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METHOD OF OPERATION
TEST CIRCUIT

Final Multiple Test Lines For - Testing Incoming Selector Circuits (Mechanical) Having Four Party Semi-Selective AC Ringing - 95 - 110 Volts - Automatic Routine Selector Test Frame - Power Driven Machine Switching System.

GENERAL DESCRIPTION

1. This circuit is used with either an automatic routine test circuit or manual testing circuit to make tests on inter-office machine switching B and inter-office key indicator incoming selector trunk circuits which have supervisory relays both on the tip and ring sides of the circuit and also to make tests on inter-office and local incoming selector circuits which have supervisory relays on the ring side only all of which are arranged for four party semi-selective ringing. This circuit is arranged to test for premature tripping false tripping and timely tripping of the ringing relays in the incoming selector circuit and also test the supervisory relays on the ring side of all incoming selector circuits. After the supervisory relay on the ring has been tested an additional test of the supervisory relay on the tip side of inter-office machine switching B and inter-office key indicator trunk circuits are made.

2. The test line circuits are cross connected to the final multiple but not cross connected to either line switches or line finders. The incoming selector under test seizes a final selector. The final selector circuit is directed to one of these test line circuits either automatically by the routine test circuit or manually by a machine switching B operator who writes up the necessary test number on the keyboard. When the supervisory relays are tested disconnection takes place restoring the test line circuit to normal.

DETAILED DESCRIPTION

3. When the terminals of this circuit are seized by a final selector circuit, battery is connected to lead S operating the CO relay which locks through cam Q when the R-1 switch advances to position 1-1/2. When the incoming selector circuit under test has advanced to trunk closure and its ringing position, the R relay operates through cams P and O on the first interval of ringing current supplied by the 2 ring interrupter brush in turn operating the R-1 relay. The operation of the R-1 relay (a) closes a circuit through interrupter brush #1, PU-1 lamp, cam I, R-1 relay, cam D, break contacts of PU-1 and PU-2 relays to battery through the winding of the PU-2 relay and (b) from ground through interrupter brush #2, PU-2 lamp, cam H, T-1 relay, break contacts of the PU-2 and PU-1 relays to battery through the winding of the PU-1 relay. If the ringing current being supplied to the testing circuit is through interrupter brush #1, the PU-1 relay operates through the interrupter brush set #2. If the ringing current being supplied to the test circuit is through ringing interrupter brush set #2, the PU-2 relay operates to ground through interrupter brush #1.

4. Either the PU-1 relay or the PU-2 relay operated locks to ground on cam K and advances the switch to position 2. Should ground be connected through

either one of the P.U.interrupter brushes, a circuit is closed through the associated I or H cam, contacts of the PU-1 relay to battery through the winding of the PU relay which operates and locks to ground on cam K preventing further functioning of the testing circuit until disconnection takes place. If ground is not connected through either one of the PU brushes, the PU relay does not operate allowing the switch to advance to position 3. During the silent period between the two rings, the R relay releases in turn releasing the R-1 relay. The R-1 relay released closes a circuit from ground on cam J, make contact of the CO relay and break contact of the R-1 relay, cam F, break contact of the PU relay to battery through the R-1 magnet, advancing the switch to position 3. In position 3, the R relay reoperates on the second ringing period of two ringing current, re-operating the R-1 relay. The R-1 relay operated closes circuit from ground on cam J, make contacts of the CO and R-1 relays, cam D, break contact of the PU relay, R-1 magnet to battery advancing the switch to position 4. During the ringing interval the R and R-1 relays re-operate but perform no useful function. When the #1 brush set of the PU interrupter makes contact with grounded segment a circuit is closed through contacts of cam I and make contacts of the PU-1 relay (assuming this relay operated in position #1 of the test switch), contacts of cam R to battery through the inner winding of the PU relay, which operates. Upon the next ringing interval the R and R-1 relays operate closing a circuit from ground through cam J, make contact of the CO relay make contacts of the R-1 relay, cam F, make contacts of the PU relay to battery through the R-1 magnet advancing the switch to position 5.

PREMATURE TRIPPING TEST

5. In position 5, the R relay is disconnected from the ring side of the testing circuit and connected through cam P, break contact of the PU-2 relay to the 2 ring interrupter brush set #1. During the next ringing interval, ringing current is supplied to the test line circuit from the incoming selector circuit under test and is also connected through interrupter brush #1 and break contact of the PU-2 relay to ground on cam O, through the winding of the R relay which operates. The R relay operated operates the R-1 relay which closes a circuit from ground through its make contact, cams D and E (R-1) cam B, (R-2) to battery through the R-2 magnet advancing the timing switch out of position 1. Ground through cam K to cam B carries the switch to position 9. As the R-2 switch is passing through positions 2 to 7-3/4, the A, B, C and D resistances are connected across the tip and ring sides of the test circuit through cam L (R-1) and cam H (R-2) to make premature tripping test on the ringing relays in the incoming selector circuit under test. During the silent interval between the 2 rings, the R and R-1 relays release. The release of the latter relay connects ground through its break contact and cams F and G (R-1), cam C (R-2) to battery through the R-2 magnet advancing the timing switch to position 10. With the operation of the R-1 relay on the second ringing interval, the R-2 switch advances out of position 10. Circuit: ground, make contact of the R-1 relay, cams D and E (R-1) cam B (R-2). Ground through cam K and cam B carries the switch to position 18.

