400A, B, C, AND D TYPE KEY TELEPHONE UNITS

IDENTIFICATION, INSTALLATION, CONNECTIONS, AND MAINTENANCE

1. GENERAL

1.01 These key telephone units (KTUs) are designed for use as CO or PBX line circuit units in a 1A2 key telephone system.

1.02 This section is reissued to:

- Change title of section.
- Change resistor values in the 400D short time-out control circuit.
- Include information concerning the Manufacture Discontinued (MD) 400A, 400B, and 400C KTUs.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

2. IDENTIFICATION

2.01 The 400A(MD), 400B(MD), 400C(MD) and 400D KTU line circuits are mechanically and electrically interchangeable for use in 501-, 502-, 550-, and 551-type key service units, or 583- and 584-type panels, or a 259-type KTU.

2.02 Each KTU is an 18-contact plug-in unit with circuit components mounted on an epoxy-coated metal board interconnected by printed wiring on one side. The printed wiring for the 400D KTU is on both sides of the board.

2.03 The printed wiring is extended to the plug-end of the board. The plug-end allows each unit to be mounted into a receptacle which has a matching contact arrangement. The plug-end is slotted in two places to orient for proper seating in the receptacle.

2.04 The KTUs provide the means for, or the control of, the following key system service and operational features:

- CO or PBX line pickup and hold.
- Flashing line lamp.
- Wink (or steady) hold lamp indications.
- Individual line time-out with optional short or extended release time interval.
- Common audible signal on incoming calls.
- Talking circuit maintained during local power failure.
- Line circuit released by the switching equipment from a hold condition when the held party abandons the call (400D KTU only).

2.05 A plastic option block on each KTU permits a quick change of circuit options as required. See Table A for the various features provided by the options for each unit.

400A and 400B Key Telephone Units

2.06 The 400A and B KTUs (Fig. 1) are identical units with the exception of an additional diode (CR4) connected on the 400B KTU. This diode serves to prevent a system from falsely indicating an incoming call at a station following a momentary power interruption.

2.07 Each KTU is equipped with a U-shaped metal grip handle to assist in the insertion and removal of the KTU from its mounting receptacle.

400C Key Telephone Unit

2.08 The 400C KTU (Fig. 2) is designed specifically for use on CO or PBX lines subject to 60-cycle induction above 12 volts rms. In all other aspects, it is equivalent to the 400B unit.

2.09 The additional circuit components of this unit provide protection against false ringup due to longitudinal and transverse induced foreign potentials.

TABLE A

WIRING OPTIONS

FEATURE	OPTION	WIRING	STRAP ON TERMINALS		PROVIDED BY FACTORY†
			400A, B, AND C KTU	400D KTU	
Time-Out Control	Long Time Delay	*	None		No
	Short Time Delay	Z	1 to 2		Yes
	Reduction of Short Time Delay‡	‡		1 to 2 (1st lead) 3 (2nd lead)	No
Visual Hold Signal	Lamp Wink	Y	8 to 9	7 to 10	Yes
	Lamp Steady	X	7 to 9		No
Audible Signaling	Interrupted Ring	W	5 to 6	5 to 8	Yes
	Steady Ring	T	4 to 6	6 to 8	No
	Common, With Relay Control	V	3 to 6	4 to 8	No
	Common, With Matrix Control	S	5 to 6	5 to 8	No

* Long time delay is effective only when the Z option strap is removed.
† When changing options, remove factory or existing option straps.
‡ For 400D KTU only. See Table B.

TABLE B

RESISTANCE REQUIRED FOR DECREASING SHORT TIME-OUT INTERVAL ON 400D KTU†

DESIRED FRACTION OF EXISTING TIME-OUT	MEGOHM RESISTOR*	RESISTOR COLOR CODE
3/4	1.20	BROWN-RED-GREEN
2/3	.75	VIOLET-GREEN-YELLOW
1/2	.39	ORANGE-WHITE-YELLOW
1/3	.20	RED-BLACK-YELLOW
1/4	.13	BROWN-ORANGE-YELLOW

* KS-13490, List 1 or equivalent 1/2-watt resistor.
† When the duration of the machine ringing is 1.0 seconds, the time-out shall not be reduced more than 50% of the original time-out.

