PULSE REPEATING RELAYS
PULSING REQUIREMENTS TA1 THROUGH TF2
USING 2B-1 SIGNALING TEST SET SD-56134-02 (J64730B)
AND ASSOCIATED PULSE REPEATING ADAPTER CIRCUIT

1. GENERAL

1.01 This section covers the conditions and methods for applying pulsing requirements TA1 through TF2 to pulse repeating relays. The adjusting procedures to be followed where the relays fail to meet the pulse repeating requirements under the conditions described are also included. The relays are associated with circuits in the following groups:

(a) Intertoll dialing outgoing or 2-way trunks.

(b) Intertoll keypulsing outgoing or 2-way trunks.

(c) Intertoll transmission selectors.

(d) Master office trunks associated with intertoll dialing.

(e) CX or SX signaling circuits associated with intertoll dialing or keypulsing trunks at the intertoll dialing office end, or associated with pulse link circuits included in intertoll dialing for through-pulsing facilities.

(f) Toll switching or outgoing trunks associated with intertoll dialing.

(g) Pulse corrector circuits associated with intertoll dialing trunk circuits.

1.02 The tests are based upon the use of the 2B-1 pulsing test set in combination with the pulse repeating adapter circuit (SD-56134-02, Fig. 5). The 2B-1 signaling test set consists of a 2B signaling test set modified by the addition of capacitor C18 which is required to condition it for use with the pulse repeating adapter circuit.

2B-1 Test Set and Pulse Repeating Adapter Features

1.03 The 2B-1 signaling test set provides a source of controlled pulses suitable for application toward the line or drop side of a circuit on E or M signaling leads. The pulse repeating adapter circuit converts the battery and ground pulses of the 2B-1 signaling test set to a form suitable for testing pulse repeating relays and CX, SX, and DX circuits at the equipment location.

1.04 Requirements TA, TB, etc, each refer to a particular testing and patching arrangement whereby the pulse repeating test set is connected to the operating winding and to the pulsing contacts of the relay under test. The numerical digit associated with each requirement, TA1, TA2, etc, refers in each case to the percent break of the pulses applied to the relay. Digit one represents 64 percent break; digit two, 59 percent break; digit three, 58 percent break; digit six, 29 percent break; and digit eight, 40 percent break.

1.05 The percent break values specified in this section are based on office battery limits of 24 to 26 volts for 24-volt battery, 36 to 38 volts for 38-volt battery and 48.5 to 50 volts for 48-volt battery.

1.06 ***Pulse Rate and Percent Break Input to Relay Under Test:*** Pulses applied to the relay under test are delivered by contact closures of the PR relay of the pulse repeating adapter circuit (SD-56134-02, Fig. 5). The pulsing speed and percent break of pulses delivered by the PR relay are transferred by means of an M lead patch cord arrangement from the signaling test set to the pulse repeating test set. The pulsing rate (pps) and the percent break for the various requirements TA1 through TF2 are shown in Table A. Pulsing speed for all requirements except TA6 and TA8 is 12 pps. TA6 and TA8 requirements are 6 and 8 pps, respectively.

1.07 Six locking-type keys designated SEND LOOP are included in the pulse repeating adapter circuit. These keys are used to insert a

resistance requirement in series with the pulsing input to the relay under test. The keys are designated 100, 200, 400, 800, 1600, and 3200 and may be operated singly or in additive combination to insert the desired resistance value.

1.08 ***Percent Break Output of Relay Under Test:*** The percent break of a relay under test is delivered to the percent break meter of the 2B-1 test set by means of an E lead patch cord arrangement interconnecting the pulse repeating test set and the 2B-1 signaling test set. Only the red scale of the 2B-1 test set percent break meter is used.

2. REQUIREMENTS

2.01 Table A defines the pulse rate and percent break of the pulses which shall be applied to the relays under test for each of the requirements TA1 through TF2. The table also indicates the jacks in the associated circuit and in the pulse repeating test set which, when patched together, provide the necessary circuit arrangements for applying the pulses.