6. As the timing switch, (R-2) is passing through positions 11 to 16-3/4 the premature tripping of the ringing relays is tested a second time by connecting the A, B, C and D resistances across the tip and ring of the test circuit through cams L and H. Upon the release of the R-1 relay after the second premature tripping test, the R-1 switch advances to position 6, from ground

through the break contact of the R-1 relay cams F and G (R-1) cam D (R-2) R-1 magnet to battery. The same ground closed through cam G, cam C (R-2) advances the timing switch to position 1. The operation of the R and R-1 relays on the first period of the next two ring interval, advances the R-2 switch out of position 1. Circuit: Ground make contact R-1 relay, cams D and E, cam B R-2 switch. The switch is carried to position 9 by ground on cam K.

7. As the R-2 switch is passing through positions 2 to 7-3/4 on the second revolution, the A, B, C and D resistances are connected across the tip and ring of the line through cams L and H to test the premature tripping of the ringing relays in the incoming circuit a third time. The release of the R and R-1 relays during the silent period between the two rings advances the R-2 switch to position 10 from ground break contacts of the R-1 relay, cams F and G and cam C (R-2). With the R-2 switch in position 10, ground through the break contact of the R-1 relay, cams F and G (R-1), cam D (R-2) advances the R-1 switch to position 7. In position 7 the R relay is again connected across the tip and ring side of the test circuit and operates on the second period of ringing current if the ringing relays in the incoming circuits have not tripped prematurely. If the relays have tripped, the R relay does not operate and the test circuit is held in position 7 until disconnection takes place. With the R relay operating on the second ringing period, the R-1 relay operates and advances the R-1 to position 8 through contact of the R-1 relay, cam D, break contacts of PU relay R-1 magnet to battery.

8. During the silent interval between each two 2 ring periods the R-1 relay releases and advances the R-1 switch to position 9 through cam F and break contact of the PU relay. Upon the next interval of 2 ring current, the R and R-1 relays re-operate, the latter closing a circuit through its make contacts cams D and E, cam B (R-2) advancing the timing switch out of position 10, ground on cam K advances it to position 18. As the timing switch is passing positions 11 to 16-3/4 of its second revolution, the A and B resistances are connected across the tip and ring of the line through cams L and H to trip the ringing relays in the incoming circuit. During the silent interval between rings, the R and R-1 relays release advancing the R-2 switch from position 18 to position 1. When the R-2 switch enters position 1, the same ground through the break contact of the R-1 relay, cams F and G on R-1 and cam D on R-2 advances the R-1 switch to position 10. In position 10 the R relay is again connected to the ring side of the test circuit and incoming circuits to verify the tripping of the ringing relays in the incoming selector circuit. If the ringing relays have not tripped the R relay operates on the next interval of ringing current in turn operating the R-1 relay which locks through cam D to ground through the make contact of the CO relay and cam J. The test circuit remains in this position until released by disconnection.

9. If the ringing relays in the incoming selector circuit are tripped, the R and R-1 relays do not operate but the TP relay operates in a circuit from battery through the cams N, I, H and G resistances, tip side of the test line and incoming circuits to ground. The operation of the TP relay closes a circuit from battery through the inner winding of the PU relay make contact of the TP relay make contact of the PU-1 relay, cam I to ground on the

P.U. interrupter brush #1, operating the PU relay when the ringing interrupter sends its next interval of current. (NOTE: This is the same interval of current that would operate the R relay in case the ringing relays in the incoming circuit are not tripped). With the PU relay operated a circuit is closed in position 10 of R-1 from ground on cam J, through the make contact of the CO relay, break contacts of the R-1 relay, contacts of cam F, make contact of PU relay to battery through the R-1 magnet advancing the testing switch to position 11. As the switch leaves position 10 the PU-1 relay releases. In position 11, the R-1 relay is put under control of the 149 interrupter.

10. When the brushes on the 149 interrupter make, ground through the interrupter and cam C operates the R-1 relay advancing the R-1 switch to position 12 through cam D and the break contact of PU relay. When the brushes on the interrupter break, the R-1 relay releases advancing the R-1 switch to position 13. In position 13, ground is connected through cam J and the A resistance to the ring of the circuit for a soaking test of the supervisory relay in the incoming selector circuit.

TEST OF SUPERVISORY RELAY

11. Upon the make of the interrupter brushes, the R-1 relay operates and advances the R-1 switch to position 14. When the interrupter contacts break the R-1 relay releases advancing the R-2 switch to position 2 through cams F and G, cam C (R-2) to battery through the R-2 magnet. When the interrupter makes contact the R-1 relay operates advancing the R-2 switch to position 3. Circuit: Break contacts of the R-1 relay, cams F and G (R-1) and cams C (R-2). With the R-1 switch in position 14 and the R-2 switch in position 3, a circuit is closed from ground through cam E (R-2), cam M, (R-1), E, D, C, B and A resistances or the C, B and A resistances depending upon the type of supervisory relay being tested, ring sides of the test line as an operating test of the supervisory relay in the incoming selector circuit.

