

KEY TELEPHONE SYSTEMS
STATION ARRANGEMENT FOR 2- AND 4-WIRE
NO. 5 CROSSBAR CENTRAL OFFICE LINES
IDENTIFICATION

1.00 INTRODUCTION

1.01 This section contains the description and use of telephone sets arranged for common battery operation and key telephone units used to terminate 2- and 4-wire No. 5 crossbar central office lines.

1.02 This equipment was designed primarily for government agencies requiring conventional 2-wire and high-grade 4-wire transmission facilities to carry encrypted voice, facsimile, teletype, and data communications, in addition to ordinary voice.

1.03 This section is reissued to:

- Change 240A KTU to 240B KTU to provide connection for an auxiliary ringer.
- Add new line transfer unit coded 244A.
- Add new attenuator pad unit coded 245A.
- Add reference to new telephone sets (608, 616, and 618 types).

1.04 Due to extensive changes marginal arrows have been omitted.

2.00 GENERAL

2.01 The 4-wire No. 5 crossbar switching system will accept either rotary dial or TOUCH-TONE pulsing. It is arranged to handle special calls in the following categories.

- A call that must be given priority handling to expedite its completion.
- A call that is permitted to spill over to the commercial network when trunks in the private network are busy.
- A call that must be completed over trunks conditioned to meet special grade transmission requirements.

2.02 An individual line may be assigned on a class-of-service basis so that each call originated is placed automatically in one or a combination of the categories mentioned in 2.01. The line may be assigned so that the customer may place a call in the desired category by the operation of certain keys or by dialing certain codes.

3.00 FEATURES

3.01 The telephone sets used with this arrangement connect the service features provided by the 1A1 and 1A2 key telephone systems. Exceptions for the present are speakerphone and station busy lamp features. For information on the 1A1 and 1A2 key telephone systems, refer to the sections covering the 1A1 and 1A2 systems.

3.02 The telephone sets and associated 4-wire key telephone units provide the following service features:

- Pickup of one or more 4-wire lines.
- Holding.
- Visual line signals.
 - (a) Flashing (incoming calls)
 - (b) Steady busy
 - (c) Steady or winking hold.
- Manual exclusion.
- Transfer of 4-wire line to customer-owned equipment.

3.03 The operating features such as line selection, answering an incoming call, holding, and exclusion on 4-wire lines are similar to those of the 1A1 and 1A2 key telephone systems.

3.04 An auxiliary line pickup relay is associated with each pickup key used to connect a 4-wire line. Since the pickup key in the telephone

set does not have enough contacts to control all of the 4-wire station leads, this relay provides the necessary additional contacts. The operation of the relay is controlled over an *A* lead which connects through the operated pickup key and switchhook of the telephone set to an *A1* ground.

3.05 The 4-wire line circuit operates under control of an *A2* lead connected to the pickup relays. Pulsing for outgoing calls is sent out over the transmitting pair. Incoming calls operate the *R* relay which is bridged across the receiving pair. Operation of the *R* relay operates the circuits controlling the visual and audible signals.

3.06 The loop from the central office to a 4-wire station will be built out, as necessary, to provide 8-db loss on the transmitting pair and 12-db loss on the receiving pair. Resistances in series with the transmitting pair and receiving pair are connected to screw terminals on the back of the line circuits to provide a means for adjusting the db loss. Where the desired loss will be exceeded, *vf* (voice frequency) repeater or carrier circuits will be used. Then the loss will be adjusted to the proper amount.

3.07 An exclusion relay is provided when exclusion is required on a 4-wire line. This relay operates under control of an exclusion key at a control station to cut off extensions.

