1A AND 1A1 KEY TELEPHONE SYSTEMS

MAINTENANCE

1.00 GENERAL

1.01 This section covers specific items of maintenance of 1A and 1A1 key telephone systems. Maintenance information for telephone sets, buzzers, and power equipment is contained in the appropriate C Sections.

1.02 The section is reissued to:

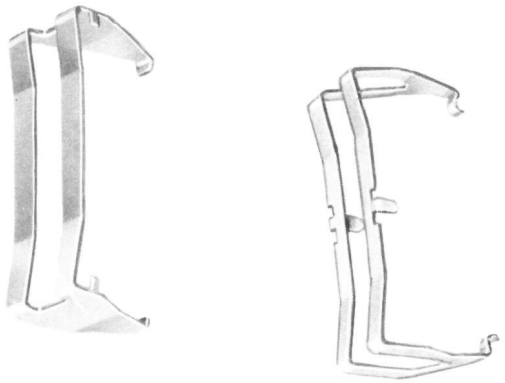
- Include information on the 4A cover clip for wire spring relays.
- Include information on 1A1 system false hold conditions.

Due to extensive changes marginal arrows have been omitted.

2.00 RELAYS

2.01 When necessary, relays shall be tested and adjusted in accordance with information contained in related subsections of division 040 of the Plant Series. Relay operating requirements for specific relays used in various 1A and 1A1 system circuits are listed in the Circuit Requirements tables. These tables are associated with the various SD drawings concerned.

2.02 The 4A cover clips shown in Fig. 1 are used to minimize damage to wire spring relays during shipping and handling. The clips of early manufacture are shown in Fig. 1 (A) and 2(A), and those of later manufacture in Fig. 1(B) and 2(B). They may be used interchangeably.



(A) (B)

Fig. 1 — 4A Cover Clip

2.03 To place the clips:

1. Slide the clip over the lower end of the cover far enough to engage the tang.
2. Press the upper end of the clip over the cover until the tang engages with a positive snap.

2.04 To remove the clips:

1. Insert the tip of a KS-6854 screwdriver between the lower end of the 4A clip and the relay cover. A slight twist will disengage the tang. Do not pry on the relay card.
2. Hold the clip with the left hand. Disengage the top tang and slide clip up and off. See Fig. 2(A) and 2(B) for position of the screwdriver on the two modifications of the clip.

2.05 Check the position of the plastic cover after placing or removing the 4A clip.

2.06 The 4A clips may also be used on relays on apparatus to be returned to storeroom to minimize damage to the relays.

(A) (B)

Fig. 2 — Removing 4A Clips

3.00 LUBRICATION OF 204-TYPE SELECTOR

3.01 The 204-type selector is a part of a 207C KTU. Following initial installation, component parts listed in 3.03 should be lubricated at intervals of approximately three months, when feasible. This is a recommended interval and may be extended locally if periodic inspections indicate that no undue maintenance should result as a consequence.

3.02 Component parts of the 204-type selector should be lubricated with KS-2832 lubricant or KS-6232 oil. One dip of lubricant or oil is the amount retained on a No. 4 artist's brush after it has been immersed to a depth of 3/8 inch in the oil or lubricant and then wiped against the edge of its container. There should not be sufficient lubricant or oil to form a drop.

3.03 When lubrication is necessary, the following 204-type selector parts shall be lubricated with KS-6232 oil or KS-2832 lubricant. One dip of KS-6232 oil should be divided between the following points:

- Wiper assembly bearing through the slot in wiper shaft, Fig. 3(A).
- Both ends of pawl bearing, Fig. 3(B).
- Pawl stop at point where it is engaged by pawl, Fig. 3(C).
- Pawl guide arm bearing surface at frame, Fig. 3(D).
- Rotary armature spring bearing surface on frame, Fig. 6(A).
- Release armature spring bearing surface on the normal stop, Fig. 4(A).
- Rotary armature bearing pin where it touches bearing yoke, Fig. 5(A).
- Release armature bearing pin where it touches bearing yoke, Fig. 6(B).
- Points where pawl and release ratchet dog engage the ratchet teeth shall be lubricated with KS-2832 lubricant, Fig. 4(B). One dip of lubricant shall be distributed over the ratchet.

