

PRIVATE LINES

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## PRIVATE LINES

### 1. GENERAL

**1.01** This section has been issued to cover the circuits and connections used in private line terminations.

**1.02** A private line is a line without access to the exchange system, used for telephone communication between stations or order equipment on the same or different premises.

**1.03** Station instruments and associated subscriber sets, including transmitters, receivers, and induction coils, shall be the same as for an individual line station for the transmission zoning given on the service order. When local battery talking equipment is specified, provide battery feed filter and battery feed in accordance with standard practices for L.B.T. and C.B.S. stations as covered in Section 510-100-180.

**1.04** The following code letters shown after the code for a private line indicate the type of signaling provided on the line. The first letter is for the type of signaling to be provided at the originating end and the second for the type of signaling at the terminating end.

CODE	DESCRIPTION
R	Manual signaling — Ringing key or push button
W	Manual signaling — Hand generator
Y	Automatic Signaling Using local equipment
M	Automatic Signaling Using central office equipment (Upstate only)
U	No signaling

The following are examples of typical private line codes:

**PL RW** Private line with two-way manual signaling:  
     Originating End — Ringing Key or Push Button  
     Terminating End — Hand Generator

<b>CODE</b>	<b>DESCRIPTION</b>
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<b>PL MM</b>	Private line with two-way automatic signaling using <i>central office</i> equipment (Upstate only): Originating End — Automatic Signaling Terminating End — Automatic Signaling
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<b>PL YU</b>	Private line with one-way automatic signaling using <i>local</i> equipment: Originating End — Automatic Signaling Terminating End — No signaling
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### 2. BATTERY FEEDS AND RINGING SUPPLIES (GENERAL)

**2.01** There are two basic methods of providing a battery supply for private lines which are being used at the present time. One method uses a talking battery supply from the central office. The second utilizes a local battery supply at each station when a central office battery source is either not available or cannot be used for various reasons.

**2.02** There are two basic methods of providing a ringing supply. One method uses a supply from the central office. The second utilizes a local ringing supply obtained from a frequency converter or subcycle generator at each station when a central office supply is either not available or cannot be used for various reasons. The subcycle generator or frequency converter contains equipment to produce 20 or 30 cycle ringing current.

### 3. CENTRAL OFFICE BATTERY FEED AND RINGING SUPPLY CONNECTIONS

**3.01** Where a 24 volt battery supply is available in the central office, figures 1 and 2 may be used as private line battery sources. Figure 1 ("X" wiring) and figure 2 cover the cases in which battery is fed in both directions

from the central office. Figure 1 ("Y" wiring) illustrates a method of feeding battery in one direction only from the central office, the other side being connected to another central office battery source or to a station having a local battery feed.

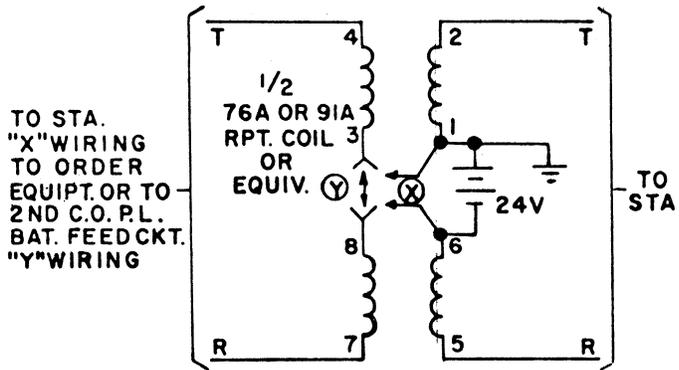


Fig. 1 - 24V - P.L.C.O. Battery Feed

Note: Fig. 1 is a composite of Figures 1 & 2 of SD-96166-01.

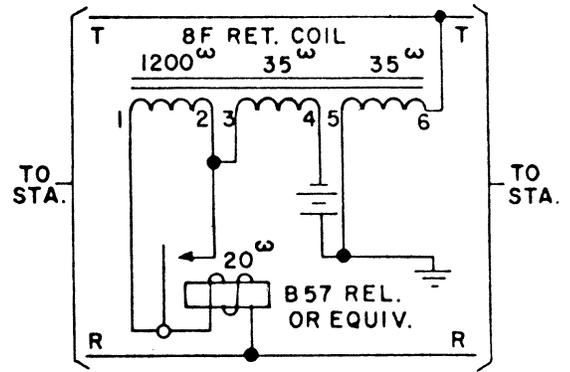


Fig. 2 - 24V - P.L.C.O. Battery Feed

3.02 Where only 48 volt central office battery is available, figure 3 may be used as a private line battery source. "Y" wiring and apparatus provides battery in both directions from the central office. "X" wiring will be used to feed battery in one direction only, the other side being connected to another central office battery source or to a station having a local battery feed. "Z" wiring and apparatus may be provided where lighting protection is required.