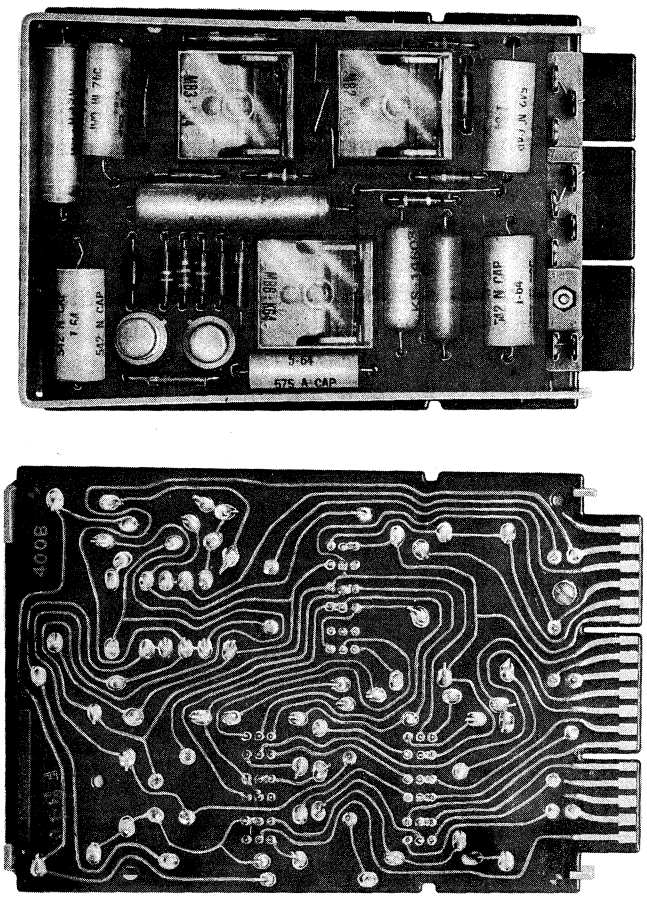


Fig. 1 — 400B Key Telephone Unit

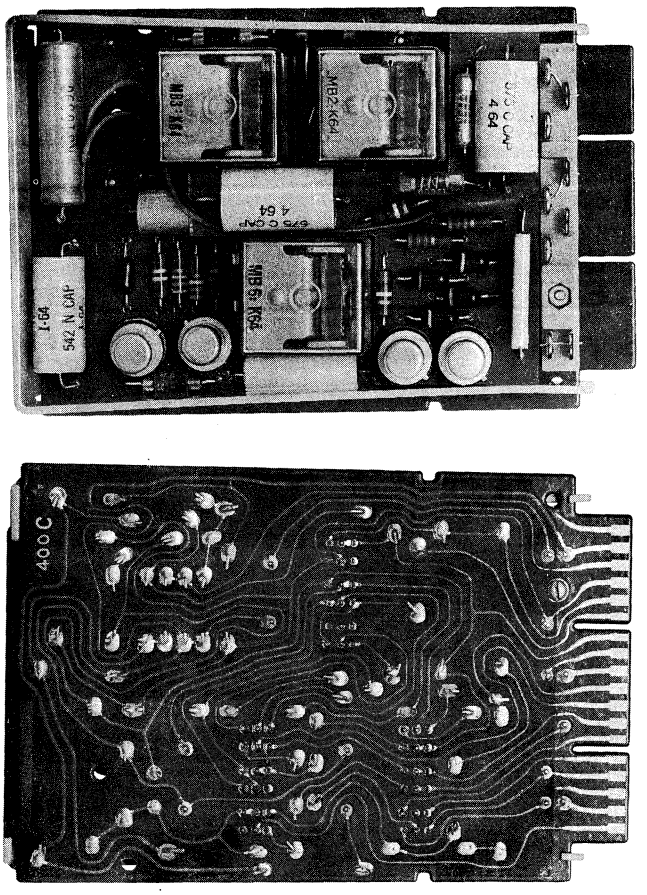


Fig. 2 — 400C Key Telephone Unit

2.10 The 400C KTU can be used in place of a 400A or when necessary. However, it should ***only*** be used when false ringup problems are being experienced with existing 400B KTUs.

400D Key Telephone Unit

2.11 The 400D is functionally similar to the 400A, B, and C KTUs (Fig. 3). In addition to the option features of earlier KTUs, the combination option block and finger-grip handle of the 400D provide the means for field installation of a resistor to reduce the short time-out interval, if required.

2.12 The 400D KTU should be used as a maintenance replacement for the 400A, B, or C KTUs if the latter units fail to meet customer operating requirements.

