat steps 7, 8 and 9 until all switches have been tested.	

(F) LOOP OULSING TEST

3	Operate "FUNCTION" switch to the required Loop Position. (LP.1400, LP.1200, or LP.750)	
4	Operate "DIGIT" switch to position 9.	
5	Operate the "PPS" switch to "10" or "12" whichever is appropriate.	
6	Insert the 240-H plug into the test jack of the switch under test.	Switch is seized.
7	Operate the "TEST" key momentarily.	Observe that the switch steps evenly to the 9th level and cuts in to the first idle trunk.
8	Operate the "RLS" key and remove 240-H plug from test jack of switch.	Switch restores to normal.
9	Repeat steps 6, 7 and 8 until all switches have been tested.	

(G) LEAK PULSING TESTS

3	Operate the "FUNCTION" switch to the required Leak position (LK.A, LK.B, LK.16K).	
4	Operate the "DIGIT" switch to position 9.	
5	Operate the "PPS" switch to "10" or "12", whichever is appropriate.	

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STEP	ACTION	VERIFICATION
6	Insert the 240-H plug into the test jack of the switch under test. <i>Note:</i> On some switches it is necessary to separate contacts 5 & 6 of the Test jack assembly with an orange stick in order to perform pulsing tests.	Switch is seized.
7	Operate the "TEST" key momentarily.	Observe that the switch steps evenly to the 9th level and cuts in to the 1st idle trunk.
8	Operate the "RLS" key and remove the 240-H plug from test jack of switch.	Switch restores to normal.
9	Repeat steps 6, 7 and 8 until all switches have been tested.	

7. CALIBRATION

- 7.01 This covers the calibration of the QUIK CHEK Test Set. Calibrations should be made periodically, or if the test set has been exposed to exceptionally rough handling.
- 7.02 Remove the QUIK CHEK from its case by removing the two screws at the bottom of the case. The QUIK CHEK will then easily slip out of its case.
- 7.03 All calibrations should be made with the QUIK CHEK Test Set in a flat position, face up.

8. MILLIAMMETER

- 8.01 Operate the "N.O. ADJ" rheostat in a counter-clockwise direction so as to cut in all the resistance.
- 8.02 Operate the "FUNCTION" switch to the "A.N.O." position.
- 8.03 Connect a known standard milliammeter in series with a -48V battery and ground source, and the tip and ring of the QUIK CHEK test jack.
- 8.04 Operate the "TEST" key and compare readings at low, medium and high range. Use the "N.O. ADJ" rheostat to adjust to values desired.
- 8.05 If necessary, readjust the meter in the QUIK CHEK Test Set by means of the adjusting screw on the back of meter.

9. SPEED OF PULSES

- 9.01 Using the 2 conductor cord, connect -48V battery and ground to the "BATT" jack of the QUIK CHEK Test Set.
- 9.02 Operate the "FUNCTION" switch to the "POLARITY & MON"
- 9.03 Operate the "DIGIT" switch to the "CAL" position.
- 9.04 Operate the "PPS" key to 10 or 12, whichever is appropriate.
- 9.05 Operate the "TEST" key; You should hear 10 skip pulses from the pulse generator within the set, every ten seconds (use a stop watch or a watch with a second hand). For 12 PPS, there will be 72 skips a minute or 12 each 10 seconds.
- 9.06 If either speed fails to check within ± 5 PPS, remove the set from the case and adjust the speed control potentiometers. (10 "PPS ADJ" for 10 PPS, and "12 PPS ADJ" for 12 PPS.

10. PERCENT BREAK

- 10.01 Before checking the percent break, the the speed should be correct.
- 10.02 A western Electric KS-7361 Percent Break Meter or an equivalent is required.
- 10.03 With the case removed, insert the test leads into the CALIBRATE JACKS on the bottom of the set. Operate the "FUNCTION" switch to "POLARITY & MON"; the "DIGIT" switch to "CAL" and the "PPS" switch to 10 or 12 as appropriate.

- 10.04 Operate "TEST" key. Percent break should read 60.5% \pm .5% in 10 or 12 PPS.
- 10.05 Operate the "FUNCTION" switch to "LP. 1400".
- 10.06 Operate "TEST" key. Percent Break should read 68.5% \pm .5%.
- 10.07 If the Percent Break does not meet requirements in paragraphs 10.04 and 10.06, adjust as follows:

PPS	FUNCTION SWITCH POSITION	ADJUST BY POT.#
10	POLARITY-MONITOR	10 - 60.5
12	POLARITY-MONITOR	12 - 60.5
10	LP. 1400	10 - 68.5
12	LP. 1400	12 - 68.5

