



Descriptions and Explanations

Practice P720.310
Issue 1, January, 1962
Gen. Tel. Co. of Calif.

**1A KEY TELEPHONE SYSTEMS
CIRCUITS AND DESCRIPTIONS
(INDIVIDUAL UNITS)**

1. GENERAL

1.01 This Practice provides the circuits and circuit descriptions for 1A key telephone systems using individual units.

1.02 Section 55, Part 601 is hereby cancelled and replaced by this Practice.

1.03 The drawings (Figures 1 thru 9) together with the circuit descriptions are shown on the same page, wherever possible. These circuits consist of:

(a) Fig. 1 Ringing and Common Audible Circuit for 15A-15B units.

(b) Fig. 2 Ringing and Common Audible Circuit for 15C and 15D units.

(c) Fig. 3 Combined Line and Busy Lamp Circuit for 15A-15B or C units.

(d) Fig. 4 Combined Line and Busy Lamp Circuit for 15C-D and 18D-E units.

(e) Fig. 5 Time-out Circuit.

(f) Fig. 6 Hold Circuit - 1A units.

(g) Fig. 7 Hold Circuit - 1B units.

(h) Fig. 8 Winking Hold Control Circuit.

(i) Fig. 9 Winking Hold Circuit.

2. RINGING AND COMMON AUDIBLE SIGNALING CIRCUIT (15A - 15B UNITS)

2.01 Ringing current from ring (or tip) side of line, R or T condenser and thermistor through 3200 ohm secondary winding of the R relay and the R varistor to ground, or when 16 KTU is used, to R1 varistor, through R1 relay winding to ground.

2.02 The R varistor acts as a diode or half wave rectifier, which passes 1/2 cycle of the ringing current but blocks the other 1/2 cycle which operates the R relay.

2.03 The R1 varistor is a full wave bridge rectifier which rectifies the ringing current for operation of the R1 relay.

2.04 Thermistors are heat-controlled devices. Their normal or cold resistance is about 50,000 ohms which prevents false operation of the R relay during dialing. As ringing current is applied this resistance drops to about 2000 ohms permitting current to flow. The two thermistors are shunted by the S varistor which provides protection from any large line current surges.

2.05 A battery operated common audible signal circuit is provided from contacts 3-4 top of the R relay.

2.06 An intermittent ac or dc common audible signal circuit is provided from contacts 1-2 of the R1 relay.

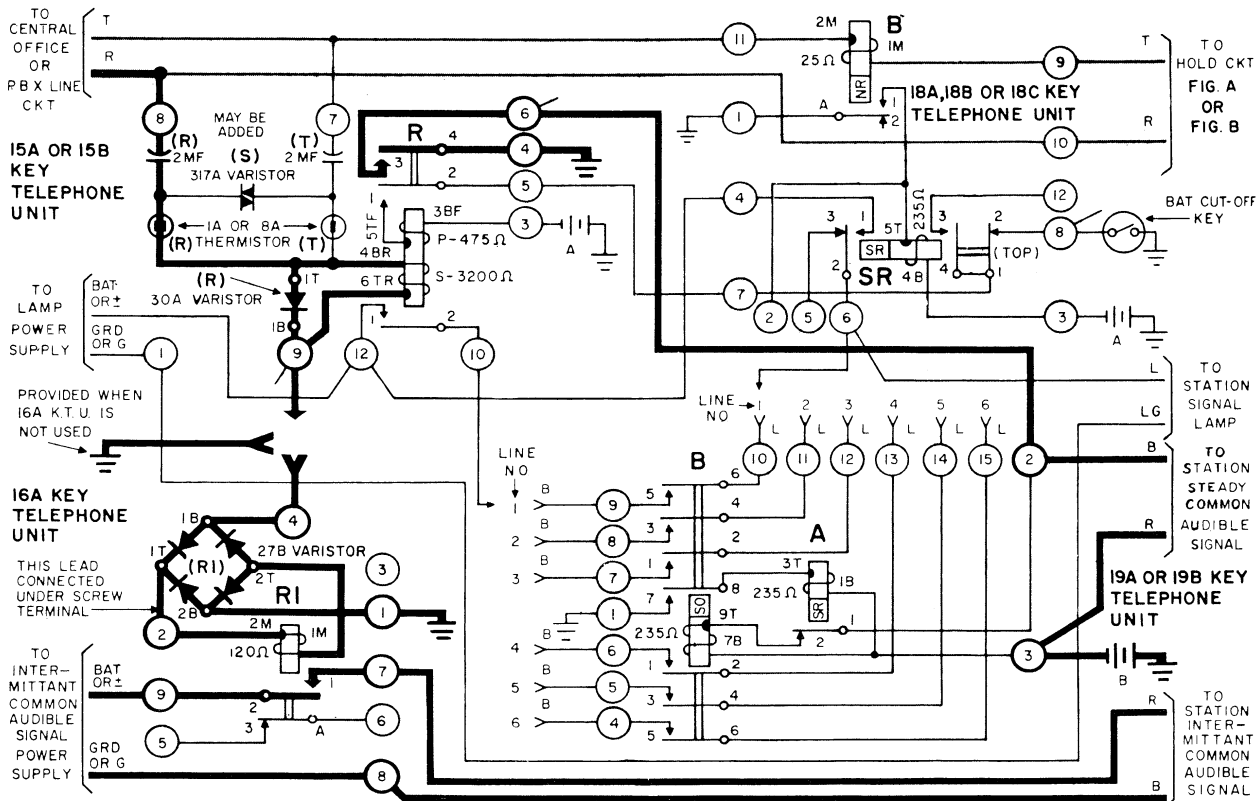


Fig. 1 Ringing and Common Audible Signaling Circuits
(15A and 15B Units)