3. INSTALLATION

3.01 If customer requirements are different from factory-furnished options indicated in Table A, these options should be changed on the KTUs before inserting into mounting receptacle. Bare 24-gauge wire should be used for strapping purposes. Use long-nose pliers for insertion or removal of strapping.

3.02 On early production models of 400B and C KTUs, the wire clips on the option blocks require that small (P-48F768) C-clamps be slipped over the clips to assure option strap retention and good circuit continuity (Fig. 4).

3.03 Later production models of the 400B and C and all 400D KTUs are equipped with flat stamped option block terminals that do not require use of C-clamps (Fig. 5 and 6).

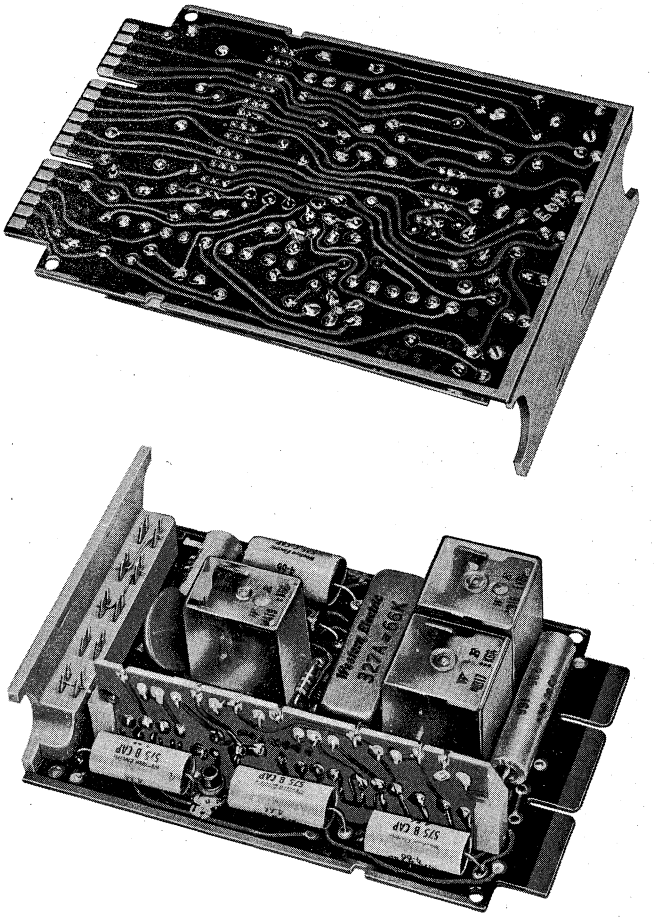
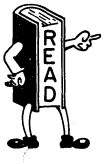


Fig. 3 — 400D Key Telephone Unit

3.04 When inserting a KTU, grasp the unit by the handle, and with a vertical rocking motion use sufficient force to seat it fully in its receptacle.



The plug-edge of each KTU is treated with a lubricant to assist in removal from or inserting in its mounting receptacle DO NOT WIPE OFF LUBRICANT.

Modifications To Reduce Short Time-Out Interval

3.05 When desired, the 400-type KTUs may be modified to provide a reduction of the short time-out interval (Z option).

3.06 Shortening the time-out interval will reduce the length of time that the audible and flashing visual signals will continue after the call has been answered or abandoned externally to the key system. This continuance of signals creates distractions at the key station.

> ***Note:*** Within the key system the audible and visual signals will stop immediately when the pickup key associated with the line being run is operated and the handset is removed from its mounting.

3.07 The factory-furnished Z option on the 400B and C KTUs provides a short time-out interval of 15 seconds after the first or second ring. Subsequent ringing within this 15-second interval resets the timing cycle to about 9 seconds. Modifying the units will reduce these intervals to about one-half their original periods.

3.08 To modify the 400B and C KTUs, connect a 1/2-watt, 100,000-ohm resistor electrically in parallel with the C5 capacitor. Physically, place, connect, and solder the resistor between points C and D as shown in Fig. 4.

3.09 To reduce the short time-out interval (Z option) on the 400D KTU, proceed as follows:

(1) Determine in seconds, the existing short time-out interval. Do this by dialing one line from another line at the same station, and counting the number of flashes on the called line lamp after hanging up on the calling line. Count one second for each flash of the lamp.