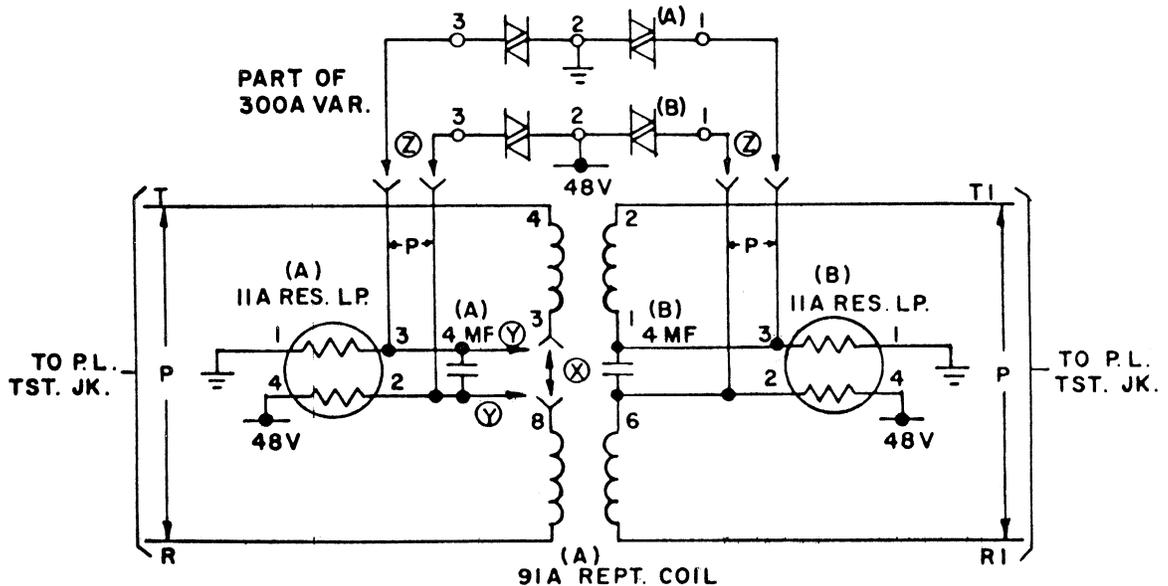


Fig. 3 - 48V - P.L. - C.O. Battery Feed

Note: Drawn from N.Y.Tel.Co. drawing MST-90647.

3.03 Where it is desirable to reduce a 48 volt battery supply to 24 volts to supply a number of 24 volt P.L. circuits a Lorain Bat-Tap, model QB15A may be used. This equipment requires an input of 8 amperes, 44-52 volts D.C. to furnish an output of 15 amperes, 21-27 volts D.C.

3.04 Unless otherwise specified on the service order, furnish power generator feed for signaling and connect ringing keys as specified

below. Provide ringers in accordance with standard practices for individual lines.

