6A KEY TELEPHONE SYSTEM

IDENTIFICATION

1.00 INTRODUCTION

1.01 This section covers the description and use of the 6A key telephone system, a dial selective intercommunicating circuit which will eventually replace the 9-station dial intercommunicating arrangement covered by SD69199-01 as used in 1A and 1A1 key telephone system installations. In addition to being a larger capacity system, it incorporates new optional features which broaden its field of application and increase its usefulness.

1.02 The 6A system permits single and multiple station selection, intercommunicating, conferencing, camp-on, and interconnection with other telephone system circuits up to a maximum of 36 stations.

2.00 GENERAL

2.01 The 6A key telephone system is arranged to permit wide variations in the number of stations and their calling rates. Some optional features may be obtained by simple strapping changes on one or two basic key telephone units; other features require the addition of a key telephone unit. The change from a single link to a two talking link system can be made only by the replacement of one key telephone unit with another.

2.02 The three general arrangements are:

Selector Only

This arrangement provides for:

- Access to a common talking path for a maximum of 36 stations.
- Dial station selection.
- Line busy lamps.
- Station signaling over a separate pair.
- Means for originating a preset conference connection.
- Means for connecting off-premise stations as part of the intercommunicating network.
- Means for conferencing an incoming central office or PBX line and stations of the intercommunicating system.

Single Link

This arrangement provides all those functions found in the Selector Only and also provides for:

- Signaling key station selection.
- Flashing the signaling lamps on an incoming call.
- Station signaling over the T and R leads or over a separate signaling pair.
- Operating a common audible signal over a separate signaling pair.
- A selector link and a primary talking link: the selector link used in the process of station selection and as a talking link with any of the other associated stations before the called station answers, and the primary link used as the talking path between the called and calling stations.
- Options for automatic cutoff of all, some, or none of the associated stations.
- Means whereby all conferenced stations receive a flashing signal lamp until all stations which are to be a part of the conference have answered.
- Means for the use of camp-on.
- The return of a busy tone signal to the station using camp-on and to any other station which may try to originate a call after the system has been camped on.

Two Link

This arrangement can furnish all those functions found in the Selector Only or Single Link and also provides for:

- A secondary talking link in addition to the selector link and primary talking link, which enables one system to carry two simultaneous and independent conversations.
- A busy signal to the calling station when a called station is busy or when some of the stations which are to be part of a conference connection are busy.

2.03 Apparatus for the 6A system is designed on unit panel-type mounting plates (200 series key telephone unit) for installation in standard equipment cabinets.

3.00 APPARATUS

The coded key telephone units providing relays and associated apparatus for the various circuit functions of the 6A system are listed in Table A.

TABLE A

KTU Code	Feature or Option	Number Required	Width inch	Horizontal Space Holes	Fig. No.
207B	Selector Circuit	1 Per System	5-1/4	12	1
214B	9-station Battery Supply & Signaling Ckt (Single Link)	1 Per Initial 9 Stations	14-7/16	32	2
215A	3-station Signaling Ckts (Single Link)	1 Per Addl 3 Stations	3-15/16	9	3
216A	Transfer Ckt	1 Per Addl 9 Codes	3-1/16	7	4
217A	Preset Conference Control Ckt	1 Per 2 Preset Conf Arr	3-1/16	7	5
222A	9-station Battery Supply & Signaling Ckts (Two Links)	1 Per Initial 9 Stations	21	49	6
223A	3-station Signaling Ckts (Two Links)	1 Per Addl 3 Stations	5-11/16	13	7
224A	Busy Signal & Camp-on Control Ckt	1 Per System	3-1/2	8	8
225A	Long Line Ckt	1 Per Off-premise Sta	2-3/16	5	9
226A	Incoming Conference Control Ckt	1 Per CO Line	3-1/2	8	10
227A	Station Common Audible Control Ckt	See Note	3-1/16	7	11

Note: When more than forty lamps are required for the system, or when two or more of the following options are to be associated with the same stations' signaling circuit, provide the needed contacts through a common slave relay of the 227A key telephone unit. Other units may be used on a locally engineered basis.

- Inward conferencing.
- Signaling over separate signal pair.
- Station common audible.