(2) Select a resistor from Table B which will provide the time-out interval desired. The resistor selected will reduce the original time-out interval to the fractional value shown.

(3) Remove the Z option strapping.

(4) Connect one lead of the selected resistor to terminal 3 on the option block. Connect the other lead to ***both*** terminals 1 and 2 (Fig. 6).

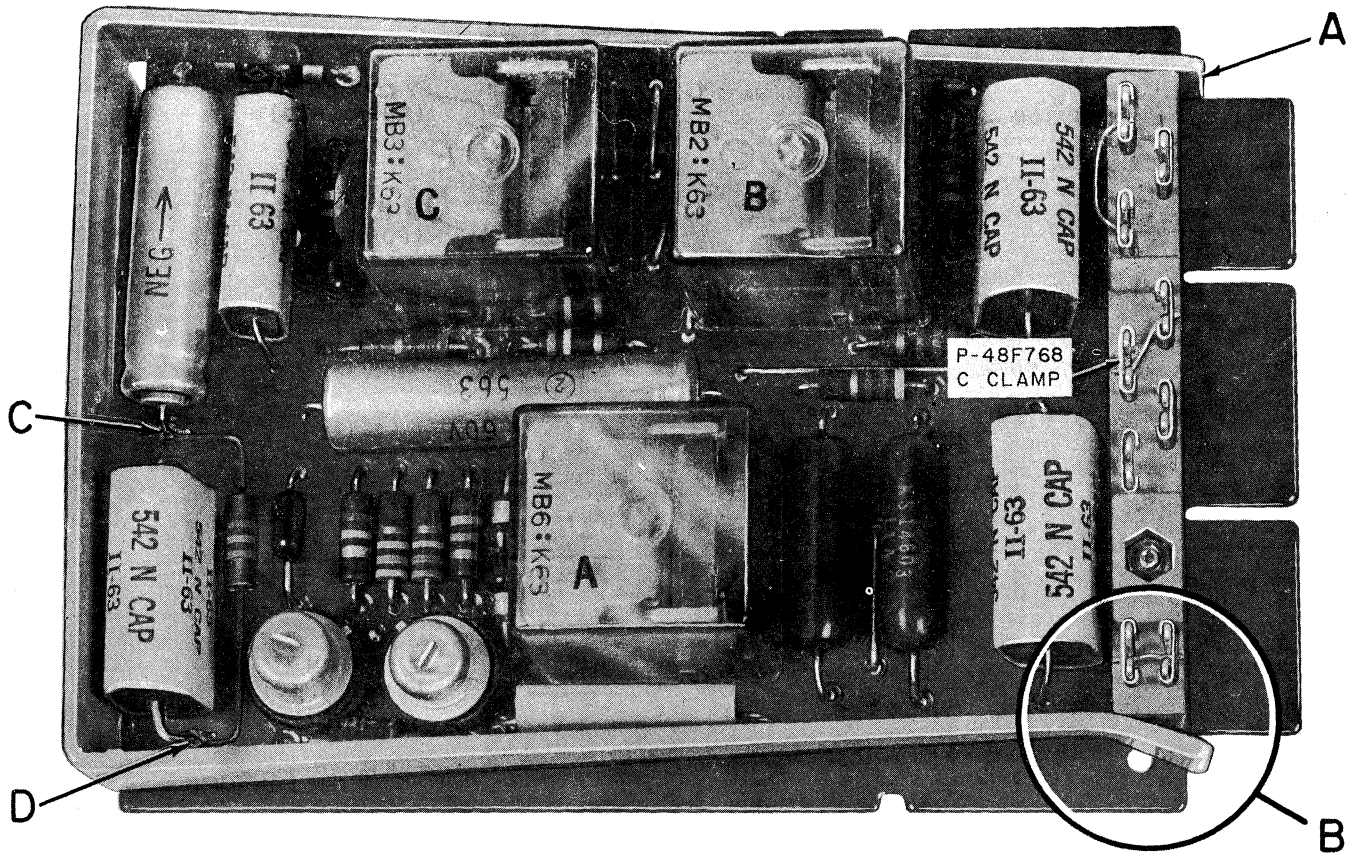


Fig. 4 — Modification of 400B or C KTU

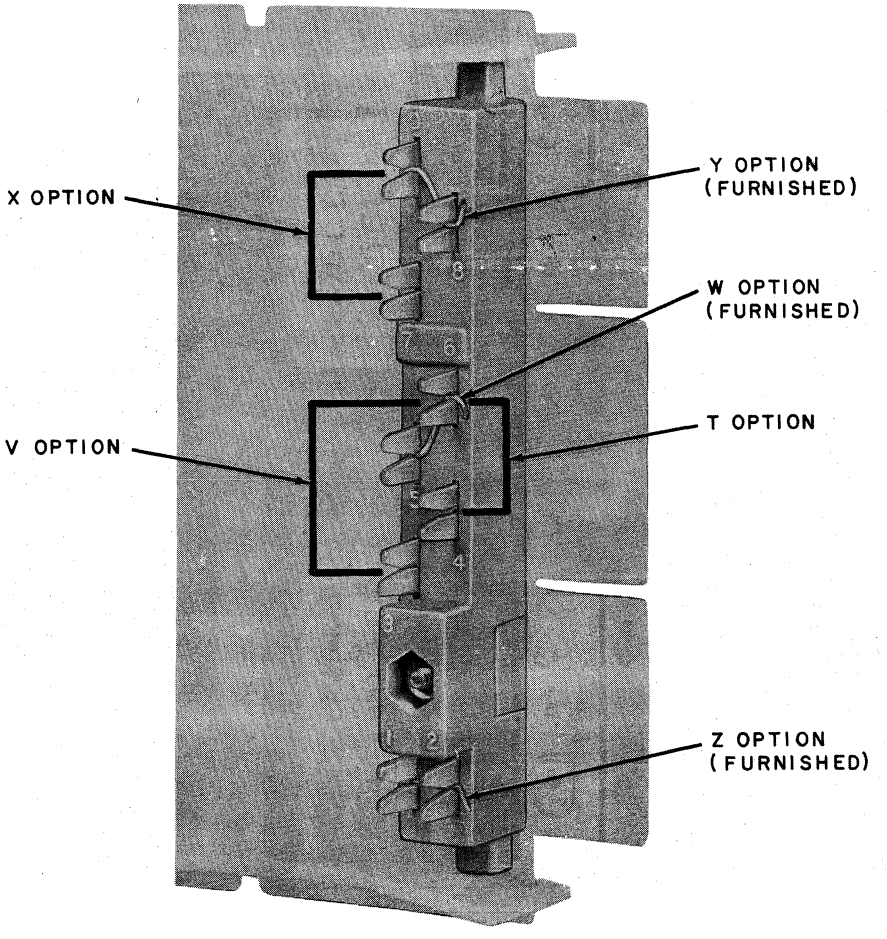


Fig. 5 — Option Block, 400A, B, and C KTUs

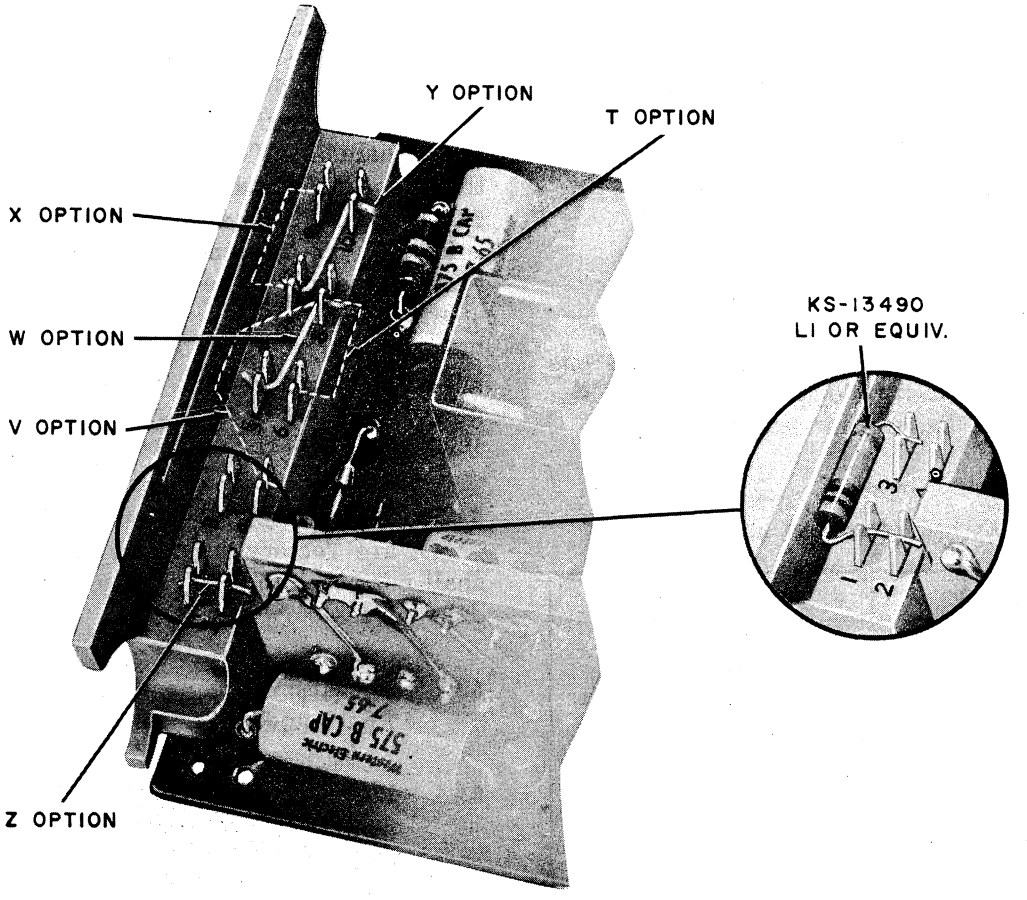
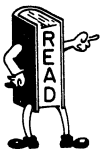