3.08 A transfer circuit (240B or 244A KTU) is provided when a 4-wire line is to connect to customer-owned equipment. The operation of this circuit is controlled by a nonlocking transfer key on the telephone set. Transfer can be accomplished only while the handset is off the hook and the associated line pickup key is operated. When the transfer key is momentarily depressed, the transfer circuit operates and locks. The *T* relay in this circuit transfers the 4-wire line from the line circuit to the customer equipment. The 240B KTU is equipped with a 120C repeat coil which provides a 1 to 1 ratio between the line and the customer-owned equipment. The 244A KTU is equipped with a 120G repeat coil. Depending on the wiring, this coil provides the following ratios:

- 1 to 2.5
- 1 to 1.5
- 2.5 to 1
- 1.5 to 1

3.09 An auxiliary transfer circuit (241A KTU) is provided in addition to the first transfer circuit when more than one piece of customer equipment is to be used on the line. A second nonlocking auxiliary transfer key on the telephone set is required to control the auxiliary transfer circuit.

3.10 The associated line pickup key and transfer key will be illuminated as long as the customer equipment remains connected to the line.

3.11 To release a transfer or auxiliary transfer circuit connecting customer equipment to the line, the handset must be off the hook and the associated pickup key operated. Momentary operation of the controlling transfer key disconnects the customer equipment and transfers the line back to the station.

3.12 External line equalization may be provided when required. The two transfer circuits are connected in tandem so that the same equalization, when provided, may serve for both pieces of equipment.

3.13 A 245A KTU, containing attenuator pads, is required when the input signal to the customer-owned encryption or data equipment is not at the proper level. Two plug-in 89-type resistors per 245A KTU must be ordered *separately*. Table B lists the 89-type resistors and the db loss introduced to the circuit. When two customer-owned equipments require pads of the same value, a common pad arrangement may be furnished ahead of the auxiliary line transfer circuit (241A KTU) as shown in Fig. 1. When two customer-owned devices require pads of different values, provide individual 245A key telephone units after the auxiliary line transfer circuit (241A KTU) as shown in Fig. 1.

3.14 The 240B and 244A key telephone units provide a connection for an auxiliary service ringer. The ringer, if provided, would be used to signal the customer from the toll test board if the 4-wire circuit were inadvertently left in the encryption or data mode. The 240A KTU (Mfr Disc.) did not provide for this feature.

3.15 When the visual and audible signal circuit equipment is not available as part of an associated 1A1 key telephone system installation,