2.02 When pulses are applied to the pulse repeating relay under conditions described in requirements TA1, TA2, etc, the percent break output of the relay should meet the requirements specified in the circuit requirements table on the circuit drawing where provided. Where the requirements are not shown on the circuit drawing, the limits given in Table B of this section should be used.

2.03 Two general types of circuits are installed in the plant. One type has an adjustable biasing resistance for use with pulse repeating requirements, and the circuit drawing specifies that this resistance shall be adjusted to obtain the required percent break output. The other type, in

TABLE A

REQUIREMENTS	JACK PROVIDING ACCESS TO RELAY	CORRES JACK IN PULSE REP ADAPTER	PERCENT BREAK INPUT TO RELAY	PULSE RATE (pps)
TA1	C	S/R	64	12
TA2	C	S/R	59	12
TA6	C	S/R	29	6
TA8	C	S/R	40	8
TB2	T A	S R	59	12
TC1	T	S R	64	12
TD2	T	S R	59	12
TE3	TST PLS	S R	58	12
TF2	TEST*	S R	59	12

*6-Point jack not designated.

general the earlier of the two, does not have this adjustable biasing resistance. If the circuit drawing shows the adjusting biasing resistance and it has been provided in the office, the limits shown on the drawing should be used. If the drawing shows this adjustable biasing resistance and it is not provided in the office, the limits specified in Table B should be used. If the circuit drawing does not show the adjustable biasing resistance, but percent break output requirements are specified, the requirements on the drawing should be used. If the percent break output requirements are not specified on the circuit drawing, the limits specified in Table B should be used.

TABLE B

CIRCUIT	REQUIREMENTS	FIG. NO. WIRING OR STRAP	DUMMY PLUG-IN JACK	OUTPUT PERCENT BREAK LIMITS	SEE NOTE
SD-55060-01	TD2	–	C	57-61	
SD-55086-01	TD2	A	B	57-61	
SD-55087-01	TD2	–	B	55-59	
SD-55088-01	TD2	A	A	55-59	
SD-55109-01		See circuit requirements table			
SD-55130-01	TE3	–	MB	58-62*	
SD-55130-01	TE3	–	MB	60-64	
SD-55275-01		See circuit requirements table			
SD-55301-01		See circuit requirements table			
SD-55379-01		See circuit requirements table			
SD-55415-01	TE3	4	MB	60-64	2
SD-55415-01	TE3	–	MB	58-62*	
SD-55530-01		See circuit requirements table			
SD-64469-01		See circuit requirements table			
SD-64471-01	TD2	T	B	60-64	
SD-66471-01	TD2	S	B	56-61	
SD-64471-01	TD2	R & S	B	58-62	
SD-64471-01	TD2	No Strap		56-61	
SD-64472-01		See circuit requirements table			
SD-64473-01		See circuit requirements table			
SD-64474-01		See circuit requirements table			
SD-64475-01	TA1	–	–	56-61	
SD-64482-01		See circuit requirements table			
SD-64484-01	TA1	–	–	56-61*	
SD-64484-01	TA1	–	–	57-59	
SD-64485-01		See circuit requirements table			
SD-64487-01		See circuit requirements table			
SD-64531-01		See circuit requirements table			
SD-64538-01		See circuit requirements table			
SD-64574-01	TD2	A or H	C	55-59	
SD-64584-01	TD2	A or B	C	55-59	
SD-64606-01	TD2	A or B	C	55-59	
SD-64630-01	TD2	T or R	C	57-61	
SD-64644-01	TD2	T or R	C	57-61	
SD-64645-01	TD2	T or R	C	55-59	
SD-64645-02	TD2	T or R	C	57-61	
SD-64646-01	TD2	–	C	55-59	
SD-64649-01	TD2	T or R	C	57-61	
SD-64662-01	TA1	–	–	56-61	

TABLE B (Cont)