Fig. 6 — Option Block — Handle, 400D KTU

(5) Check the modified time-out interval by repeating procedures outlined in (1).



If a 400D KTU is being installed in equipment associated with a 235A or 236A KTU station line concentrator, the 235A and 236A KTUs must be modified as outlined in Section 518-310-405 to prevent a false-hold condition and possible permanent damage to the 400D KTU. The 235A and 236A KTUs do not require this modification when associated with equipment using the 400B and C KTUs.

4. CONNECTIONS

4.01 The printed circuit wiring extends to the contacts of the KTUs, which are on one side of the circuit board along the plug-end (Fig. 1, 2, and 3). See Table C for lead designations.

TABLE C

TERMINAL ASSIGNMENT FOR 400-TYPE KTU

TERM. NO.	LEAD DESIG
1	RC
2	LW
3	
4	10V±
5	ST
6	LG
7	LF
8	L
9	R (CO)
10	105V±
11	RN
12	T (STA)
13	R (STA)
14	T (CO)
15	GRD B
16	A
17	BAT. B
18	

5. MAINTENANCE

5.01 When circuit trouble is encountered with a 400-type KTU, interchange it with one known to be working properly to determine whether the trouble is in the KTU itself or external to it. If the KTU is proved defective, replace with a good unit.

Note: Exercise care when inserting or removing the KTU to avoid damage to the printed wiring and other circuit components.

5.02 Line circuit failure can occur as a result of improper seating of the 400B or C KTU in its receptacle. On early production models of these units, the ends of the U-shaped handle may strike the receptacle and prevent the unit from being fully seated (point A on Fig. 4). Should this condition exist, bend the outer ends of the handle sufficiently to permit passage over the ends of the receptacle (point B on Fig. 4). After bending, the arms of the handle should be sufficiently pretensioned (squeezed together at the base of the U) to rest snugly against the ends of the option block. Later models have the option block insert extended at each end sufficiently to hold unbent U-handle arms in order to allow proper insertion in a mounting receptacle. Handles should not be flared on these KTUs (see Fig. 5).

5.03 The miniature relays used in the KTUs are factory adjusted. Field adjustments shall not be attempted. Do not remove the relay dust covers.

5.04 Operational sequence charts are shown in Fig. 7 and 8.

5.05 Refer to CD- and SD-69513-01 for detail description and schematic drawings.

These units can be easily damaged by attempting field measurements without proper instruments. Such measurements should not be attempted.

During periods when the local dc supply is inoperative, outgoing calls may be originated at any time. Incoming calls to the KTUs operate connected line ringers in the usual manner, although common audible signals and all visual signals are inoperative.

To avoid damage, use blister pack when transporting or storing a 400-type KTU. Over-pack when necessary.