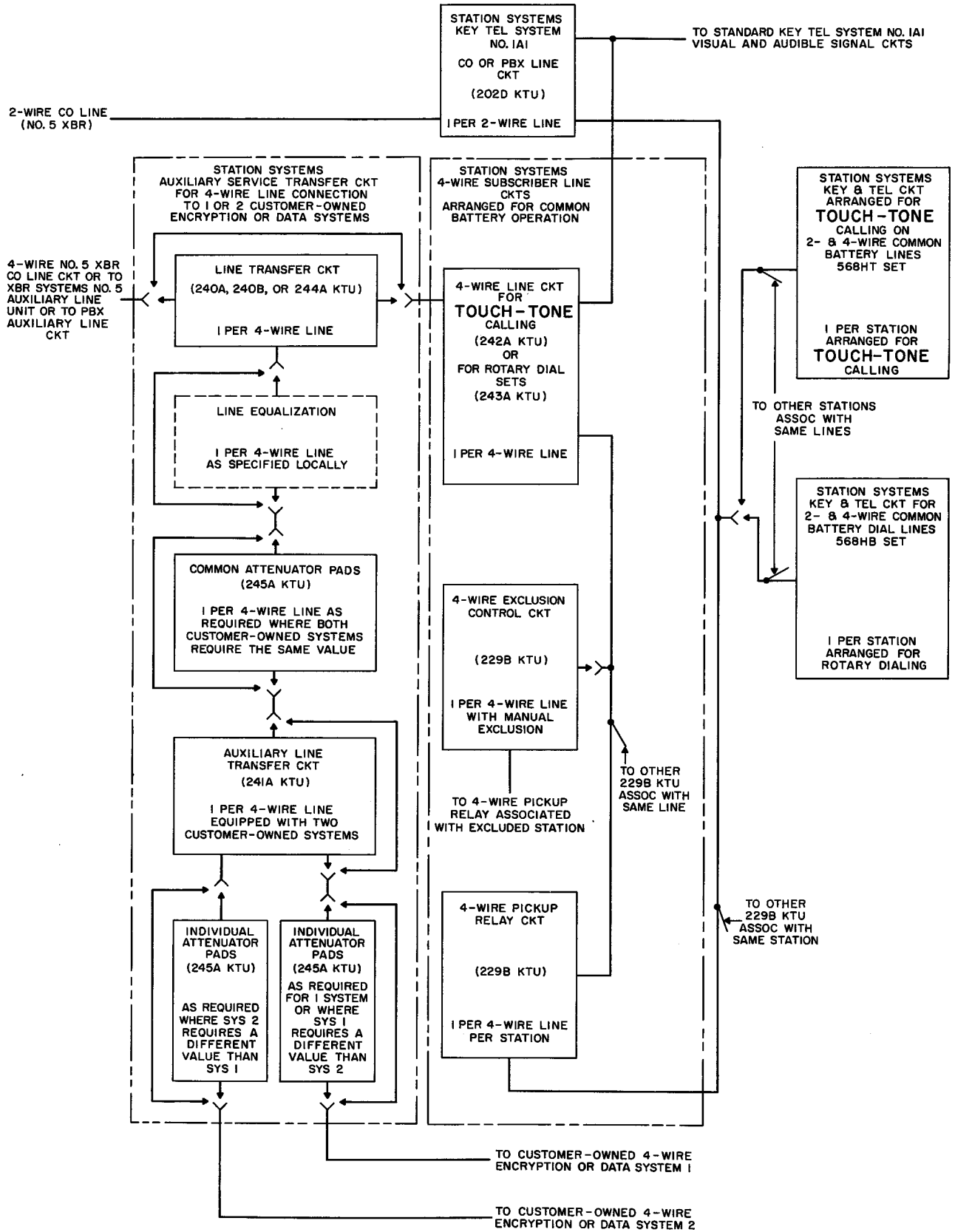


Fig. 1 - Block Diagram, Station Arrangement for 2- and 4-Wire Service

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a 232-type KTU equipped with a KS-15900, List 1 electromechanical interrupter must be provided.

3.16 Fig. 1 is a block diagram showing the various arrangements of the key telephone units and associated key telephone sets for 2- and 4-wire service.

4.00 TELEPHONE SETS

4.01 Telephone sets for use with this circuit are coded as follows:

- TOUCH-TONE calling
 - (a) 568HT (6-button key telephone set)
 - (b) 616 type (18-button set) (THE CALL DIRECTOR)
- Rotary dialing
 - (a) 568HB (6-button key telephone set)
 - (b) 618 type (18-button set) (THE CALL DIRECTOR)

(c) 608 type (30-button set) (THE CALL DIRECTOR)

4.02 These sets are equipped, internally, with a relay which permits switching from 2-wire to 4-wire circuitry. The 6-button sets are also equipped with an exclusion key. In addition the 568HT (Fig. 2) and the 616-type sets are equipped with two additional buttons, colored red, designated P (priority) and SG (special grade) as part of the dial.

4.03 On stations privileged to do so, priority or a special grade facility may be obtained on TOUCH-TONE sets by operating the P and/or SG button before the number is dialed. Sets with rotary dials must dial certain prefix digits ahead of the called number digits.