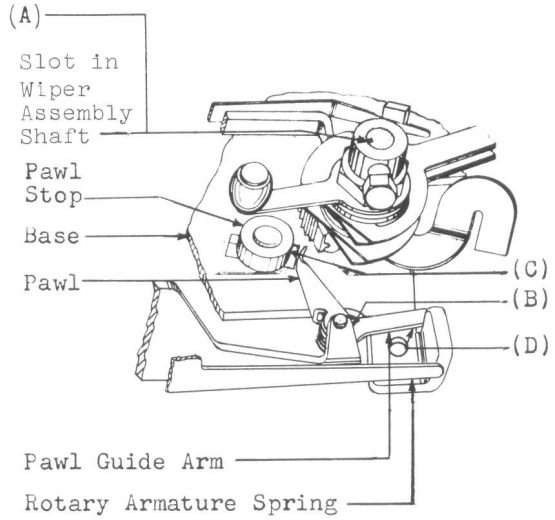


Fig. 3 — Points of Lubrication

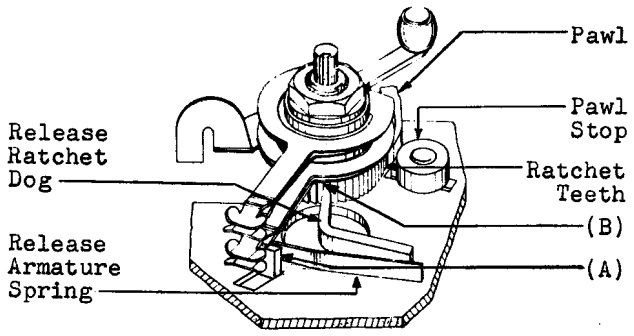


Fig. 4 — Points of Lubrication

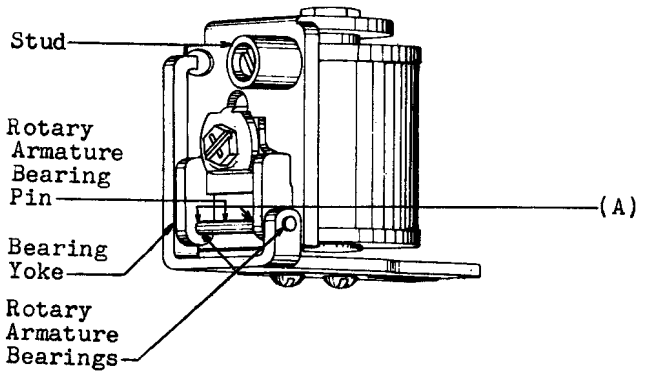


Fig. 5 — Rotary Magnet

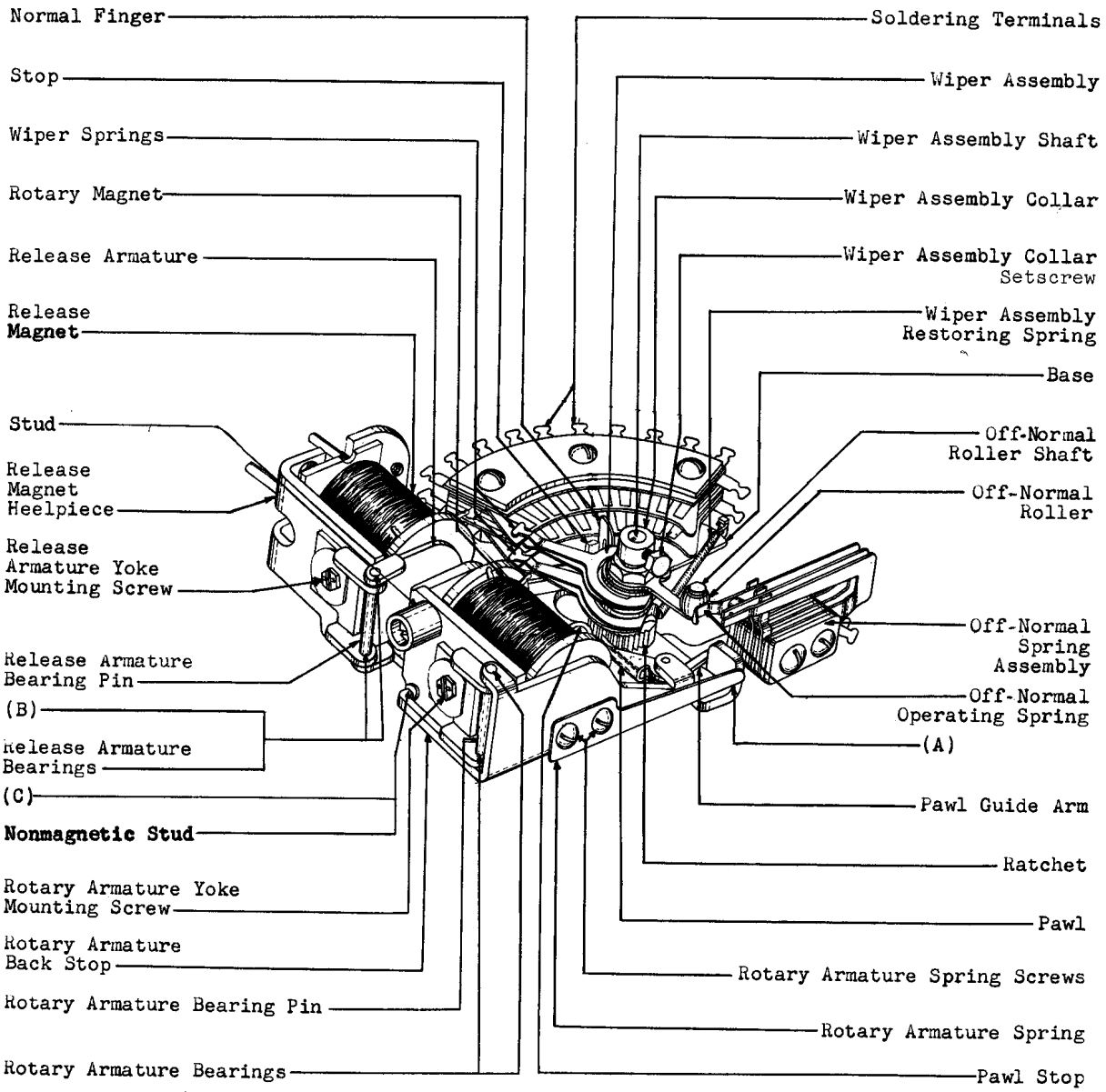


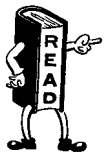
Fig. 6 — 204-Type Selector

4.00 NONPOLARIZED ELECTROLYTIC CAPACITOR

4.01 A polarized electrolytic KS-14136 capacitor has been used in the manufacture of some 23A, 51A, and 211A key telephone units. This capacitor has been replaced in recent manufacture by a nonpolarized KS-16485 capacitor.

4.02 The KS-14136 polarized electrolytic capacitor has been known to generate gases within the case due to battery reversal. When the normal safety plug fails to blow under such circumstances, a severe dislocation of the case and failure of the capacitor results.

4.03 For a time, the Western Electric Company modified existing stocks of KS-14136 polarized capacitors. This modification consisted of puncturing the case and covering the puncture with three layers of cellophane tape. Modified capacitors are marked with a red "P" stenciled under the KS number at end of the capacitor.



Do not modify the KS-14136 capacitor in the field.

4.04 Substitution of the KS-16485 nonpolarized electrolytic capacitor in place of the KS-14136 polarized electrolytic capacitor (including modified capacitor) in all 23A, 51A, and 211A key telephone units does not require a code change of the key telephone unit. The KS-16485 capacitor, while 1/2 inch longer, is the same diameter as the KS-14136 capacitor and mounts interchangeably with it.

4.05 Replace KS-14136 polarized electrolytic capacitors in all working 23A, 51A, and 211A key telephone units. This should be done at the most opportune time, preferably the next station visit.

4.06 Installation of the KS-16485 capacitor should be done as follows:

1. Disconnect battery from the working circuit.
2. Discharge KS-14136 capacitor by momentarily shorting its terminals with an insulated-handle screwdriver or equivalent tool.
3. Disconnect leads from capacitor and remove it from mounting.
4. Mount KS-16485 capacitor in its place and reterminate leads to it.
5. Solder all connections.

Since the KS-16485 capacitor is nonpolarized, it is not necessary to determine polarity before reterminating disconnected wires.

6. Reconnect battery to circuit.

5.00 RADIO SIGNAL INTERFERENCE

Radio signal interference may be experienced while talking or by a distant station when a hold condition is placed on the line. When interference is from a low-frequency (commercial broadcast) radio station and the key system station is a 400-type set, install a KS-13814, List 7 capacitor at the telephone set to minimize the interference. Information on installing the KS-13814, List 7 capacitor and on other methods for reducing radio interference in telephone sets is contained in the C Section entitled Radio Signal Suppression in Telephone Sets.