2 5 7 3

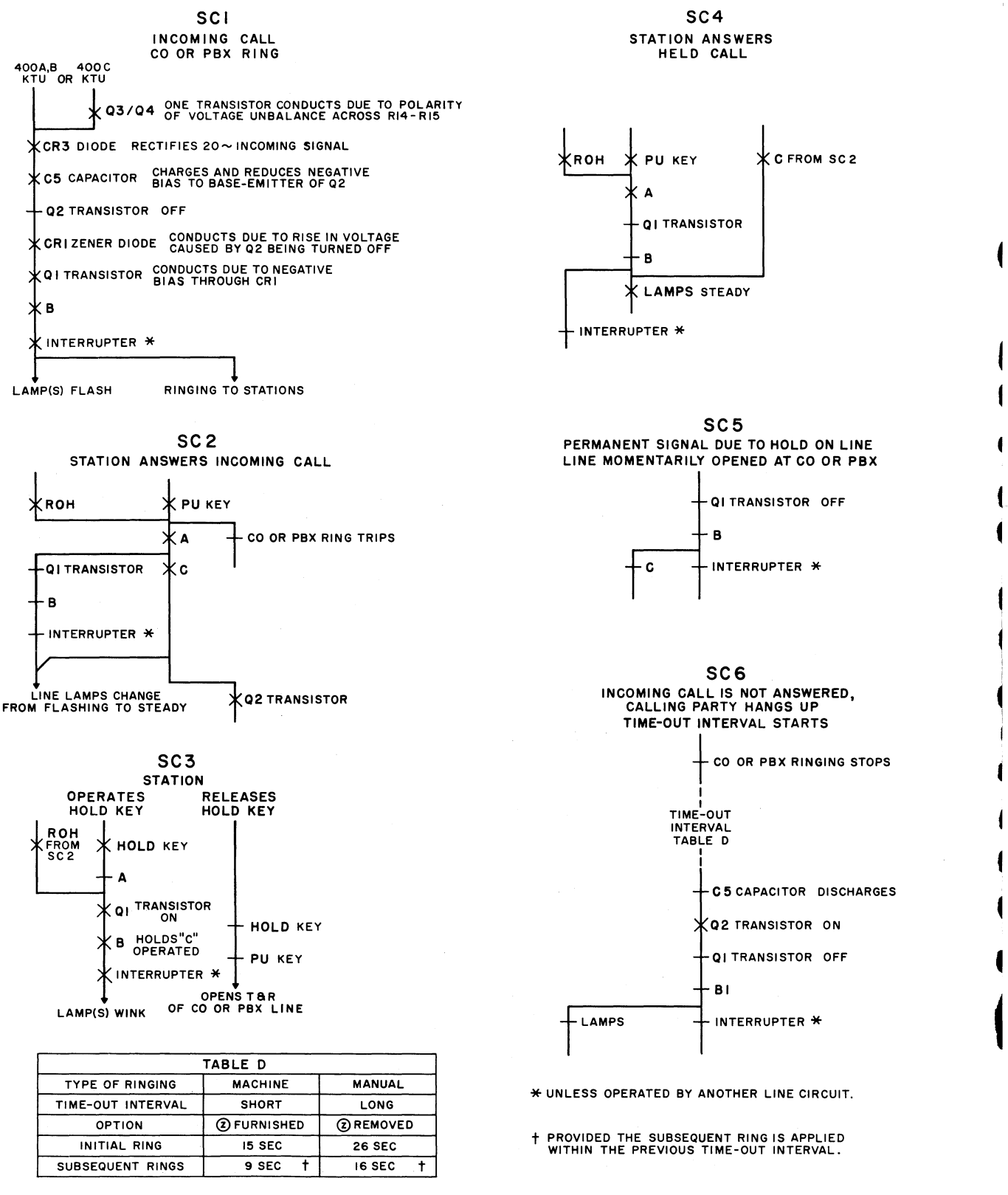
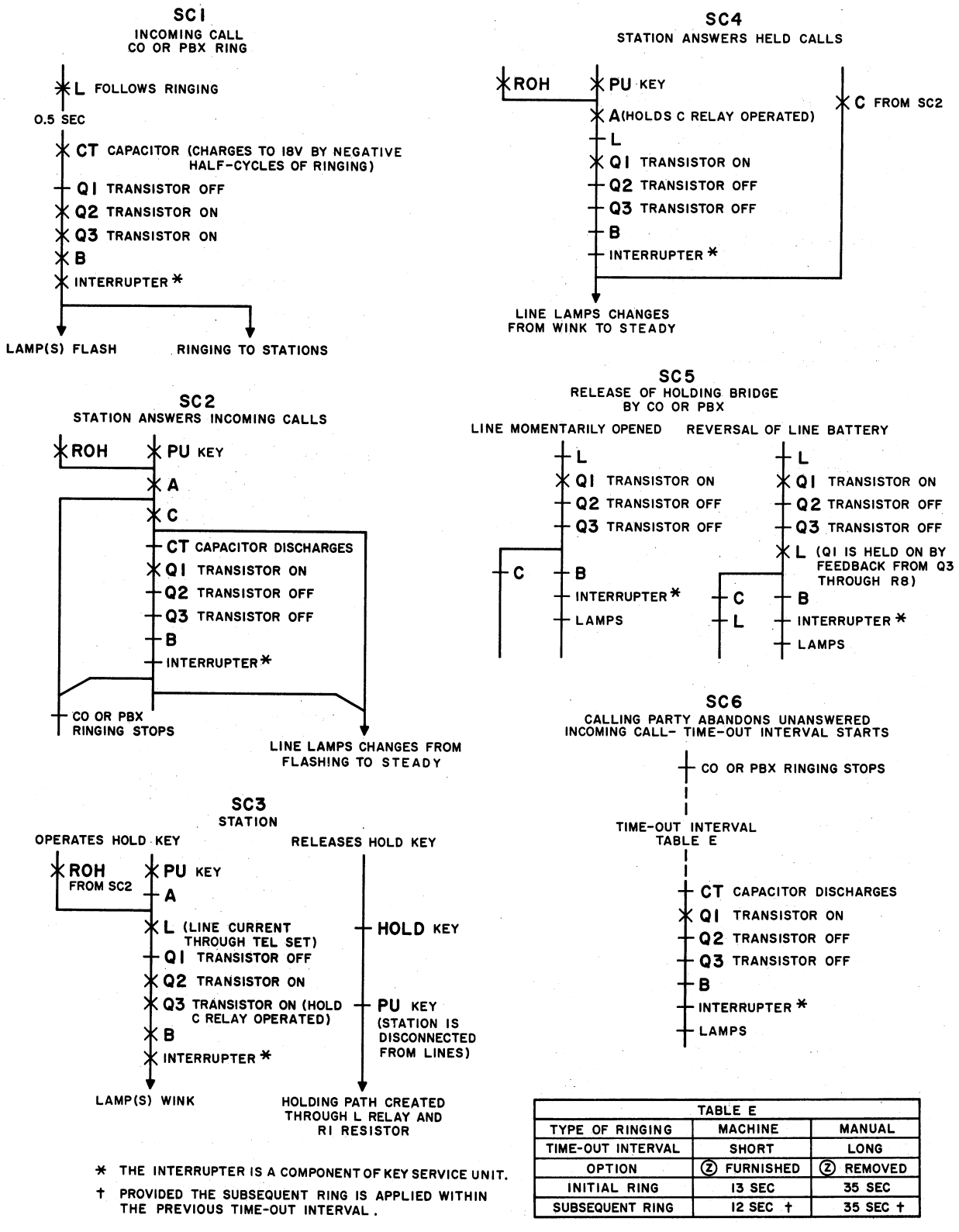