CIRCUIT	REQUIREMENTS	FIG. NO. WIRING OR STRAP	DUMMY PLUG-IN JACK	OUTPUT PERCENT BREAK LIMITS	SEE NOTE
ES-64663-01	TA1	–	–	56-61	
ES-64666-01	TD2	–	B	61-65	
ES-64678-01	TA1	–	–	56-61	
ES-64679-01	TD2	–	B	61-65	
SD-64680-01	See circuit requirements table				
SD-64680-01	TA1	–	–	56-61	
SD-64682-01	TE3	–	MB	60-64	4
SD-64824-01	See circuit requirements table				
SD-64832-01	TD2	Fig. D or E	–	–	
SD-64832-01	TD2	Strap E	B	56-61	
SD-64832-01	TD2	Strap F	B	58-62	
SD-64832-01	TD2	Strap G	B	60-64	
SD-64832-01	TD2	Strap H	B	56-61	
ES-64856-01	TD2	–	B	58-62	
SD-64899-02	TD2	–	B	56-61	
SD-95028-01	TE3	–	MB	62-72	
SD-95028-02	TE3	–	MB	62-72	
SD-95028-03	TE3	–	MB	62-72	
SD-95029-01	TE3	–	MB	62-72	
SD-95029-02	TE3	–	MB	62-72	
SD-95048-01	TE3	–	MB	55-68	
SD-95048-01	TE3	–	MB	62-72*	
SD-95051-01	TE3	–	MB	55-68*	2,3
SD-95051-01	TE3	–	MB	62-72	
SD-95053-01	TE3	–	MB	55-68	1
SD-95060-01	See circuit requirements table				
SD-95067-01	TE3	–	PLS	57-59	
SD-95095-01	See circuit requirements table				
SD-95311-01	See circuit requirements table				

*239-Type relays.

Notes

1. Check SD circuit requirements table, charts, or circuit notes for further information to make proper break limit tests.

2. The pulse repeating relay should be checked in accordance with adjustment A or B, as covered in the section for the particular relay involved.

3. Strap ring and sleeve of TST jack of SD-95051-01, if "K" option is not provided.

4. Supplementary check with test panel for 209-type relays may be necessary where circuit conditions are severe.

3. APPARATUS

3.01 2B-1 signaling test set and pulse repeating adapter (SD-56134-02).

3.02 One each 2P1D and 2P3B patching cords, length as required (for patching 2B-1 test set to pulse repeating adapter).

3.03 One or two of the following cords (for patching the pulse repeating adapter to the relay circuit under test):

3P6F
5P3A
6P4B
3P7A
6P3A
3P15A

3.04 258C dummy plugs as required.

4. TEST SET PREPARATION

4.01 ***Test Set and Testing Interconnections:*** Connections between the 2B-1 test set and the pulse repeating adapter and between the 2B-1 test set and the KS-19653, L1 power supply accompanying the pulse repeating adapter are accomplished by means of patching cords. The power cords attached to the 2B-1 set are connected to the A and B jacks of the KS-19653, L1 power supply. The 3-prong plug of the power supply ac cord is connected to a 117-vac service outlet. It is essential that the service ground of the ac supply circuit is adequate to ensure that the requirements for the safety of the operator and the equipment operation of the test set will be met. Third-wire grounding of the ac power supply plug ordinarily meets these requirements, but the circuit features of the pulse repeating adapter and 2B-1 set require that there is no difference in potential between the office equipment ground and the ac service ground. The requirement is met by connecting a No. 14 or larger wire between the GROUND binding post on the KS-19653, L1 power supply and the office equipment frame. The power supply dc output voltage and the central office battery voltage must also be matched as closely as practicable. A measurement to determine the degree of difference existing in the power supply output and the central office voltage is made by the use of a KS-14510 volt-ohm-milliammeter, or equivalent. A 48-VOLT ADJUST potentiometer and pin jacks for connecting a voltmeter are provided on the power supply so that a voltage measurement and adjustment may be made while the test sets are under load. A voltage comparison check made at the —48V office battery test termination at the test set location will determine the adjustment required. Connection of the 2B-1 set to the pulse repeating adapter is accomplished by connecting a 2P3B patching cord and a 2P1D patching cord between the E and E1 and M and M1 jacks, respectively, of the 2B-1 set and the pulse repeating adapter. Circuits providing access to the relays to be tested are connected by patching to the S and R or S/R jacks of the adapter using cords as shown for CONNECT CORD on the appropriate test figures in this section.