4.04 When the sets are connected to a 2-wire line, the usual 500-type set transmission circuitry is used.

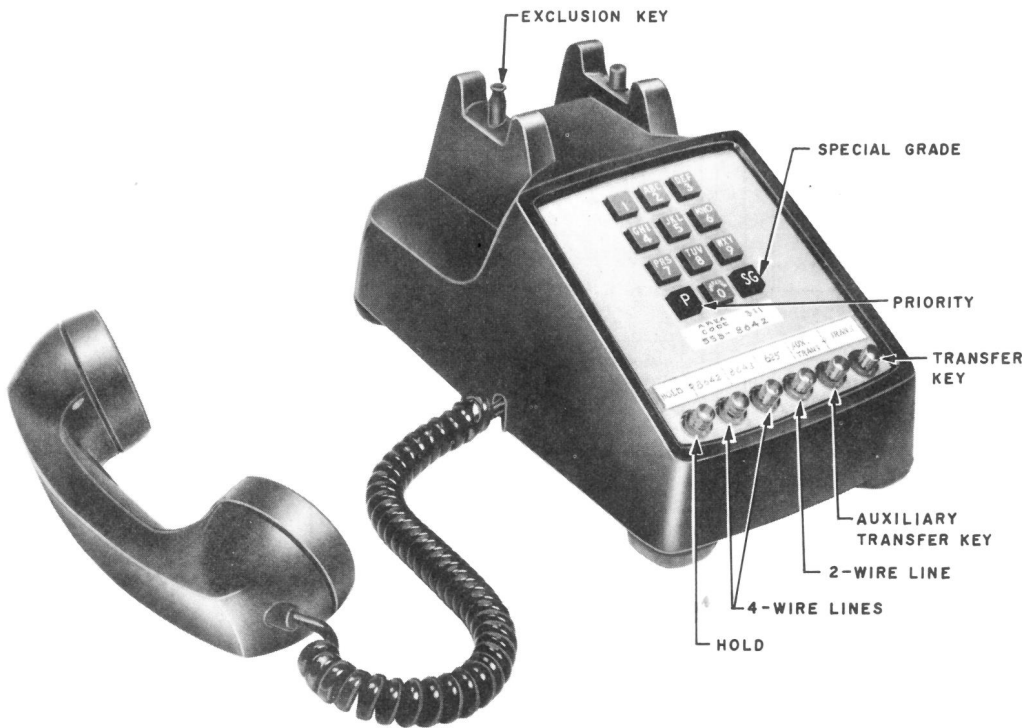


Fig. 2 — 568HT Telephone Set with Typical Arrangement of Pick-up and Signaling Keys

4.05 When sets are connected to a 4-wire line, the relay in the set operates and disconnects the receiver from the network. A 202A repeating coil in the line circuit matches the receiver to the receiving loop to obtain a true 4-wire termination. The handset transmitter is connected through the network coil and equalizer to the transmitting loop. The equalizer limits the transmitting level on short loops.

5.00 KEY TELEPHONE UNITS

5.01 Panel-type key telephone units equipped with wire spring relays provide the various 4-wire features. These units mount in standard equipment cabinets, on apparatus mountings, and on relay racks (with the use of 67A or 67B brackets).

5.02 Table A lists the units used for 4-wire service as provided in this arrangement.

5.03 Table B lists the 89-type resistors for use with the 245A KTU. It also shows the db loss that each type resistor introduces to the circuit.

6.00 POWER SUPPLY

This equipment is designed to operate from a 20- to 26-volt dc source. A 101G-type power plant may be used to furnish power. A 101G power plant J86731A, List 4 should be provided when 105-volt 20-cycle ringing is required for the audible signals. The power supply from an associated 1A1 key telephone system installation may be used providing its capacity is adequate. Power supply arrangements and limitations appear in the section covering station systems power supply.