TABLE D		
TYPE OF RINGING	MACHINE	MANUAL
TIME-OUT INTERVAL	SHORT	LONG
OPTION	(Z) FURNISHED	(Z) REMOVED
INITIAL RING	15 SEC	26 SEC
SUBSEQUENT RINGS	9 SEC †	16 SEC †

* UNLESS OPERATED BY ANOTHER LINE CIRCUIT.

† PROVIDED THE SUBSEQUENT RING IS APPLIED WITHIN THE PREVIOUS TIME-OUT INTERVAL.

Fig. 7 — Sequence Charts (SC1 to SC6) Showing Operational Sequence of 400A, B, and C KTUs



* THE INTERRUPTER IS A COMPONENT OF KEY SERVICE UNIT.

† PROVIDED THE SUBSEQUENT RING IS APPLIED WITHIN THE PREVIOUS TIME-OUT INTERVAL.

TABLE E		
TYPE OF RINGING	MACHINE	MANUAL
TIME-OUT INTERVAL	SHORT	LONG
OPTION	(Z) FURNISHED	(Z) REMOVED
INITIAL RING	13 SEC	35 SEC
SUBSEQUENT RING	12 SEC †	35 SEC †

Fig. 8 — Sequence Charts (SC1 to SC6) Showing Operational Sequence of 400D KTU