11. CIRCUIT DESCRIPTION

11.01 CIRCUIT COMPONENT PARTS

- (1) Mode (FUNCTION) Switch - 12 positions - 6 wafers
- (2) Type "44" Rotary Switch - 3 levels
- (3) "DIGIT" Switch - 12 positions - 2 wafers
- (4) "TEST" key double pole - Double Throw. Non-locking
- (5) "RELEASE" key double pole - Double Throw. Non-locking
- (6) Push to "TALK" double pole - Double Throw. Non-locking
- (7) "PPS" Switch 4 pole - Double Throw. Locking
- (8) Printed circuit board - Solid State Pulsing Circuit
- (9) Five Relays "T", "R", "D", "A", "P",
P - Pulsing, A - Audio, D - Digit Delay,
R - Release, T - Test
- (10) Meter - 10-20 MA.
- (11) Rheostats - Two - 2.5K
- (12) Potentiometers - Two 500K & four 50K
- (13) Two 24B Lamps (30 - 45 MA.)
- (14) One TA-9 Module
- (15) One Microphone
- (16) One Speaker

- (17) One Volume Control 1 Meg.
- (18) Test Jack
- (19) Batt. & Grd. Jack

11.02 CIRCUIT FUNCTIONS

- (1) Current Flow "A" relay test
- (2) "B" relay release timing test
- (3) "C" relay release and rotary speed test
- (4) Loop pulsing tests
- (5) Leak pulsing tests
- (6) Polarity test
- (7) Monitoring & push to talk feature
- (8) Digit selection control

11.03 "A" RELAY TEST

- Step 1: "FUNCTION" switch operated to the "A SOAK" position.
- (a) A short is placed across the "A" relay.
- Step 2: "FUNCTION" switch operated to the "A.N.O." position.
- (a) The tip side of the cord is connected thru the "TEST" jack to the No. 2 terminal of Wafer A and on the No. 2 contact of "TEST" key.
 - (b) The ring side of the cord is connected thru the "TEST" jack to the No. 2 terminal of Wafer B, thru a 2.5K rheostat, a diode and a suppressed 10-20 Ma. meter to the No. 3 contact of the "TEST" key.
 - (c) When the "TEST" key is operated, the current can be adjusted with the "N.O. ADJ" rheostat to the proper non-operate value.
- Step 3: "FUNCTION" switch operated to "A OPR" position.
- (a) The tip side of the cord is connected thru the "TEST" jack to the No. 3 terminal of Wafer A and on to the No. 2 contact of the "TEST" key.
 - (b) The ring side of the cord is connected thru the "TEST" jack to No. 3 terminal of Wafer B, which in turn is connected to a 2.5K

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rheostat, diode and the suppressed 10-20 Ma. meter of the No. 3 contact of the "TEST" key closed and the rheostat may be adjusted to the proper operate current value.

11.04 "B" RELAY TIMING TEST

A. TIMING VALUE OF .500 SECONDS TO "B" RELAY.

"FUNCTION" switch operated to "B RLS" position (4).

"DIGIT" selector switch operated to "C" position (continuous pulsing).

"PPS" switch operated to 12 PPS position.

- (1) The tip of the "TEST" jack is connected thru the No. 4 terminal of Wafer A, to the No. 2 contact of "PPS" switch to the "C" wiper of the type 44 rotary switch.
- (2) The ring of the "TEST" jack is connected to the No. 2 contact of the "RLS" key and the Nos. 1 to 5 terminals of "A" level bank of the 44 switch (Contacts 1, 2, 3, 4 & 5 are strapped common.)
- (3) The solid state pulsing circuit is activated on the "B RLS", "C RLS. & ROT.", "POLARITY & MON." and the LP. and LK. tests positions (4-12 on schematic) with ground being extended from Wafer D to the pulsing circuit.
- (4) A 60-40 percent pulse comes from the solid state pulsing generator thru break contacts of the "D" relay to the No. 6 contact of the "TEST" key. The No. 5 contact of the "TEST" key is connected to the "T" & "D" relay windings.
- (5) Operating the "TEST" key closes a circuit thru to the "T" relay but not the "D" in order to absorb the first pulse to the pulsing relay. When the circuit is open during the first pulse, the "D" relay operates and closes a circuit to the "P" relay, and continues the pulsing.
- (6) Ground from the No. 6 contact of "P" relay makes with No. 5, thru to the motor magnet, driving the Type 44 rotary switch with continuous pulses. (Timing value of .500 sec. to "B" relay.)
- (7) By operating the "RLS" key, ground thru it's "make" contacts operates relay "R" to battery. A 100 mf condenser and a 600 ohm resistor gives the release relay a one second time delay. This allows

the switch under test to fully release before another function is performed. Operating the R relay causes "D" and "T" to restore. Ground from relay "R" make-contacts closes a circuit to cam springs, and the digit switch causes the 44 switch to home after the test has been completed.

B. TIMING VALUE OF .750 SECONDS TO "B" RELAY.

"FUNCTION" switch operated to "B RLS" position (4).

"DIGIT" selector switch operated to "C" position (continuous pulsing).

"PPS" switch operated to 12 PPS position.

"TALK" switch depressed and held operated.