TABLE A
KEY TELEPHONE UNITS USED
TO PROVIDE 4-WIRE FEATURES

KTU Code	Circuits		Quantity	Panel Width		Fig. No.
				inches	$\frac{1}{6}$ -inch Modules	
227A	Common Audible Control Circuit		As required*	3- $\frac{3}{16}$	7	3
229B	Auxiliary Relay Unit Used as 4-Wire Line Pickup Relay Circuit		1 per station per line	3- $\frac{3}{16}$	7	4
	Auxiliary Relay Unit Used as 4-Wire Line Exclusion Control Circuit		1 per line			
232A or B	Time-Out and Manual Intercom Circuit provides flashing, winking, ringing, and busy-tone signal interruption when equipped with KS-15900, List 1 electromechanical interrupter.		As required†	3- $\frac{15}{32}$	8	5
240B or 244A	Line Transfer Circuit‡		1 per line	6- $\frac{31}{32}$	16	7
241A	Auxiliary Line Transfer Circuit		1 per line	3- $\frac{1}{8}$	7	6
242A	4-Wire Subscriber Line Circuit	For TOUCH-TONE Calling Sets	1 per line	8- $\frac{9}{32}$	19	8
243A		For Rotary Dialing Sets				9
245A	Attenuator Pads §		As required	2- $\frac{9}{32}$	5	10

* Required when line transfer circuit is provided.

† Time-out and the required interruptions may be furnished from an associated 1A1 key telephone system.

‡ 240B KTU equipped with 120C repeat coils.

§ 244A KTU equipped with 120G repeat coils.

§ Two 89-type plug-in resistors must be ordered separately, see Table B.

TABLE B
89-TYPE PLUG-IN RESISTORS FOR USE
WITH 245A KTU

Resistor Code	Pad Loss in DB
89A	0
89E	1
89J	2
89N	3
89T	4
89AA	5
89AE	6
89AJ	7
89AN	8
89AT	9
89BA	10
89BC	11
89BE	12
89BG	13
89BJ	14
89BL	15
89BN	16
89BR	17
89BT	18
89BW	19
89CA	20

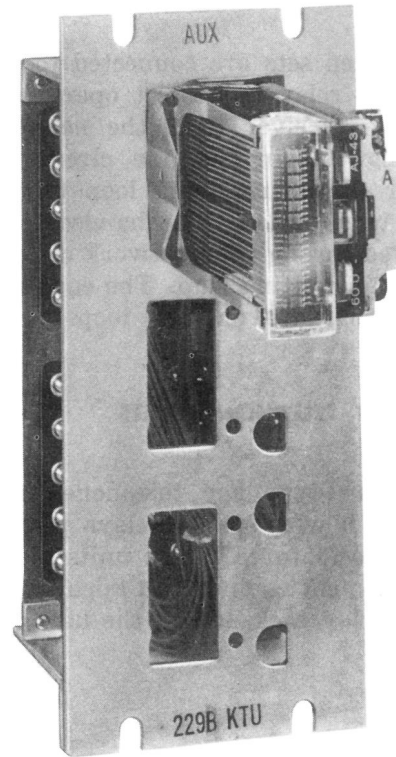


Fig. 4 – 229B KTU Auxiliary Relay Unit Used as 4-Wire Line Pickup Circuit or 4-Wire Exclusion Control Circuit