4.02 ***Speed and Percent Break Adjustment:*** Following is the method of presetting the control keys, potentiometers, and switches of the 2B-1 and pulse repeating adapter circuit functions for setting up test requirements for various types of relays. With the pulse repeating adapter connected to the circuit to be tested, allow several minutes for the 2B-1 set to stabilize after power is applied, and check the power supply output voltage against the central office —48 voltage as previously described. With all 2B-1 set keys normal, adjust the ADJ PPS control to the required pulsing speed as indicated by the pps meter. Operate the TWD L key of the 2B-1 test set to OFF HOOK and place the pulse repeating adapter FUNCTION switch to P/C. Reading the red scale of the 2B-1 % BK meter, adjust the CAL % BK control for a meter reading of 0. Operate the adapter FUNCTION switch to the desired test position and verify that the % BK meter reading is still 0 on the red scale. If a reading other than 0 appears on the % BK meter, excessive patching cord conductor loss is present between the adapter and the circuit under test. A difference in ground potential, due to an insufficiently low resistance connection between the KS-19653, L1 power supply and the office frame ground, will also cause an abnormal % BK meter indication. Return the adapter FUNCTION switch to P/C. Operate the TWD L key of the 2B-1 to normal. Operate the PLS key of the 2B-1 set to LINE, thus applying pulsing at the speed and percent break which was set up in the 2B-1 set to the PR relay in the adapter. Operate the MEAS % BK key of the 2B-1 set to LINE and slowly adjust the ADJ % BK control of the 2B-1 set until the reading on the red scale of the % BK meter coincides with the requirement shown in the PERCENT BREAK INPUT TO RELAY column of Table A. With the

pulsing requirement set up as just described, operation of the adapter FUNCTION switch to the desired test position will indicate the output percent break of the relay under test on the red scale of the % BK meter.

Note: Unless otherwise specified on a circuit requirement table, the adapter LEAK switch, the ADJ REC LOOP key, and the SEND LOOP key are always set to OUT.

5. METHODS OF CHECKING REQUIREMENTS

5.01 Check that the circuit to be tested is idle. Make the circuit busy in the approved manner. Set the 2B-1 pulsing test set and pulse repeating adapter controls to provide pulsing output requirements and input measuring facilities as specified in Part 4 of this section. If readings do not fall within the limits specified, the relay or its biasing resistance is in need of adjustment.

6. ADJUSTING PROCEDURES

6.01 If the pulse repeating requirements are not met, check the relay under test as covered in the section and in the circuit requirements table for the particular type of relay involved and readjust the relay as required.

6.02 If the percent break is still not within the specified limits, change the strapping of the adjustable biasing resistance as required.

6.03 If an adjustable biasing resistance is not provided in the circuit, some improvement in pulsing usually can be obtained by making further minor adjustments of the relay while still keeping within specified mechanical and current flow requirements. When an 8E resistance lamp is used in a voltage compensation arrangement, the percent break output of the relay may in many cases be improved by substituting a 12E resistance lamp for the 8E resistance lamp.

Note: In the case of SD-64484-01, the substitution of a 12E lamp for an 8E lamp must be accompanied by a wiring change in the circuit as covered in the circuit notes of the circuit.

6.04 In the case of 239- or 280-type relays:

(a) A lower percent break will result when the contact travel is adjusted toward the minimum specified value or when the pole pieces are adjusted with the magnetic bias to the left.

(b) A higher percent break will result when the contact travel is adjusted toward the maximum specified value or when the pole pieces are adjusted with the magnetic bias to the right.

6.05 For 239-type relays which are equipped with solid armatures, the best pulsing performance is usually obtained when the contact travel is adjusted at a point approximately midway between the maximum and minimum limits.

6.06 In the case of 221-type and similar relays:

(a) A lower percent break will result when the residual airgap and spring tension are adjusted toward the minimum values.

(b) A higher percent break will result when the residual airgap and spring tension are adjusted toward the maximum values.

6.07 Any change in the adjustment of 209-type relays must be followed by a recheck with the test panel or circuit for the particular relay involved.