3. RINGING AND COMMON AUDIBLE CIRCUITS (15C - 15D UNITS)

3.01 This circuit differs from Figure 1 in that the ground connection is removed when the called station answers.

3.02 Ringing current from ring (or tip) side of line, R or T condenser or thermistor, 3200 ohm secondary winding of the R relay, break contacts 1-2 of the SR relay to ground, or when 16 KTU is used, to R1 varistor and through R1 relay winding to ground.

3.03 The R varistor acts as a diode or half wave rectifier, which passes 1/2 cycle of the ringing current but blocks the other 1/2 cycle which operates the R relay.

3.04 The R1 varistor is a full wave bridge rectifier which rectifies the ringing current to operate the R1 relay.

3.05 Thermistors are heat-controlled devices. Their normal or cold resistance is about 50,000 ohms which prevents false operation of the R relay during dialing. As ringing current is applied their resistance drops to about 2000 ohms permitting current to flow. The two thermistors are shunted by the S varistor which provides protection from any large line current surges.

3.06 The intermittent common audible signal circuit is provided from contacts 1-2 of the R1 relay.

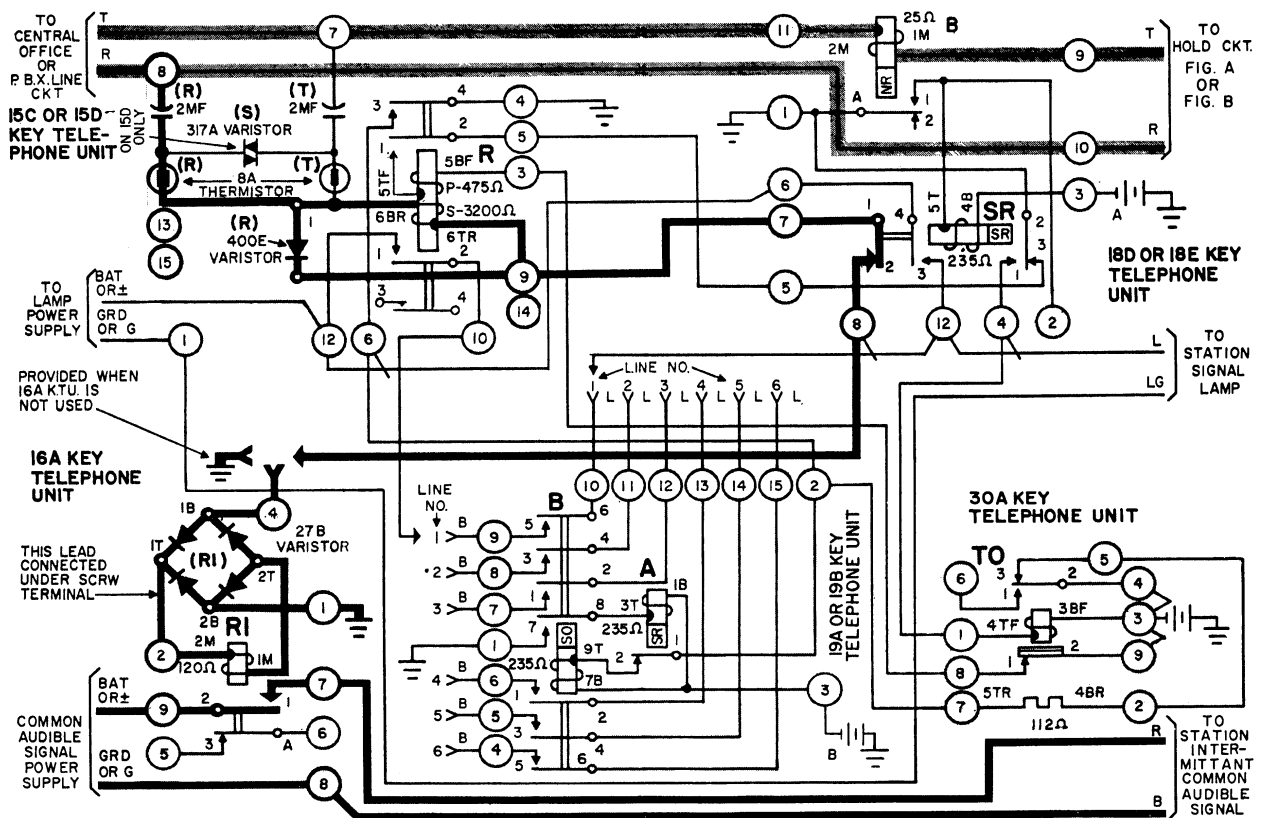


Fig. 2 Ringing and Common Audible Signaling Circuits
(15C and 15D Units)

4. COMBINED LINE AND BUSY LAMP CIRCUIT (15A-B and 18A-B or C UNITS)

4.01 R relay, initially operated by ringing current, locks operated through the primary winding, 1-2 make contacts (R relay) under control of the SR relay (18 KTU) 1-2 top break contacts and the battery cut-off key.