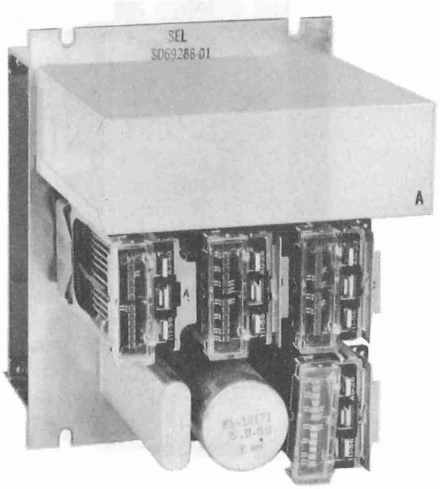

Fig. 1 - 207B Key Telephone Unit Selector Circuit

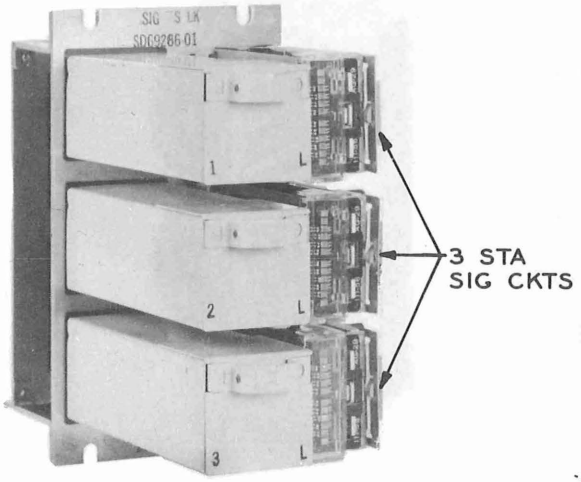

Fig. 3 - 215A Key Telephone Unit Signal Circuit - Single Link

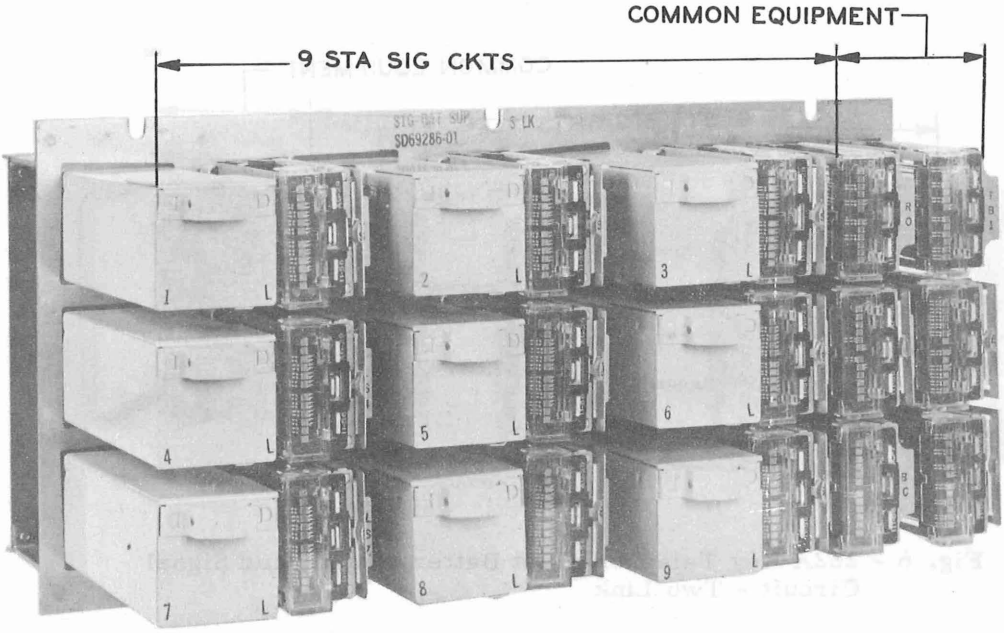

Fig. 2 - 214B Key Telephone Unit Battery Supply and Signal Circuit - Single Link

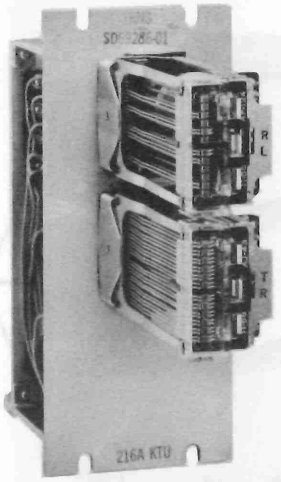

Fig. 4 - 216A Key Telephone Unit
Transfer Circuit

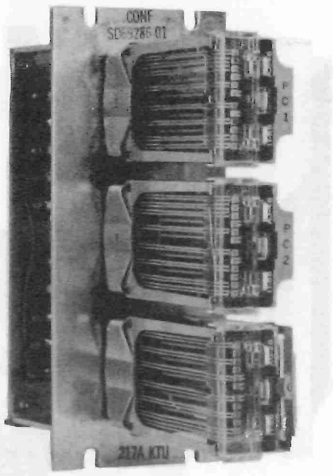

Fig. 5 - 217A Key Telephone Unit
Preset Conference Control

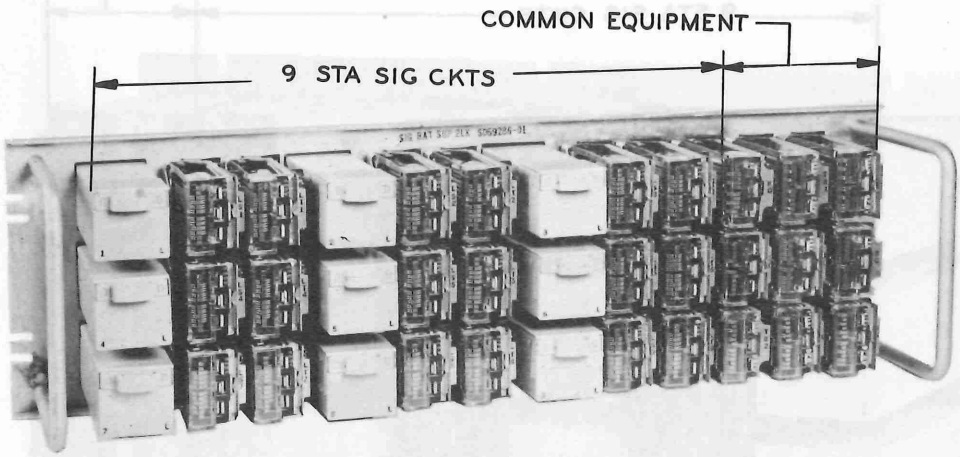

Fig. 6 - 222A Key Telephone Unit Battery Supply and Signal
Circuit - Two Link

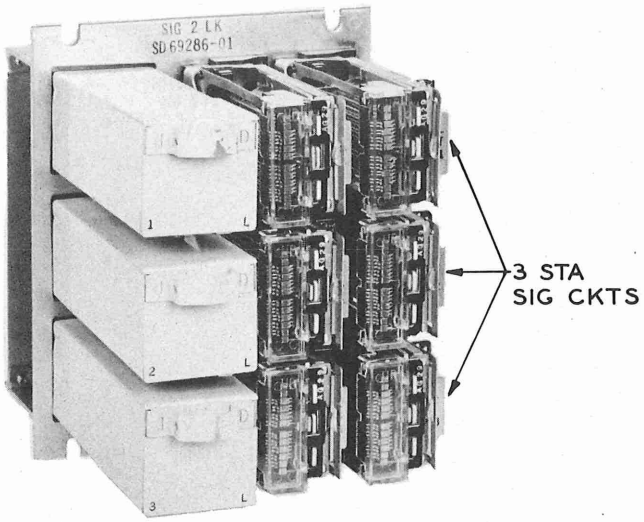

Fig. 7 - 223A Key Telephone Unit Station Signaling Circuit - Two Link

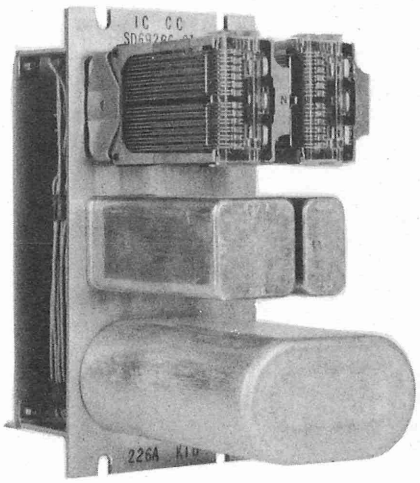

Fig. 10 - 226A Key Telephone Unit Incoming Conference Circuit

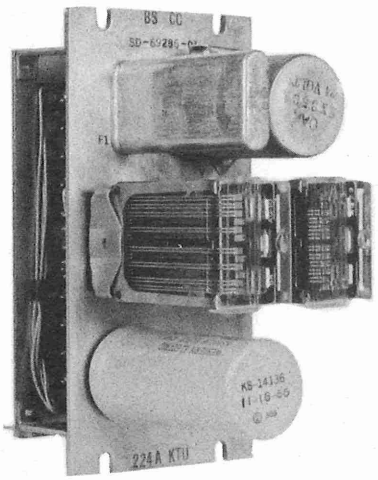

Fig. 8 - 224A Key Telephone Unit Busy Signal and Camp-on Control Circuit

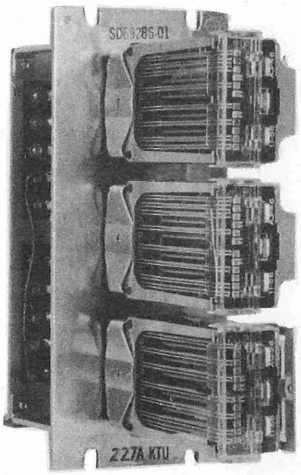

Fig. 11 - 227A Key Telephone Unit Auxiliary Relay Circuit

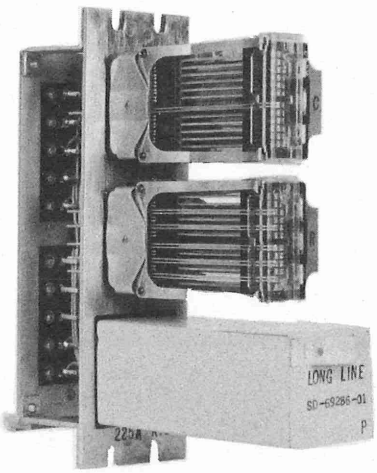

Fig. 9 - 225A Key Telephone Unit Long Line Circuit

4.00 FEATURES - SELECTOR ONLY

Information to be provided under this heading will be issued at a later date.

5.00 FEATURES - SINGLE TALKING LINK

Information to be provided under this heading will be issued at a later date.

6.00 FEATURES - TWO TALKING LINK

Line Seizure