6.08 If all the requirements cannot be met, replace the relay under test with a new one and repeat the test.

6.09 After readjustments, test the circuit with its associated circuits for proper operation.

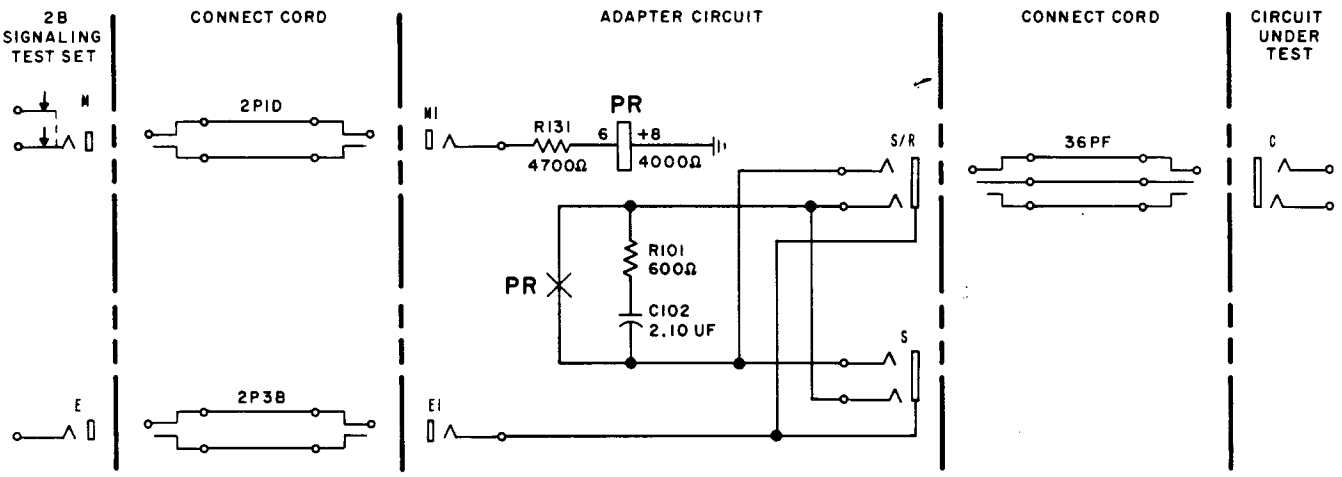

Fig. 1 — Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to TA Position

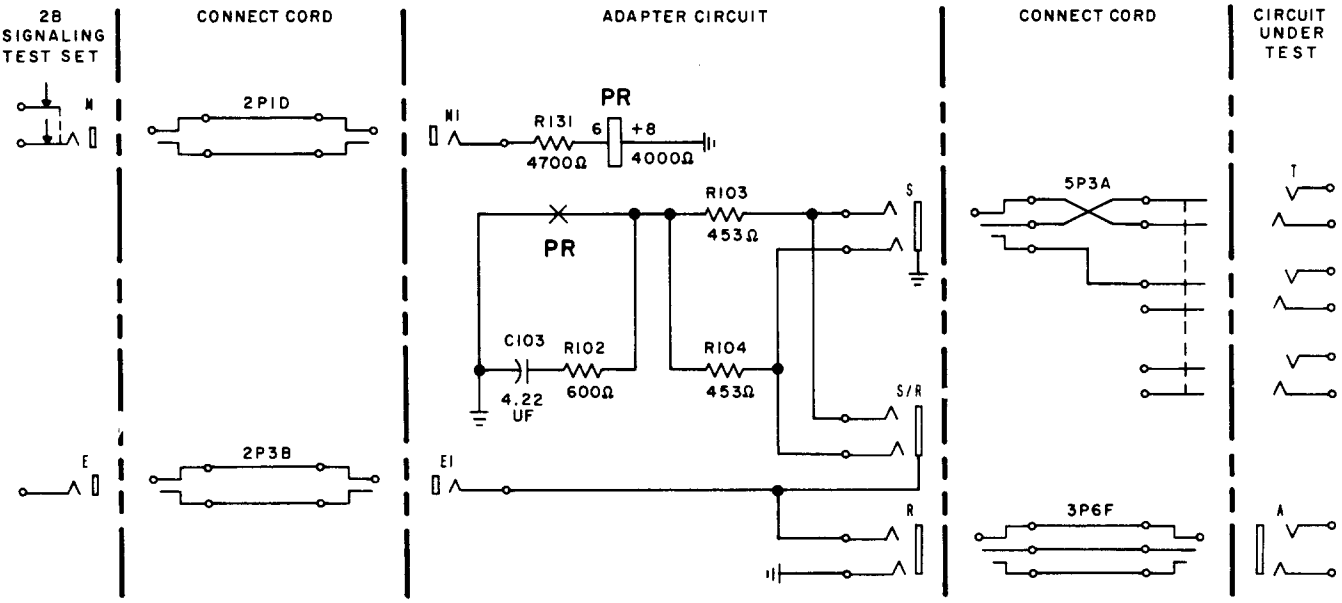

Fig. 2 —Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to TB-TD-TF Position