4.02 The B relay in the 19 KTU is operated through the 3-4 make contacts of the R relay and the 1-2 break contacts of the A relay. B relay operated, operates relay A through the (B relay) 7-8 make contacts. A relay operated, releases relay B. The combined operate-release action of the A-B relays flash the station lamps to indicate an inward call.

4.03 Should the system be unattended or the battery cut-off key be in the off position the line lamps will flash only as the R relay is operated by each ringing period.

4.04 When the call is answered, line battery operates the B relay (18 KTU) through the station line loop. B relay make contacts 1-2 operate the SR relay. SR relay operated releases the R relay (15 KTU). R relay released releases the B-A relays (19 KTU) to stop the flashing lamps. The busy lamps are operated by (SR) make contacts 1-2.

4.05 When the call is completed and the station hangs up, the B and SR relays release extinguishing the busy lamps.

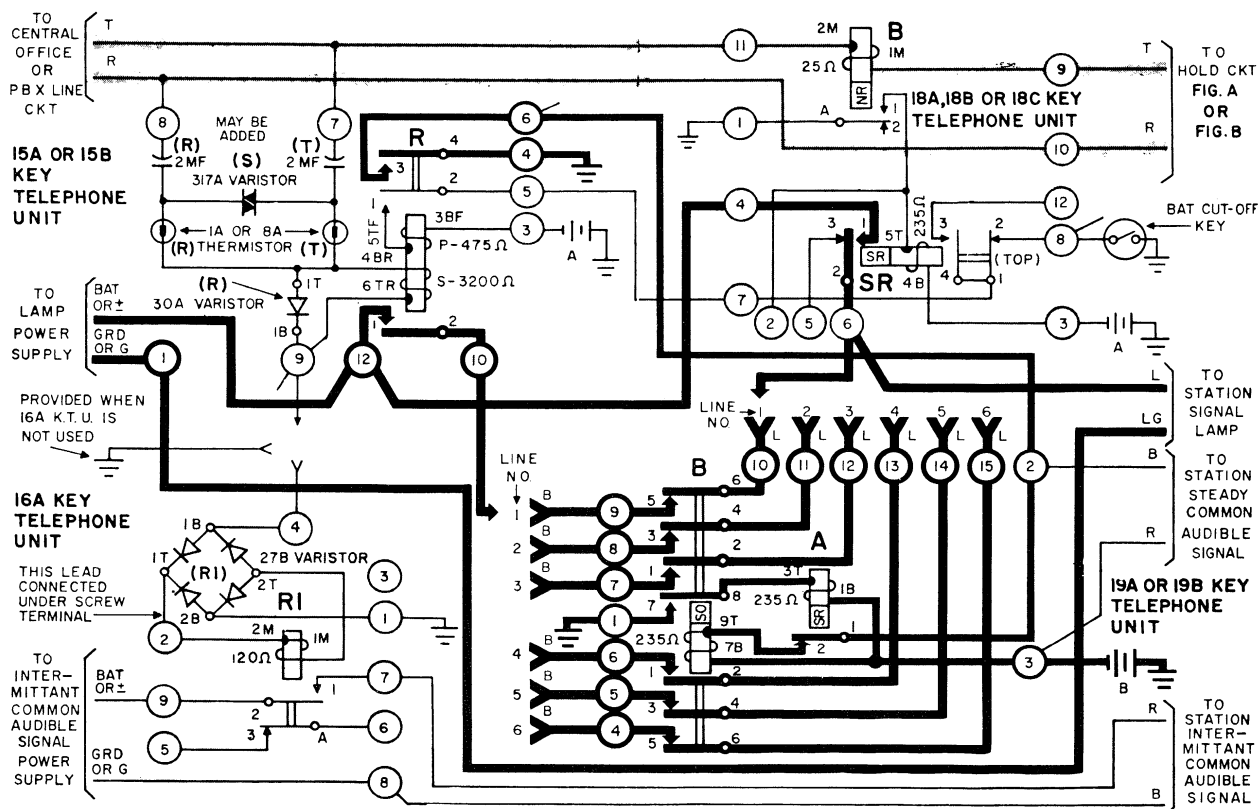


Fig. 3 Combined Line and Busy Lamps
(15A and 15B Units)

5. COMBINED LINE AND BUSY LAMP CIRCUIT (15C-D AND 18D-E)

5.01 R relay, initially operated by ringing current, locks operated through the primary winding, 1-2 make contacts (R relay) under control of the SR relay (18KTU) break contacts 2-3 and the thermal contacts of the 30A KTU

5.02 The B relay in the 19KTU is operated through the 3-4 make contacts of the R relay and the 1-2 break contacts of the B relay. B relay operated operates the A relay through the 7-8 make contacts of the B relay. A relay

operated releases relay B. The combined operate-release action of the B-A relays flash the station lamps to indicate an inward call.