3.05 Where an individual private line station is desired, connect as shown in Figure 4 or 5.

3.06 Where two stations are desired on a private line connect as shown in Figure 6 or 7.

P.L. — One Station

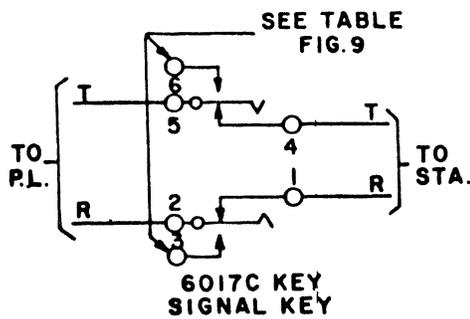


Fig. 4

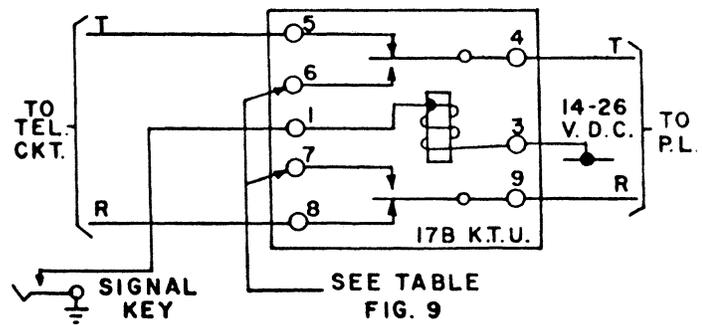


Fig. 5

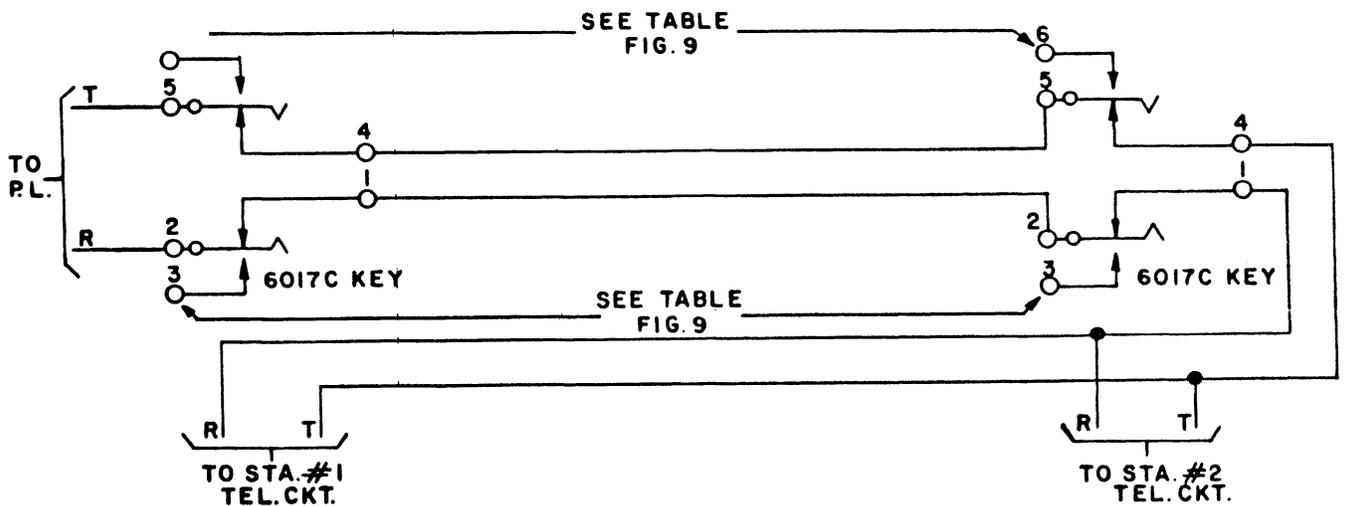


Fig. 6 — (Code R) P.L. — Two Stations

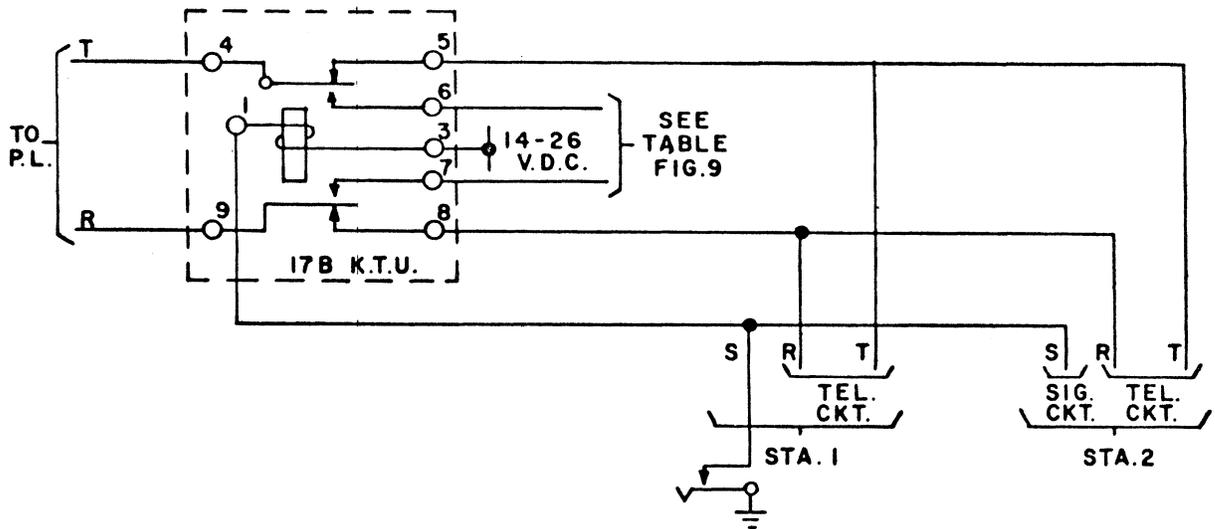


Fig. 7 - (Code R) P.L. - Two Stations

3.07 Where three or more stations are desired on a private line, install a 17B K.T.U. and connect as shown in Figure 8.

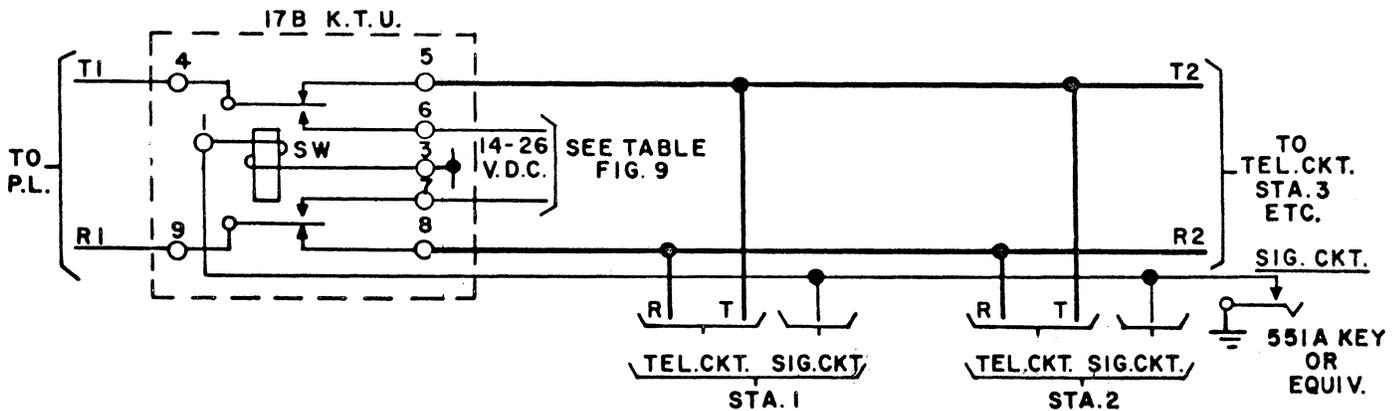


Fig. 8 - (Code R) P.L. - Three or More Stations

3.08 Signaling generator connections for Figures 4 to 8 are shown in the following table. Connections are determined by the type

of central office battery feed (Figure 1, 2 or 3) being used.

TYPE OF C.O. — P.L. BAT. FEED	CONNECTION OF GEN. FEED			
	FIGURE 4-6		FIGURE 5-7-8	