6.01 All stations are connected to the selector circuit (Fig. 1) under control of their associated station signaling circuit (part of Fig. 6 or Fig. 7). No dial tone is heard when a station originates a call, but the circuit is prepared for the stepping of the rotary selector. In addition, a ground is applied to the J lead, which causes the B1 relay in the common equipment of Fig. 6 to operate. This operated relay (a) lights the busy lamps steadily at all stations, (b) applies a ground start signal to the associated flashing circuit, and (c) applies a ground signal to an associated 1A or 1A1 key telephone system time-out control circuit if so connected.

Station Selection

6.02 A station may be selected in one of two ways: (a) by dialing a 1- or 2-digit code or (b) by using a signaling key. As the calling station picks up, it is connected to the selector circuit through its associated station signaling circuit. If a dial is used, the dialing of a predetermined code will cause the called station to receive an audible and visual signal under control of a C lead ground from the selector circuit. If a signaling key is used, a 551 or equivalent nonlocking-type signal key is furnished on a one-per-station-per-called-code basis. Operation of the key places a ground on the C lead, and the signaling procedure is then the same as in the case of dial selection with the exception that the audible signal at the called station will operate as long as the key is depressed.

6.03 When the intercommunicating system involves more than 9 codes, a transfer circuit (Fig. 4) is required for each nine additional codes. For each such transfer circuit, a single digit "transfer" code, SW lead, must be assigned. The code so assigned cannot be used as a single digit station code. For example, if an installation has 36 intercommunicating stations, three transfer circuits are required. In the event that codes "2," "3," and "4" are assigned as transfer codes, station code assignments would be 5 through 0 (6 stations); 20 through 29 (10 stations); 30 through 39 (10 stations); and 40 through 49 (10 stations) for a total of 36 station code assignments. Each of the first six stations would be selected by a single pull of the dial; the remaining 30 would be selected by dialing two digits.

Audible Signals

6.04 Three methods of audible signaling are provided:

- Over T and R leads (Y option).
- Over separate signaling pairs (Z option).
- By a station common audible signal circuit (AA option).

This discussion of audible signaling presupposes that code selection is accomplished by use of a station dial.

6.05 In signaling over T and R leads, the dial pulses cause stepping of the rotary selector. Relay operation in the selector circuit places a ground signal on a C lead to the called stations' signaling circuit. Resultant relay operation in the common equipment of Fig. 6 causes ringing voltage to be impressed on the T and R leads of the called station; the ringer will operate for approximately 1-1/2 seconds under control of slow release T relay in the selector circuit. Only a one-pulse ring is received at the called station, and no ringing audible is heard by the calling station. To rering the called station, the calling party should hang up momentarily then repeat the station selection operation.