5.03 When the call is answered, line battery operates the B relay (18KTU) through the station line loop. B relay make contacts 1-2 operate the SR relay. SR relay operated releases the R relay (15KTU). R relay released releases the B-A relays (19KTU) to stop the flashing lamps. The busy lamps are operated by the 2-3 make contacts of the SR relay.

5.04 When the call is completed and the station hangs up, the B and SR relays release extinguishing the busy lamps.

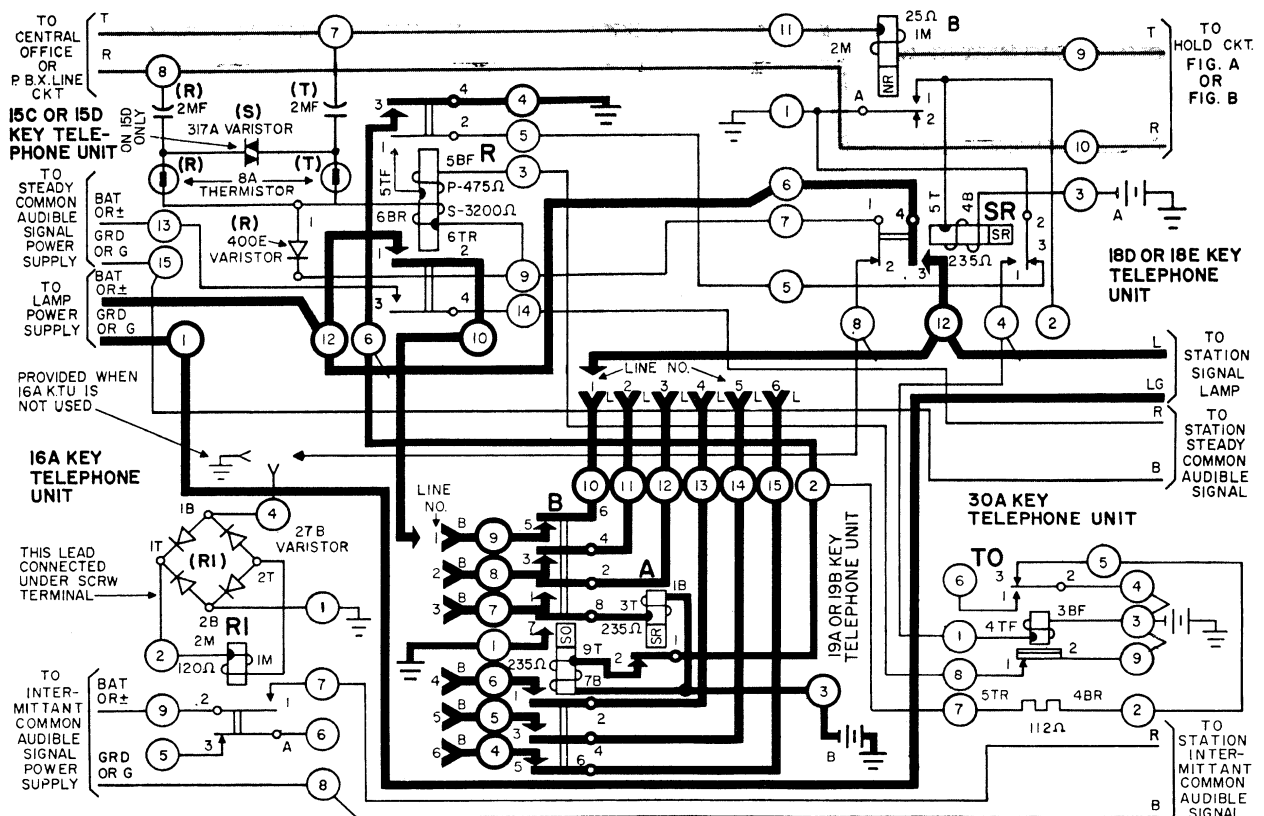


Fig. 4 Combined Line and Busy Lamps
(15C and 15D Units)

6. TIME-OUT CIRCUIT (30A KTU)

6.01 When an inward call is made and the system is unattended or the call is abandoned, battery through the heater winding to ground (make contacts 3-4 R relay - 15 KTU) will open the thermal contacts. This will occur in from 20 to 30 seconds which will open the battery supply to the R relay winding. The R relay will release and release the B-A relays in the 19 KTU.

6.02 Should calls be received before the contacts cool, the R relay will operate only during the ringing periods and the lamps will flash only at that time.