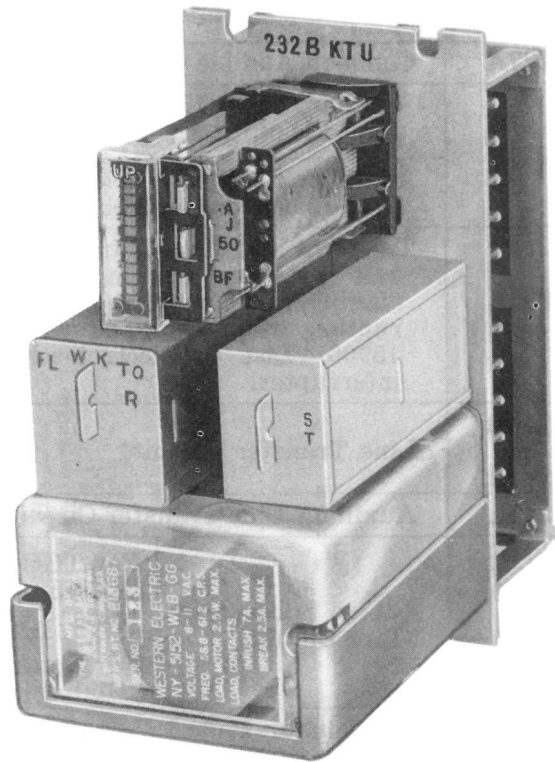


Fig. 5 – 232B KTU Flash, Wink, Ring, and Time-Out Circuit

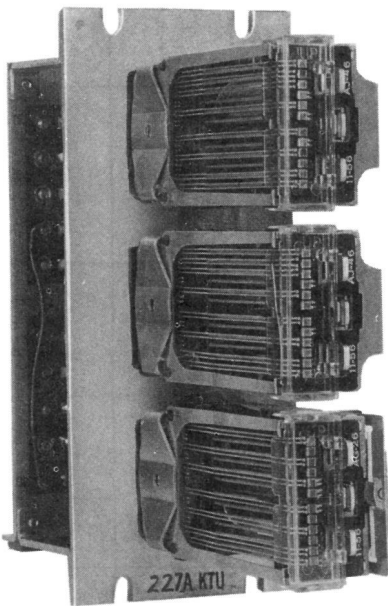


Fig. 3 – 227A KTU Common Audible Control Circuit

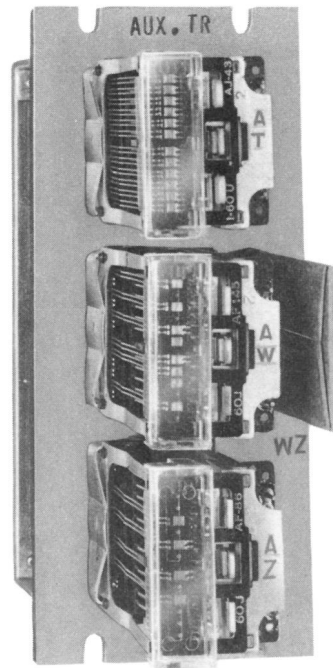


Fig. 6 – 241A KTU Auxiliary Line Transfer Circuit

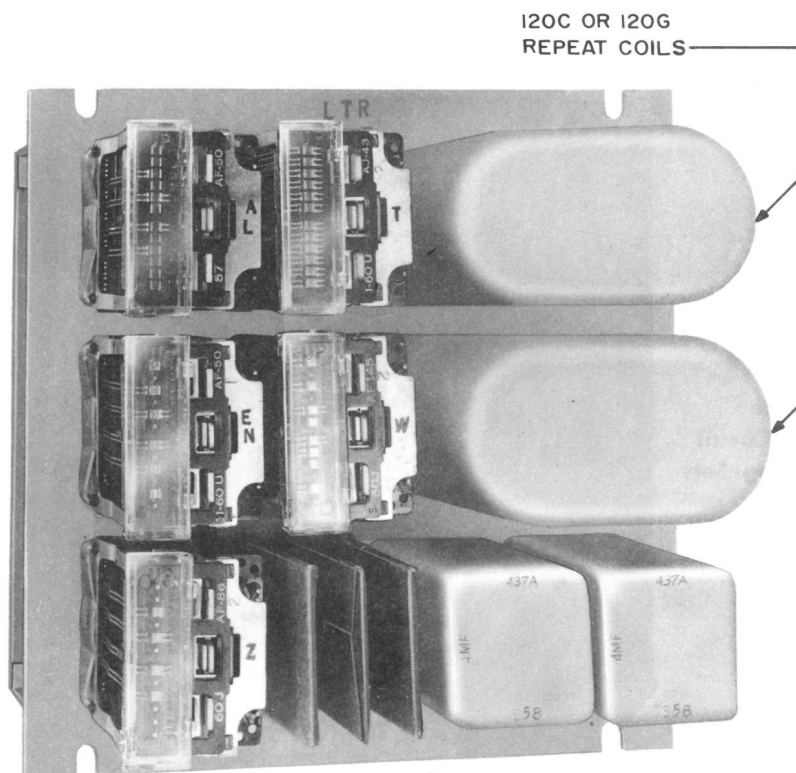


Fig. 7 – 240B KTU Equipped with 120C Repeat Coils, 244A KTU Equipped with 120G Repeat Coils