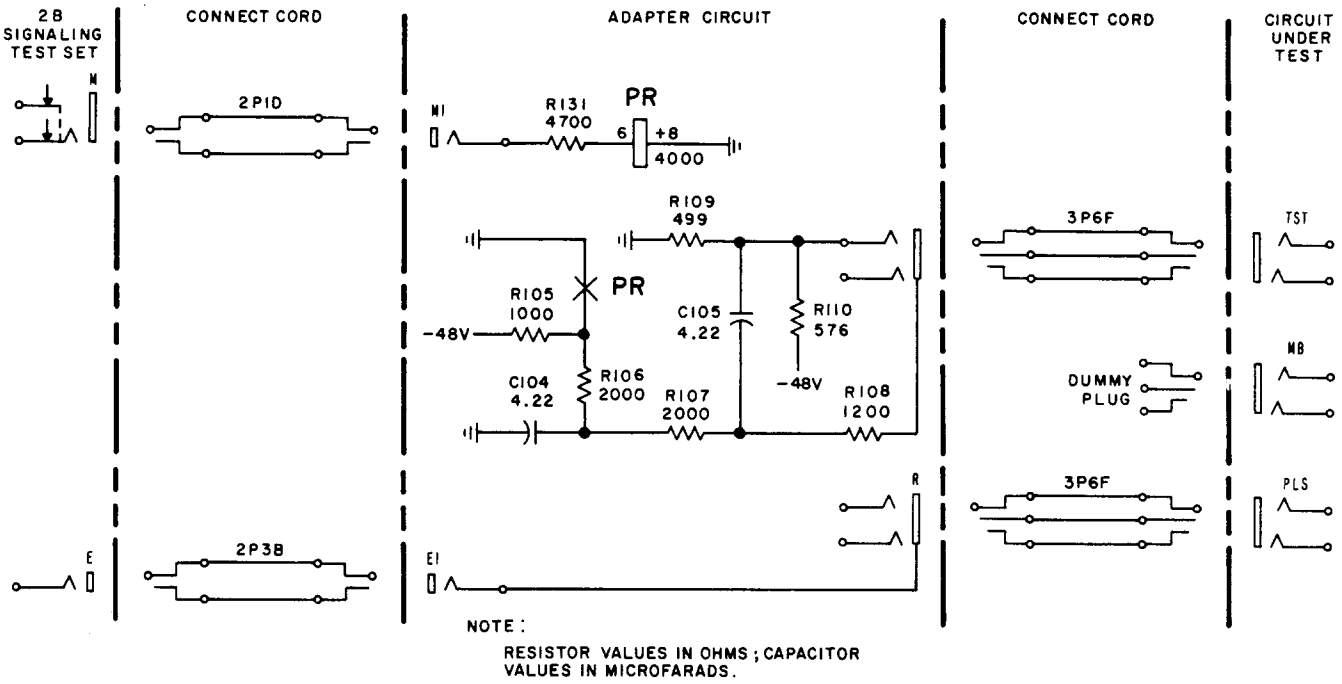

Fig. 3 — Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to TE Position

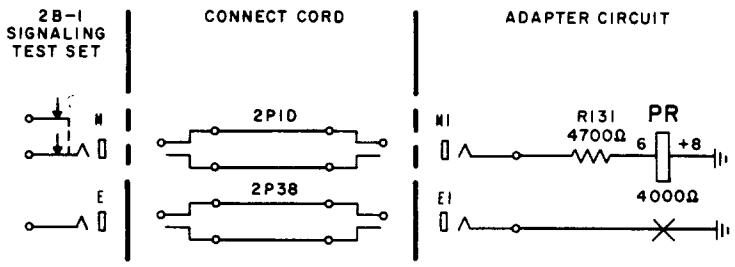

Fig. 4 — Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to PC Position

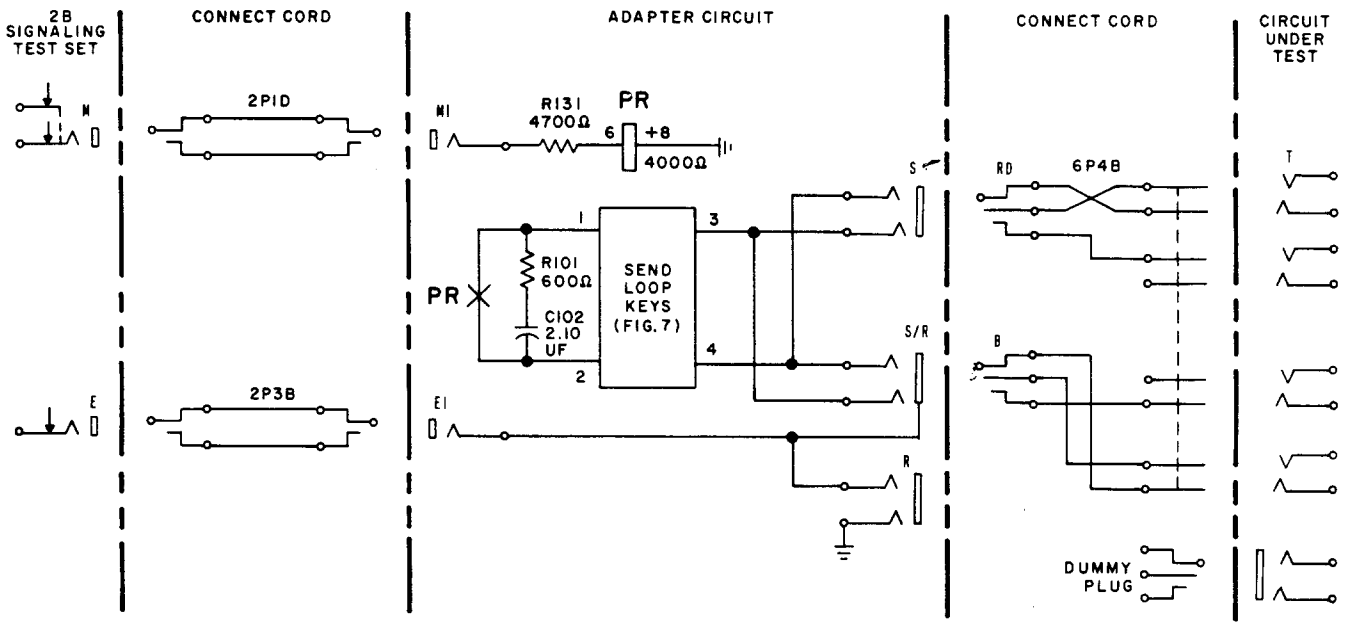