6.03 The thermal contacts will cool in from 1 to 3 minutes and again make contact, restoring the circuit to normal.

6.04 The TO relay is operated at all times that a call is in progress or in a held condition under control of the SR relay contacts 1-2 (18 KTU), which prevents time-out.

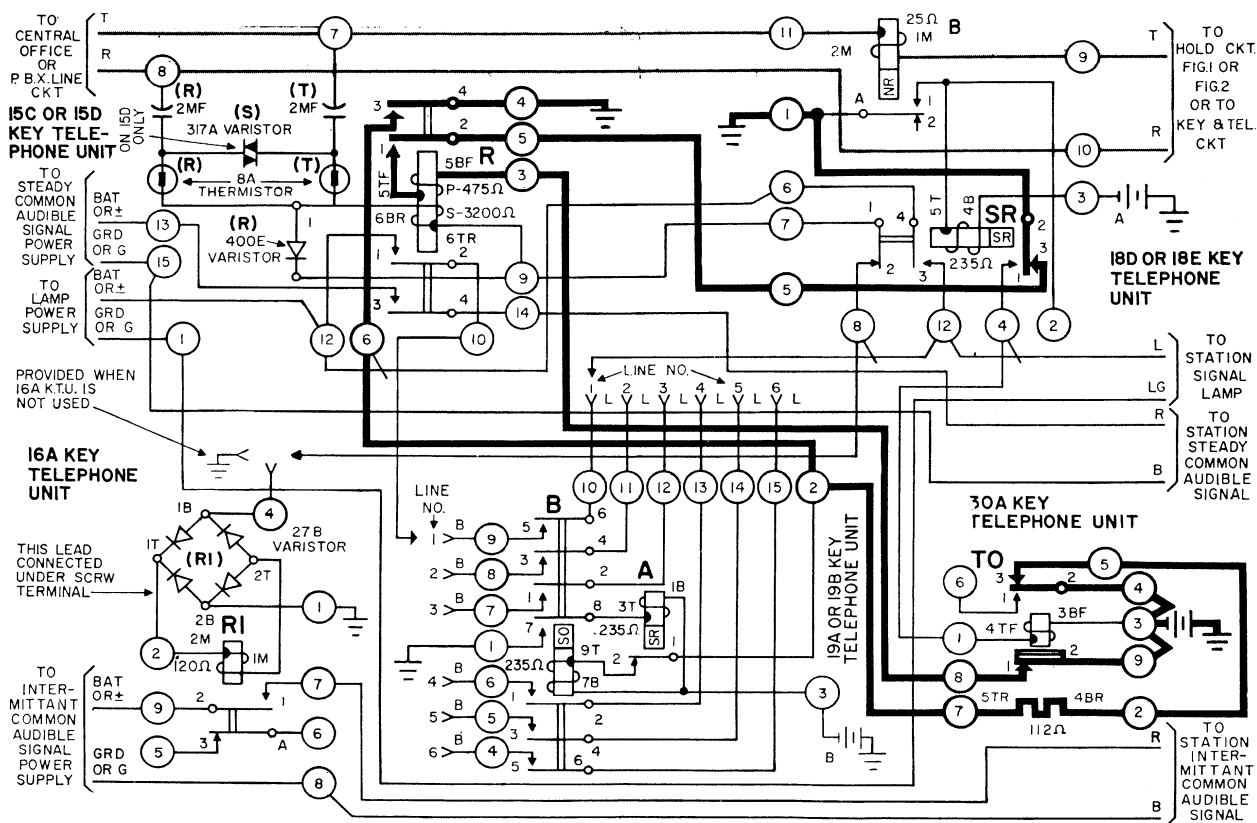


Fig. 5 Time-Out Circuit

7. HOLD CIRCUIT (1A UNITS)

7.01 When a call is in progress, line battery operates the L relay in series with the station key set. L relay performs no useful function at this time.

7.02 When the hold key is operated the circuit to the L relay is opened and releases. The H relay is operated initially, by line battery through the 22 ohm primary winding, then

places a bridge across the line through its 1 and A contacts, the T (15.5 ohm) winding and the Q (140 ohm) non-inductive winding. The 22 ohm secondary winding and the B lead balance the circuit and prevent cross-talk.

7.03 When the line key is again operated the L relay will re-operate. Contacts 1 and A short-circuit the H relay winding which releases, removing the holding bridge.