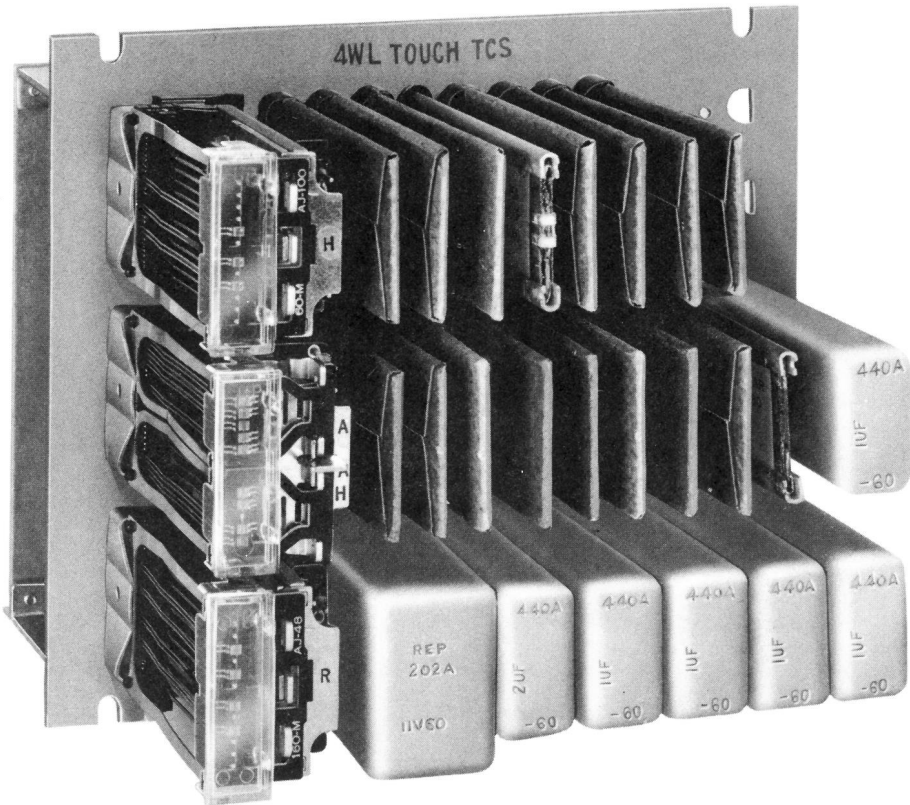


Fig. 8 — 242A KTU 4-Wire
Subscriber Line Circuit for
TOUCH-TONE Calling Sets

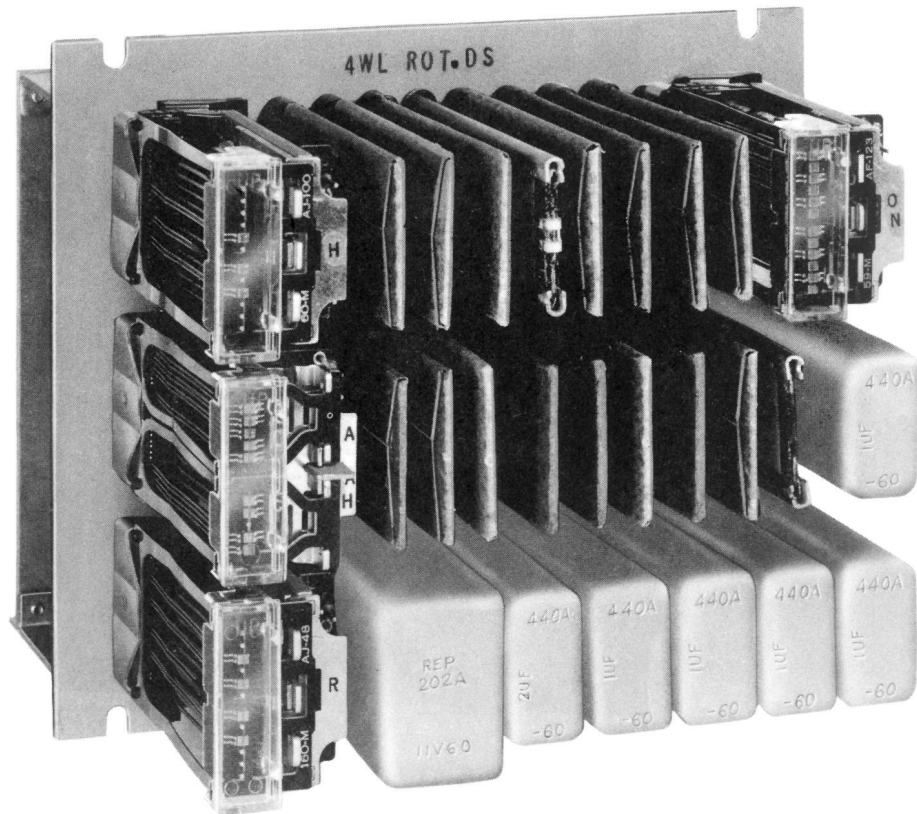


Fig. 9 — 243A KTU 4-Wire