6.06 A separate signaling pair may be used where it is desirable to operate an audible signal at a called station using a different power supply than that normally furnished over the T and R leads.

6.07 Facilities may be provided for operation of a station common audible signal through the use of a common audible signaling circuit of an associated key telephone system.

Visual Signals

6.08 The 6A key telephone system provides busy visual signals to indicate when the system is in use. On pickup, the B1 relay of Fig. 6 operates and lights the busy lamps steadily at all associated stations. When the called station answers, the TB1 relay operates, taking over control of the

busy lamps at all idle stations and causing release of the B1 relay. The called and calling stations (while talking on primary link) now have their busy lamps lighted through their operated LS relays and the released B1 relay.

6.09 When a transfer operation from the primary to the secondary link takes place, the steady busy lamp is maintained at the calling and called stations under control of the associated LT relay. The busy lamps at all idle stations will be extinguished as they were under control of the TB1 relay which released when the transfer operation occurred.

6.10 A flashing visual signal is used to supplement the audible as an indication of an incoming call. To obtain flashing lamps, it will be necessary to utilize the flashing circuit of an associated 1A or 1A1 key telephone system, or to install a 19B key telephone unit (SD69286-01B9, Fig. 12). This flashing signal becomes a steady busy signal after the called station has answered. A time-out control option is provided under the control of B1 and TB2 relays which may be connected to and prevent the operation of the time-out feature of an associated Key Telephone System No. 1A or No. 1A1.

Busy Signal

6.11 A feature may be provided (Fig. 8) which will return a busy tone signal to the calling party to indicate that the called station is busy.

6.12 Line Seizure, 6.01, describes how a ground is placed on the called station's C lead. Should the selected station be busy on the secondary link, this ground will be connected to the BY lead. The BY relay (Fig. 8) operates, which activates a vibrator. The vibrator produces a steady busy tone which is interrupted by the associated flashing circuit. The interrupted tone is then returned to the calling station as a busy tone.

Camp-on

6.13 This is an optional feature which may be provided by use of the control circuit (Fig. 8). It allows a station to pick up, dial a code to select a station, and then, if busy tone is heard, wait or "camp on" the system until the called station is free to answer, or the system is free to take another call. Signaling key station selection prohibits this feature since the T relay of the selector circuit will not be held up after the signaling key is released.

6.14 When the selected station is busy on the secondary link (the primary is free for use), a calling station may camp on as follows: The ground signal used to operate the called station's LS relay will operate the BY relay under control of the called station's operated LS and LT relays. Relay BY will lock up and operate the camp-on control and tone signals as outlined in 6.11.

6.15 Stations, which are connected so that they are not automatically cut off, cannot camp on when both links are busy since, on pick up, they are connected to the busy primary talking link.

6.16 Conversely, stations which are arranged to be automatically cut off can camp on a busy system. When the system is busy, all busy lamps will be lit. A station wishing to camp on picks up and is connected to the selector circuit. The desired station code is dialed, and a signal ground is connected to the BY1 lead. The ground on this lead operates the BY1 and BY relays which hold the T relay of the selector circuit operated by means of a TC lead. This operation registers the dialed code. Operation of the BY relay starts the vibrator which furnishes the busy tone to the calling party and to any other station which may pick up, indicating that the system is being camped on.

6.17 Under the above described conditions of camp-on, the calling party automatically will cut through to the called station when the secondary link releases. If the primary link releases first, the busy lamps, with the exception of those associated with stations connected to the secondary link, will go out. The calling party will continue to camp on until the secondary link releases.

Talking

6.18 After the called station answers, talking battery will be furnished to the talking path from the TB1 or TB2 relays of Fig. 6, under control of the called station's LS relay. In a two link arrangement, if a station other than the called station responds to the audible and visual signal,

conversation is possible by talking battery being supplied from the A relay of the selector circuit.

6.19 With two talking link arrangements all talking paths are initially established on the primary link, but immediately transfer automatically to the secondary link if it is free. If the secondary link is busy when a talking connection is established on the primary link, the conversation will remain on the primary link until the secondary link becomes free and will then automatically transfer to the second link. A slight click may be heard during this transfer operation as a result of the change in the battery supply. After this transfer, the system will be free for another call.