6.00 LINE NOISE

6.01 At some 1A key telephone system installations, objectionable noise (sometimes referred to as longitudinal noise) may be heard. This noise is heard by the calling party immediately upon answer of an incoming call. This may occur when ringing is applied to 1A key telephone system lines featuring a grounded ringing relay

circuit (51A or 52A KTU). Noise is caused by temporary unbalance to ground at a time when the thermistors are at low resistance. After ringing stops (due to call being answered), thermistors should normally cool rapidly, raise resistance, and balance the line. In some areas, where an appreciable ground potential is present, a diminishing longitudinal noise may be heard during the thermistor cooling period. In extreme cases, this ground potential can be high enough to keep the thermistors in a low-resistance condition throughout the call, causing objectionable noise.

6.02 Where the type of noise trouble referred to in 6.01 is to be corrected, all lines in the system should be equipped or modified to minimize the interference. Any of the following methods will result in opening the *ST* lead at the time a call is answered, thereby removing ground from line.

- 50-type key telephone units should be replaced by bent angle-type key telephone units per SD-69091-01, Fig. 43 (dial) or Fig. 44 (manual).

- 1A key telephone system should be changed to a 1A1 key telephone system.

- 51A and 52A key telephone units should be modified per Fig. 7 and 8.

6.03 Some 1A1 system installations featuring metallic ringing relay circuits may produce objectionable line noises attributable to the use of unfiltered battery supply on the *LK* lead. This lead furnishes battery to the locking winding of the *R* relay. Noise is induced onto the ring side of line (grounded ringing option) or onto both tip and ring sides of line (metallic ringing option) as the result of transformer action between primary and secondary windings of *R* relay. This induced noise is heard by the calling party during the silent interval of the ringing cycle until the *R* relay is released when called party answers.

6.04 Where this sort of noise is encountered, check to see if unfiltered *B* battery or filtered *A* battery is supplied on the *LK* lead to the *R* relay. If unfiltered battery is the source of noise, interference can normally be minimized by changing type of battery supplied on the *LK* lead from unfiltered to filtered. In instances where noise due to unfiltered battery is present in installations using a 232-type KTU, disconnect unfiltered battery from terminal 39 of the 232 KTU and reconnect filtered battery to the terminal.

6.05 Battery supply leads should be changed only in those cases where noise due to unfiltered battery has become objectionable.

7.00 FALSE HOLD

7.01 A false hold condition sometimes occurs on lines associated with wire spring relay 1A1 key telephone system line circuit units incorporated in the 202C, 230A, and 233A key telephone units. Except for the latter key telephone units, these line units are also components of 200F-, G-, and K-type packages.

7.02 The 202C, 230A, and 233A key telephone units use dual wound *H* relay circuits which can be falsely operated by one or both of the following causes:

- Charging of the capacitance of line ringer circuits on the station side of the line circuit.

- Switchhook bounce or handset fumble at connecting station.