- (1) Same as wiring for .500 seconds except level "B", contact #2 of the "44" switch is connected through the normal break 4 & 5 contacts of the push-to-talk key and back to contact #3 of level "B" of the "44" switch.

11.05 "C" RELAY TIMING AND ROTARY SPEED TEST

"FUNCTION" switch operated to "C RLS & ROT" position (5).

"DIGIT" switch operated to "C" position (continuous pulsing).

"PPS" switch operated to 12 PPs position.

- (1) The tip of the "TEST" jack is connected thru the No. 5 terminal of Wafer A to contact No. 2 of "PPS" switch, contact No. 3, to the wiper of the A level of the "44" rotary switch.
- (2) The ring of the "TEST" jack is connected thru the break contacts of the "RLS" key to the No. 5 terminal of Wafer A of the "FUNCTIONS" switch, to the banks of the Type 44 rotary switch. (Contacts 2-4 & 6-9 of Level A of the type 44 rotary switch are strapped common.)
- (3) Since terminals 4-12 of Wafer D are strapped common, the solid state generator continues to pulse.
- (4) The functions are the same as described in the "B" Relay Timing Test section, paragraphs 4, 5, 6 & 7. The only difference is timing of the "C" which is controlled by the strapping of the 44 switch, level A.

(5) Ground is placed on the No. 3 jack and release trunk wiper from Wafer F, No. 5 terminal, to the sleeve of the "TEST" jack, providing a rotary speed test.

11.06 POLARITY-MONITORING TEST

"FUNCTION" switch operated to "POLARITY & MON" position, (6).

"DIGIT" switch can select any digit desired.

"PPS" switch can be in either 10 or 12 PPS position.

- (1) The tip of the "TEST" jack is connected to terminal 6 of Wafer B, thru the normally "made" contact of relay "R", through the normally "made" contact of the "P", thru 200 ohm transformer.
- (2) The ring of the "TEST" jack is connected thru the normally "made" contacts of the "RLS" key to the wiper of Wafer A to terminal No. 6 thru the straight and reverse lamps and diodes to the 200 ohm audio transformer.
- (3) The TA-9 module is supplied with ground from Wafer F, terminal No. 6. Battery is stepped down thru a 300 ohm 25 watt resistor to the TA-9 module with a 500 MF filter bringing the voltage down to 6 volts.
- (4) The pulsing relay is activated by operating the "TEST" KEY. Ground thru the "make" contacts of the "P" relay drives the 44 switch, and the break springs open off the T & R circuit simultaneously. Ground is placed from the digit switch Wafer A to the B bank contacts of the 44 switch, grounding the selected digit. The 44 switch is driven by the same method as mentioned in the foregoing. When the wiper encounters ground from the B level bank, the "T" relay is shunted down by placing ground on the battery side of the "T" and "D" relays, releasing them and opening off the pulses to the "P" relay. Monitoring and talking can only be accomplished with the "FUNCTION" switch in the "POLARITY & MON" position. The listen or monitor circuit is on at all times in this position. If the operator has reason to talk to subscriber or other person, he simply pushes the "TALK" switch. This operates battery thru the "make" contacts of the "TALK" key to the "A" relay, to ground at position 6 of Wafer F. Operating relay "A", changes TA-9 module thru its contacts from a listen to a talk function. The volume control is only in the monitor circuit.

11.07 LOOP TEST

"FUNCTION" switch operated to "LP 1400" position, (7).

"DIGIT" switch on digit 9.

"PPS" switch operated to 10 or 12 PPS as required.

- (1) The tip of the "TEST" jack is connected to Wafer B terminal No. 7 to the contacts of the release relay. The ring is connected thru the contacts of the release key to Wafer "A" terminal No. 7 thru 1400 ohm resistance, and the "break" contacts of the P relay.
- (2) The "TEST" key is operated momentarily and the circuit functions as previously described in "B" Relay Timing Test section, paragraph 5. The switch under test operates to the 9th level and cuts in.
- (3) The LOOP circuits are the same in positions 7, 9 & 11. Only the loop resistance changes.
- (4) The "LOOP" positions are "out-pulsed" at 68.5% break, normally at 12 PPS.
- (5) Operation of the "RLS" key opens the tip and ring circuit, operates the release relay, giving a one second time delay so as to prevent any other function.

11.08 LEAK TEST

"FUNCTION" switch operated to LK.A. (8).

"DIGIT" switch operated to position 9.

"PPS" switch operated to 10 or 12 PPS (as required)

- (1) The test circuit operates the same as for loop test, with the exception that the pulsing circuit has zero loop resistance. It does have a network bridged across the tip and ring that is equal to the standard leak A (2 MF capacitor and 5K resistor paralleled with 10, 250 ohms.) The "LEAK" positions are 8, 10 and 12, the only differences being the leak networks.
- (2) The "LEAK" positions are "out-pulsed" at 60.5% break, normally at 12 PPS.