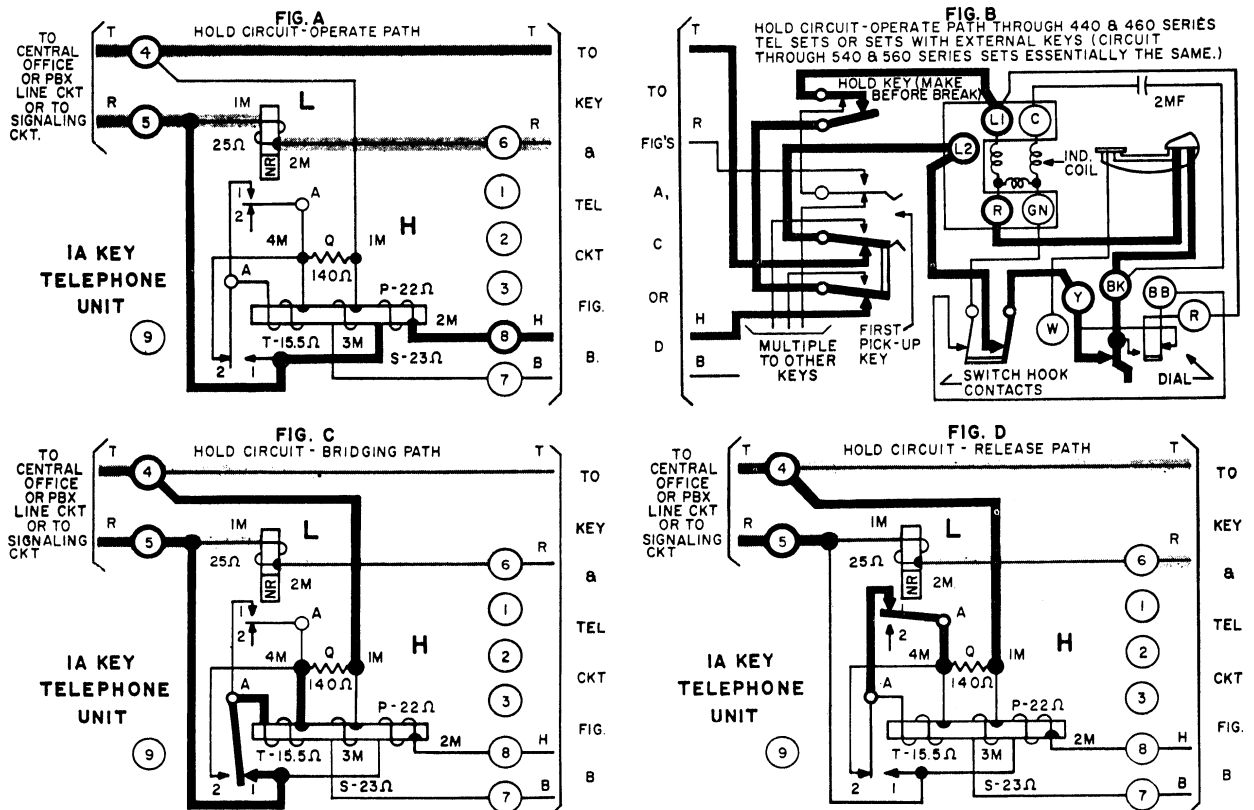


Fig. 6 Hold Circuit - 1A Units

8. HOLD CIRCUIT (1B UNITS)

8.01 When a call is in progress, line battery operates the L relay in series with the station key set. L relay performs no useful function at this time.

8.02 When the hold key is operated the circuit to the L relay is opened and releases. The H relay is operated through the 45 ohm winding and the 80 and 85 ohm 19GB resistance. This combination provides the holding bridge.

The B lead and 85 ohm resistor provide a balancing circuit to prevent cross-talk.

8.03 It will be noted that a 70 ohm non-inductive secondary winding is connected to one side of the primary winding. This is included in the relay design, but is of no use in this circuit.

8.04 It will also be noted that the primary winding is shunted by a 60MF condenser which provides a low impedance to voice currents.