12. Upon the next opening of the interrupter contacts, the R-1 relay reoperates advancing the R-2 switch to position 4. With the R-2 switch in position 4, the operating resistance is open at cam E and the releasing capability of the supervisory relay is tested through the A, B, C, D, E and F resistances in series which are connected to ground through cam K (R-1). With the make of the contacts on the 149 interrupter, the R-1 relay operates advancing the R-2 switch to position 5. The R-2 switch is advanced through positions 5, 6, 7 and 8 under control of the 149 interrupter. In position 5 an operating test is applied in position 6 a release test is made and in position 7 the operating test of the supervisory relay is again made. With the R-2 switch in position 7, ground through cams E and F (R-2), cam B (R-1) advances the testing switch to position 15. With the R-2 switch in position 8, ground through cams E, F and B advances the R-1 switch to position 16.

13. In position 15 of the R-1 switch an operating test is of the supervisory relay on the tip side of the line is applied from battery through cam N, G, resistance (45 ohms) over the tip side of the line. This low resistance permits a soaking current to flow through the winding of the supervisory relay. On leaving position 15 a releasing test is applied through

cam N and 6405 ohms resistance. With the release of the R-1 relay, the R-2 switch advances to position 8 and closes a circuit from ground through the contacts of cams E and F (R-2) cam B on (R-1) to battery through the R-1m magnet advancing the switch to position 16. As the R-1 relay alternately operates and releases under control of the 149 interrupter, the R-2 switch is advanced through positions 9 to 14 inclusive. In positions 10, 12 and 14 of the R-2 switch, the supervisory relay on the tip side of the selector circuit under test is operated from battery through cam N (R-1) cam G, (R-2) H and G resistances over the tip side of the line, final and incoming selector circuits to ground. In positions 11, 13 and 15 the operating circuit for the supervisory relay is open at cam G (R-2) and the releasing resistance I is connected in series with the G and H resistances. When the R-2 switch enters position 15 a circuit is closed from ground through cams E and F (R-2) cam B (R-1) to battery through the R-1 magnet advancing the testing switch to position 17, the A cam advancing it to position 18. Both the R-1 and R-2 switches remain in position 18 until disconnection takes place in the incoming selector circuit.

DISCONNECTION

14. The operation and release of the supervisory relay in the incoming selector circuit serves as a disconnect signal. When the final selector circuit releases the terminals of this testing line circuit, the CO relay releases and connects battery through its break contact and cam Q to the S terminal holding this circuit busy to other hunting final selectors until it is restored to normal. The release of the CO relay also closes a circuit from battery through the winding of the MR register and break contact of the CO relay to ground on cam J, operating the register, which records the number of tests performed by this circuit. The operation of the register also closes a circuit from ground on its armature advancing the timing switch to normal. With the R-2 switch normal a circuit is closed from ground on the make contact of the MR register, cam F, R-2, cam B, R-1 advancing the testing switch to normal.

15. Should an incoming selector circuit under test show trouble, the test line circuit remains in the position which causes the incoming circuit to give trouble until premature disconnection by the routine test circuit. When this occurs, the final circuit releases the terminals of this line in turn releasing the CO relay. From this point the circuit is restored to normal as described in the paragraph above.

CIRCUIT REQUIREMENTS

THE READJUST REQUIREMENTS SHOWN BELOW ARE FOR MAINTENANCE USE ONLY.

	OPERATE	NON-OPERATE	RELEASE
B31 (TP)	Readj. .0018 amp. Test .0024 amp.		Readj. .0006 amp. Test .0003 amp.
E672 (R-1)	Special requirements to insure A.C.Control. Readj. .012 amp. Test .013 amp.	Readj. .007 amp. Test .0066 amp.	
E720 (PU)	Test requirement of outer winding proportional to test requirement of inner winding.		
Inner Wdg. (1500 ohms)	Readj. .018 amp. Test .019 amp.	Readj. .011 amp. Test .010 amp.	
Outer Wdg. (1500 ohms)	Test .021 amp.		
E88 (PU-1) (PU-2)	Readj. .021 amp. Test .023 amp.		Readj. .004 amp. Test .0038 amp.
	NOTE:- To prevent chattering, the "make-before-break" spring combination of this relay shall be so adjusted that the spring which normally makes on the back contact will give the greatest possible contact pressure against the back contact.		
E1328 (CO) Wdg. in series aiding.	Readj. .018 amp. Test .033 amp.	Readj. .012 amp. Test .011 amp.	

MECHANICAL REQUIREMENTS

J-4 (R) Minimum air gap. .023".
Minimum Follow .003".

ELECTRICAL REQUIREMENTS

Test in series with IMF condenser and 7300 ohms resistance at exchange ringing voltage.

ENG.--TML-ML. 3-25-22. CHK'D.--RAP-CHV. APPROVED - C.L.SLUYTER, G.M.L.