Subscriber Line Circuit
for Rotary Dialing Sets

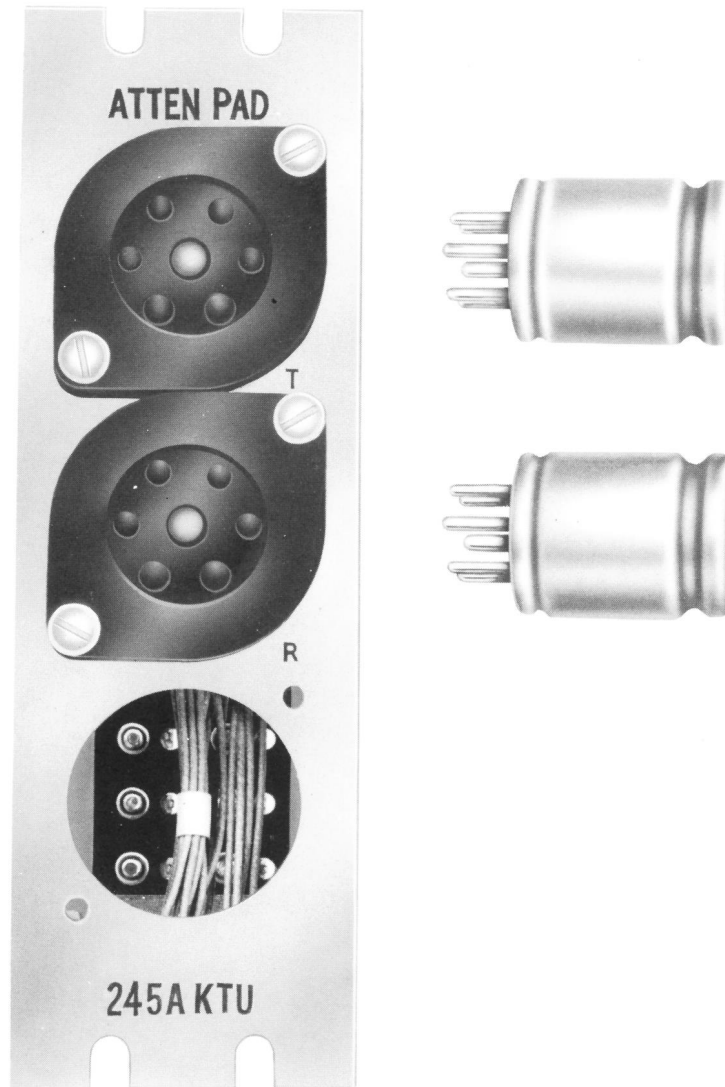


Fig. 10 — 245A KTU, Attenuator Pads Shown with 89-Type Resistors That Are Ordered Separately