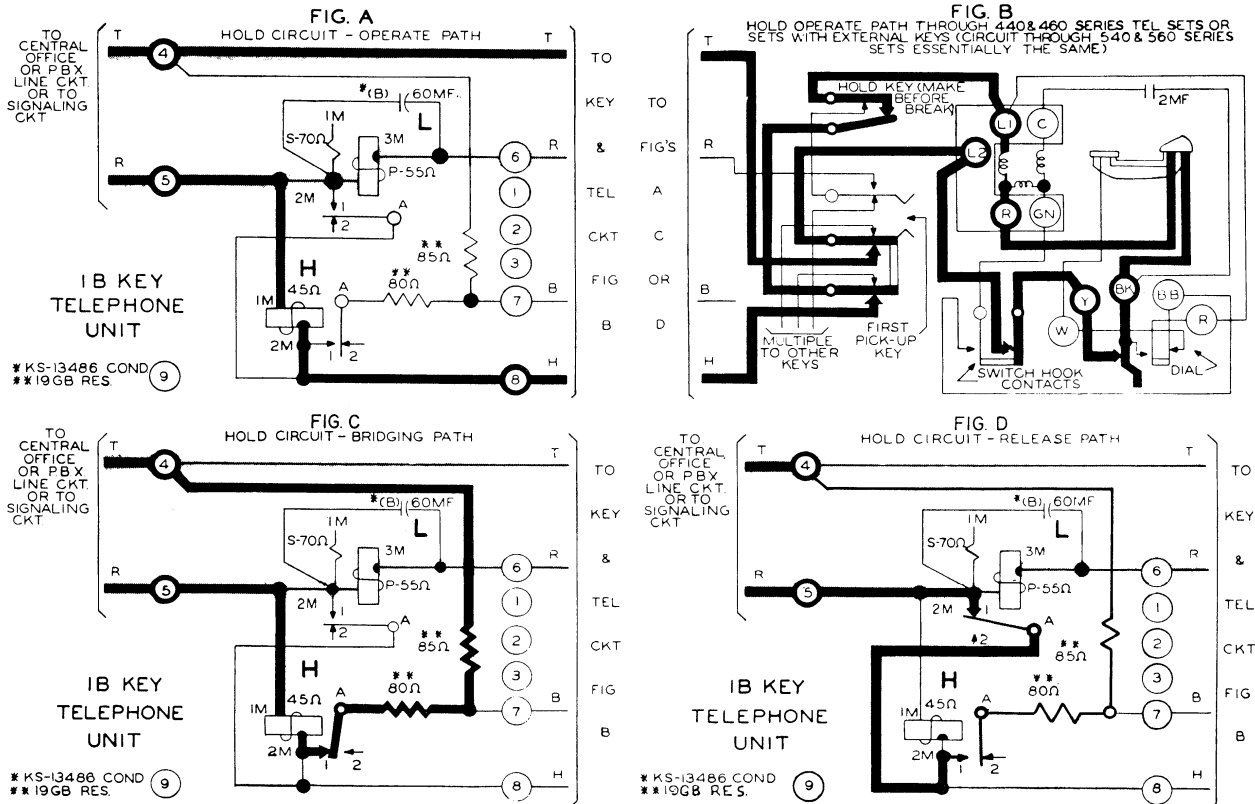


Fig. 7 Hold Circuit - 1B Units

9. WINKING HOLD (AUXILIARY 17, 18
AND 33 KTU'S)

9.01 Refer to 7.01 and 8.01 for circuit description of 1A and 1B hold circuits.

9.02 Winking hold is provided by use of one additional 18 KTU per each line together with one 17 and one 33 KTU per system.

9.03 When a call is held the winding of the H relay of either the 1A or 1B unit is wired in series with the winding of the B relay in the auxiliary 18 KTU. These two relays are operated during the time the call is held.

9.04 B relay make contacts A-1 operate the SR relay. SR relay operated:

(a) Break contacts 1-2 top disconnect the station lamp lead (L).

(b) Make contacts 3-4 top connect the station lamp lead to the LW lead.

(c) Make contacts 1-2 bottom operate the SW relay in the 17 KTU (Fig. 9), HA lead.

9.05 SW relay operated:

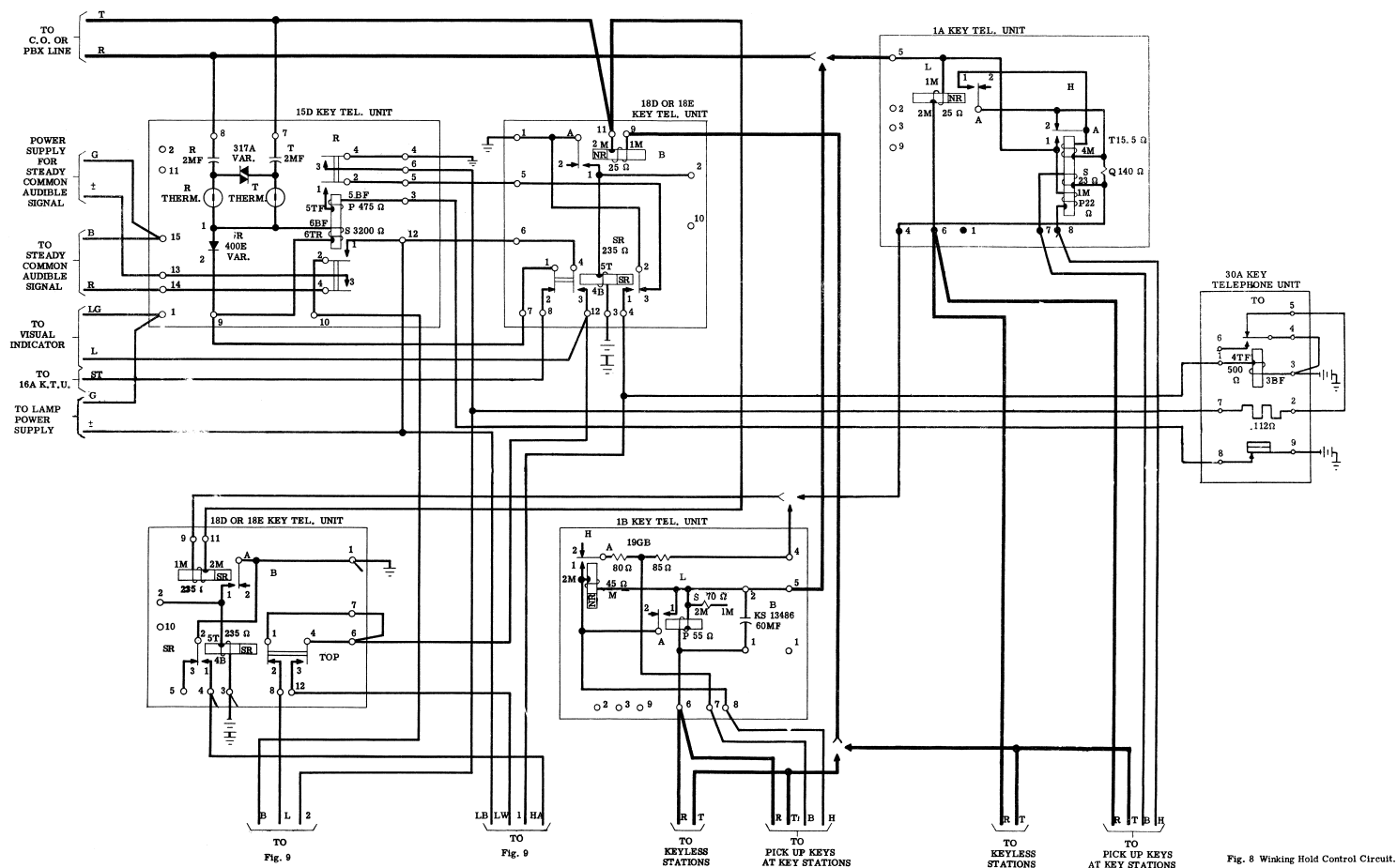
(a) Make contacts 1-2 top provide ground to 1 lead to operate the TO relay (30A KTU)