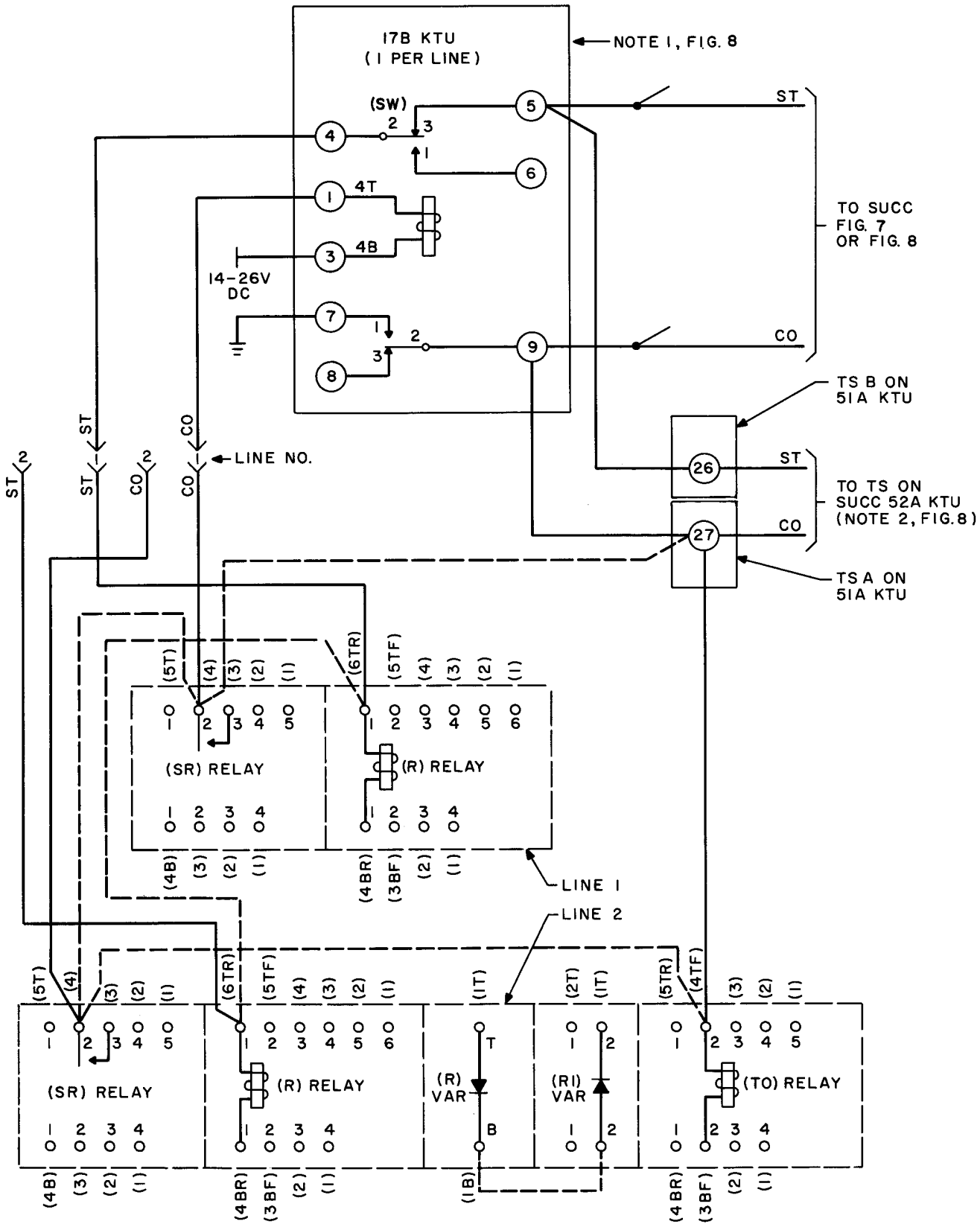
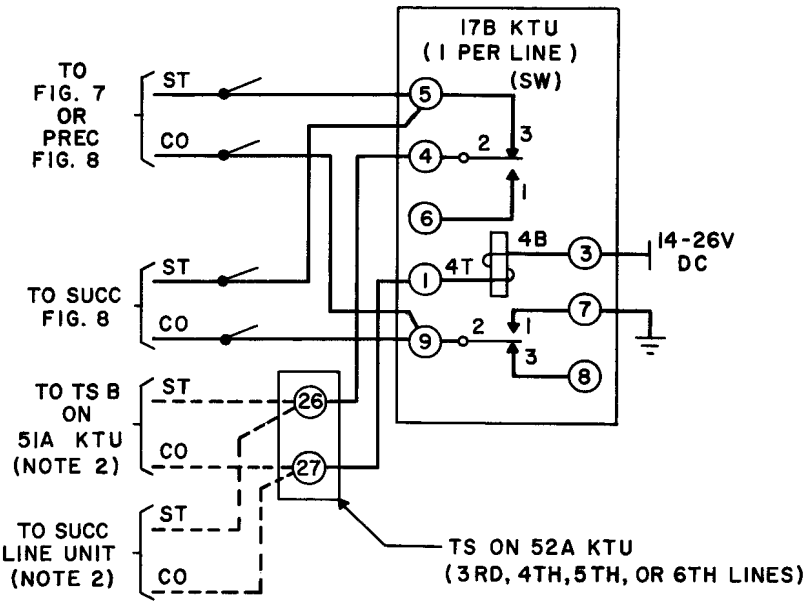


Fig. 7 — Modification of Ringing Circuit on 51A KTU Using One 17B KTU per Line (Note 1, Fig. 8)



Note 1: Add one 17B KTU per line. Add strapping as shown by solid lines. Remove strapping as shown by dotted lines.

Note 2: If system is equipped with 53A, 54A, or 55A KTU, connect straps from punchings 26 and 27 on terminal strip of 53A, 54A, or 55A KTU directly to punching 26 on terminal strip B and punching 27 on terminal strip A of 51A KTU, respectively.