Fig. 5 — Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to TC Position

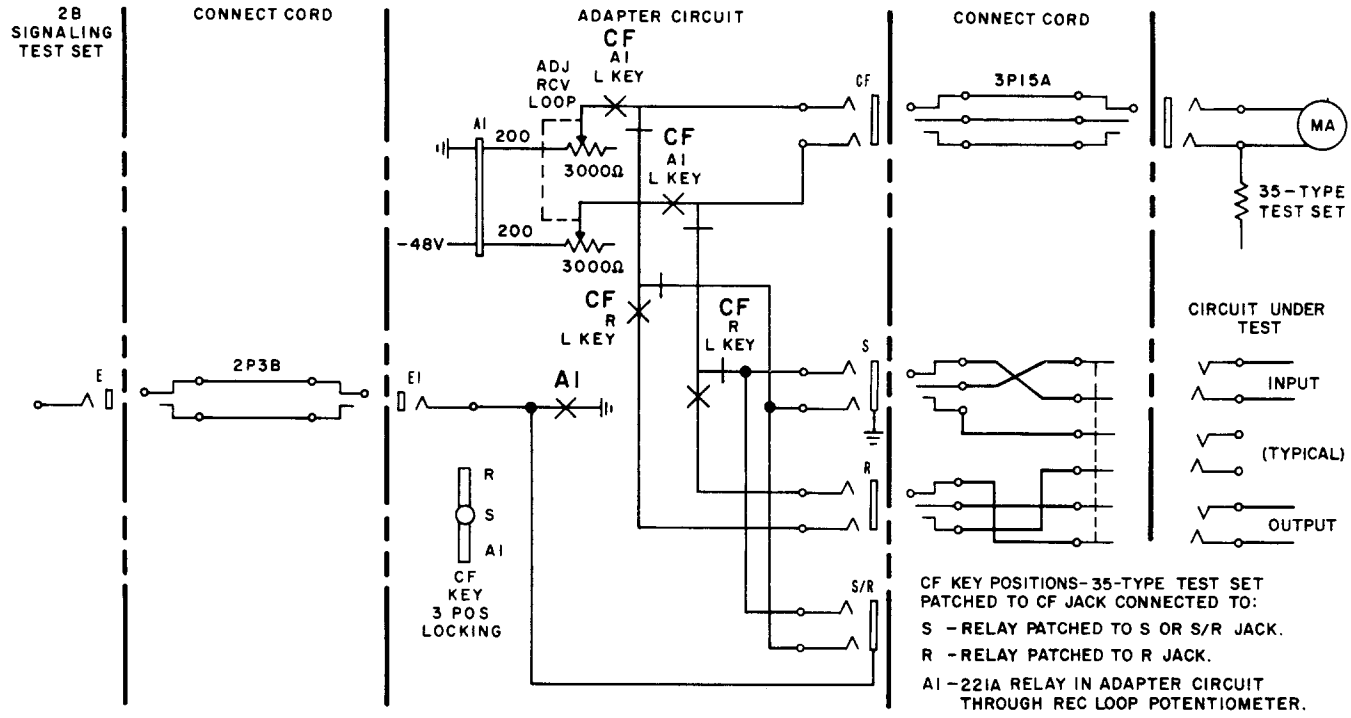

Fig. 6 — Typical Test Circuit — Pulse Repeating Adapter FUNCTION Switch Set to CF Position

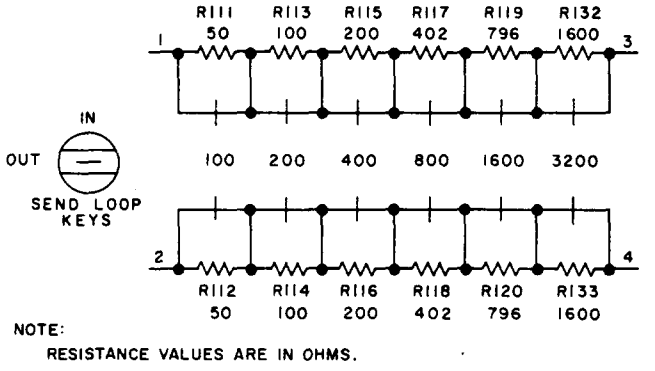

Fig. 7 — Pulse Repeating Adapter — SEND LOOP Keys — Schematic

LEAK SWITCH SETTING	LEAK CONDITION
OUT	1 o—— 2 o—— OPEN
A	1 o— R122 5050Ω — C106 2.15 UF — 2 o, R121 10,000Ω
B	1 o— R121 10,200Ω — 2 o
C	1 o— R124 600Ω — C106 2.15 UF — 2 o, R123 10,200Ω
D	1 o— R126 600Ω — C106 2.15 UF — 2 o, R125 20,300Ω
D1	1 o— R126 600Ω — C106 2.15 UF — 2 o

Fig. 8 — Pulse Repeating Adapter — LEAK Switch — Schematic