(b) Make contacts 1-2 bottom provide ground to start flashing relays B-A of the 19 KTU.

(c) Extends HA ground through contacts 6-5 of the 19 KTU (when operated) to operate the W relay under control of contacts 1-2 of the WT relay (33A KTU).

9.06 W relay operated operates relay WT. WT relay operated releases relay W. This combined action of these two relays and the closure of contacts 6-5 of the B relay (19 KTU) provide the winking hold signal to the station lamps.

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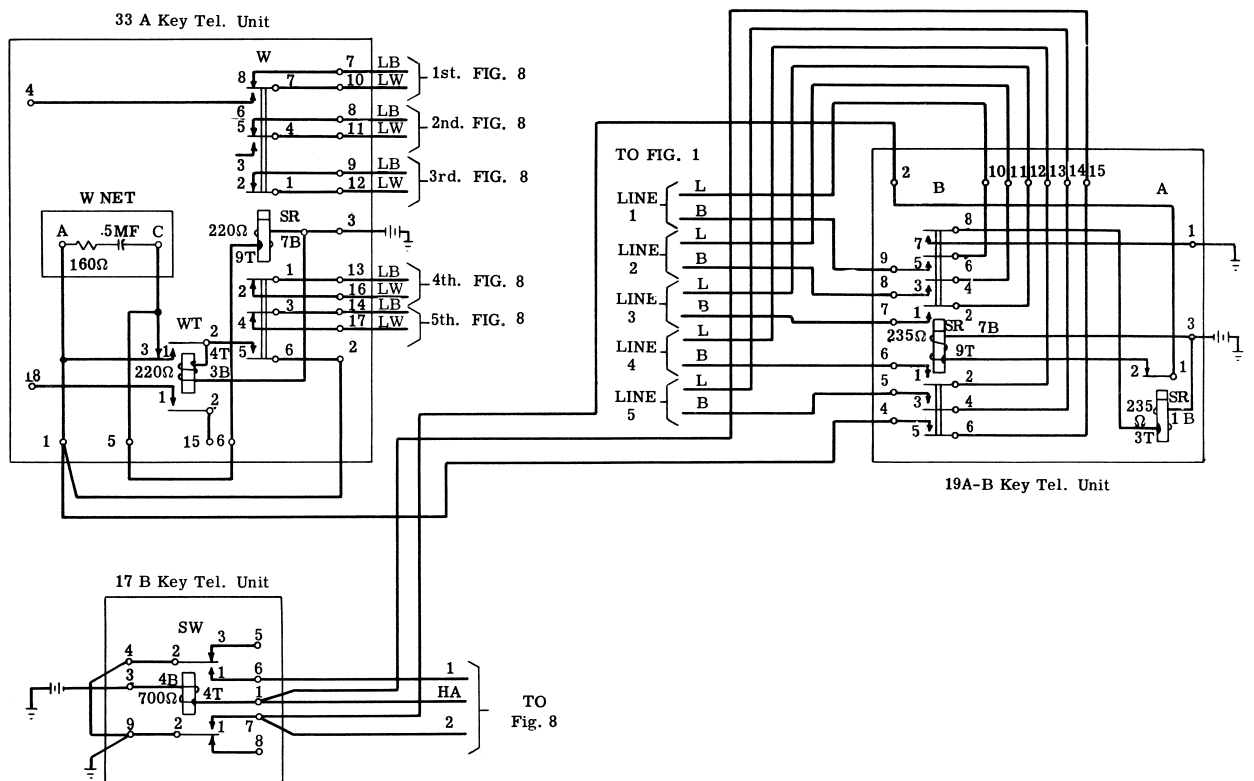


Fig. 9 Winking Hold Circuit