Fig. 8 — Modification of Ringing Circuit on 52A KTU Using One 17B KTU per Line (Note 1)

7.03 False hold caused by capacitance can be verified by operating line pickup buttons of The Call Director or key telephone set in rapid succession with handset off hook. Before making this test, it is advisable to establish a complete call to another station line on the same premises using central office trunks. This reduces the possibility of losing battery and ground during test and sets up a condition of maximum current flow in the circuit. The line circuit subject to false hold will revert to a hold condition. This will be indicated by a visual hold signal on illuminated telephone sets.

7.04 False hold caused by switchhook bounce or handset fumble can be verified by replacing the station handset in its cradle or mounting in a rough or abnormal manner—sufficient to cause momentary reoperation of switchhook contacts before handset comes to rest on hook. Line circuit subject to false hold will revert to a hold condition as in 7.03.

7.05 Once it has been determined that a false hold condition occurs due to causes noted in 7.03 or 7.04, steps can be taken to minimize the reoccurrence of this trouble. This is accomplished by paralleling each winding of the *H* relay of the affected circuit with a resistor to increase operating time of the relay.

7.06 Resistance value of resistors used depends upon current drain on the line. Resistors should be of a low enough value to bypass sufficient current around *H* relay windings to correct the false hold condition. At the same time resistors must be of a high enough value to allow sufficient current to flow through *H* relay windings to cause the relay to operate under normal conditions. Therefore, after modification of a line unit, the circuit should be tested under maximum current condition. This is best done by establishing a call as noted in 7.03. The circuit should also be tested for proper holding under minimum current condition. When the key system equipment is behind a

PBX, this is best done by establishing a station-to-station call through the PBX.

7.07 Connect resistors between terminals of the KTU according to Table A.

TABLE A

KTU	Lead Desig	Connect Resistor	
		From Terminal	To Terminal
202C or 230A	*R*	2	8
	T	1	7
233A	*R*	1U (*H* Relay)	1L (*H* Relay)
	T	2U (*H* Relay)	2L (*H* Relay)

7.08 When the line circuit involved is a 202C or 230A key telephone unit, fasten resistors under screw terminals of the KTU. Tubular insulation may be placed over resistor leads to minimize possibility of trouble due to bare wire leads.

7.09 Because screw terminals are not provided on the 10-line circuit 233A KTU, circuit modification requires resistors to be placed directly on appropriate *H* relay winding terminals. This should be done as follows:

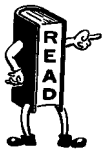
1. Remove backplate.
2. Connect resistors across *H* relay winding terminals.
3. Solder connections.
4. Replace backplate.
5. Check circuit for proper operation and release of *H* relay.

7.10 Where feasible and practical, the replacement of 202C or 230A key telephone units with 202D or 230B key telephone units should be considered when a false hold condition is encountered. Replacement should be in accordance with local instructions.

7.11 Resistance value of resistors used under various conditions are shown in Table B.

7.12 If loop resistance of a manual PBX station line exceeds 150 ohms, and the false hold condition is determined to be due to capacitance of line ringer circuits, it is recommended that associated line ringers be wired via a separate cable pair from the ***line side*** of the affected key system circuit.

7.13 Since combinations of circuit variables contribute to false hold susceptibility, it is recommended that key telephone units be modified on a "trouble found" basis only.



In all instances, when a KTU has been modified, tag the unit in a conspicuous location. Enter on the tag sufficient information to easily identify the modification performed. Example: H relay winding modified with _____ ohm resistors a/c false hold.

TABLE B

(See Note)

Type of Line Circuit		
Case 1	**Case 2**	**Case 3**
Regular CO or PBX or non-repeatered foreign exchange line: Use 144E (100-ohm) resistors.	Repeatered foreign exchange line or comparable circuit: 1. If loop resistance is less than 300 ohms, use KS-13491, L2 (22-ohm) 1-watt resistors. 2. If loop resistance exceeds 300 ohms, use 144E (75-ohm) resistors or equivalent.	Station line or manual PBX: 1. Connect 144E (100-ohm) resistors as a trial. Check line for false hold while connected to a trunk. Check line for proper hold on a station-to-station call. If these two tests are successful, proceed with modification using 144E (100-ohm) resistors. 2. If unsuccessful in Step 1 and it is determined that false hold is due to line ringer capacitance, wire ringers to separate cable pair (7.12). 3. If unsuccessful in Step 1 and Step 2 does not apply, it is recommended that line units be changed.

Note: When trunk circuits of low current drain (Table B, Case 1) and trunk circuits of high current drain (Table B, Case 2) are available for connection to the same line circuit, consideration should be given to changing the unit to a type that is not susceptible to false hold (7.10).