Inward Conferencing

6.20 Provision has been made for the directing of an incoming central office or PBX call to an intercommunicating station. One incoming conference circuit (Fig. 10) must be provided for each central office or PBX line arranged for holding which is to be so directed. It is necessary that both the central office or PBX line and the 6A line appear on pickup keys at a directing station. This station must be able to place a hold on the central office or PBX line. In addition, a nonlocking-type signaling key must be provided to control the conferencing operation. This feature is known as "inward conferencing" and is accomplished as follows:

- The incoming call is picked up under control of an associated key telephone system or key equipment line circuit.
- After it is determined that a particular 6A system station (or stations) is desired, a hold is placed on the central office or PBX call.
- The intercommunicating station is then selected and signaled, and a local talking connection is established through regular intercommunicating operations.
- The outside call may now be included in the connection by operating the push button conferencing key.
- The control station may remain on the connection or disconnect, whichever is desired.

Preset Conference

6.21 This is a feature which enables an intercommunicating station to select a predetermined group of stations (maximum of six stations to each preset conference) by dialing a 1- or 2-digit code or by operating a signaling key.

6.22 A number of preset conference arrangements can be provided, and a single station can be included in one or more preset conference groups. A preset conference control (Fig. 5) is used to provide two preset conference arrangements.

6.23 The dialing of a predetermined code or the operation of a signaling key places a ground on a C lead, as described under Station Selection. This ground causes operation of relay equipment in the preset conference control (Fig. 5), resulting in the "grouping" of the C leads controlling the stations connected to the preset conference. All signaling circuit-control leads to the preset conference stations are thereby operated simultaneously. After the first conferenced station answers, signal lamps will flash at the involved stations until they all have answered. After all stations are on the line, the flashing lamps will become steady, serving as an indication that the called conference has been established.

6.24 Should some of the signaled stations be busy on the secondary link, the calling party will receive the busy signal, operated as described in 6.11, until the first station answers. As soon as all stations which are not busy have answered, the flashing lamp signal becomes a steady busy lamp.

Automatic Cutoff

6.25 A normally used option provides automatic cutoff to stations of the 6A key telephone system so that privacy of communication is established. Stations so wired cannot join an existing conversation which has been established over the primary link. Under this wiring option, operate battery for the LS relays of stations so arranged is under control of the B lead and B1 relay of Fig. 6. As soon as the called station answers, the B1 relay releases, opening the operate path for the LS relays of those stations which are to be excluded from the existing conversation. In this

way, control is exercised over these stations' LS relays, preventing their connection to the busy intercommunicating line.

6.26 By use of another wiring option, stations may be wired without automatic cutoff in order that stations so arranged may gain access to the busy primary link.

6.27 Automatic cutoff, in effect, is always provided on the secondary link since only those stations which are connected to the primary link at the time of a transfer from the primary to the secondary are transferred. Once this operation is completed, other stations, regardless of wiring option, cannot join those so connected.

Long Line Circuit

6.28 Connections between off-premise and local 6A system stations are made under the long line circuit control (Fig. 9). Any 2-wire line may be used for this connection which may be extended through conventional local plant long line circuits or toll circuits. Busy lamps usually are not provided at the off-premise station locations because of loop ranges and other considerations involved. The off-premise connection may terminate in a 1A or 1A1 key telephone system central office or PBX line circuit at the off-premise location to provide flashing lamps and common audible signals.

6.29 Circuit connection and station selection of an off-premise station are the same as described in 6.02 and 6.03. The ground which is placed on a C lead causes relay operation (Fig. 9) resulting in: (a) the opening of the transmission path between the off-premise and the local stations, (b) applying ringing voltage on the off-premise stations' T and R leads for approximately 1-1/2 seconds, (c) re-establishing the transmission path after the ringing period, and (d) supplying talking battery to the off-premise station.

6.30 When an off-premise station initiates a call, it is connected to the selector circuit under control of the R relay and is supplied talking battery through the windings of the P relay. The P relay also repeats dial pulses originated by the off-premise station.

Disconnecting:

6.31 From Primary Link - As each station disconnects, its associated L and LS relays release. The last station to release causes release of the TB1 relay, and the system now becomes available for another call, unless camped on.

6.32 From Secondary Link - As each station disconnects, its associated L, LS, and LT relays release. The last station to release causes the release of the TB2 and H relays. If the first link is busy, the conversation on it automatically transfers to the secondary link before the system will again be available to take another call.