	CONNECT		CONNECT	
	GEN.	GRD.	GEN.	GRD.
Figure 1	Term. 6		Term. 6	
Figure 2	Term. 3		Term. 7	
Figure 3	Term. 6		Term. 6	

Fig. 9 - Wiring of Generator Supply When a Figure 1, 2 or 3 C.O. Battery Supply Is Used

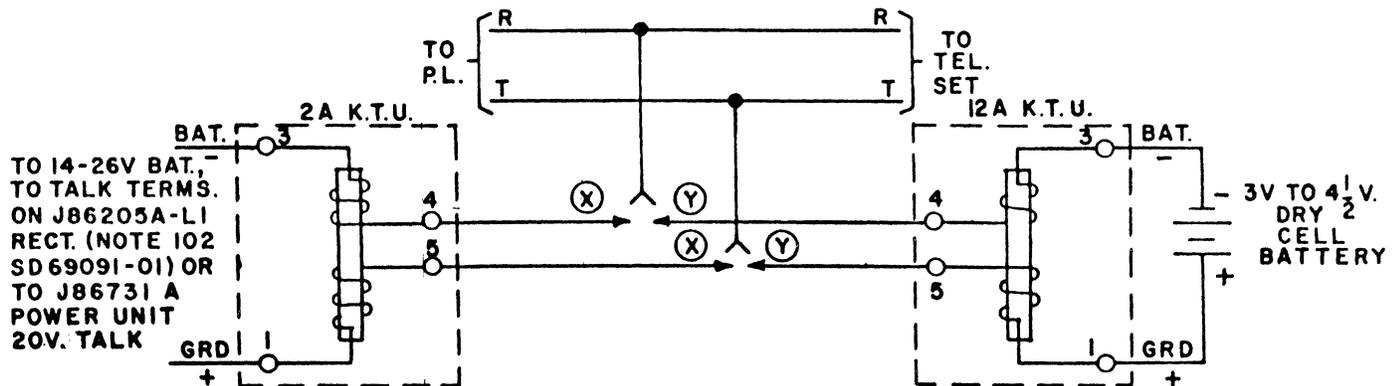


Fig. 10 - (Code U) P.L. - Connections on Premises

#### 4. BATTERY FEED AT STATION

4.01 Local battery sources may consist of dry cells, P.B.X. or individual batteries, rectifiers or a battery feeder from the central office depending on the conditions encountered and the equipment being used. For the various types of power supply arrangements see appropriate Bell System Practices.

4.02 An additional Lorain power unit has been made available (coded RT6). This power unit is capable of providing .4 ampere of filtered D.C., two 10 volt, 60 cycle 1.5 ampere supplies (may be connected in series to supply 20 volts) and a 120 volt, 30 cycle A.C., .020 ampere supply. The 30 cycle source may be used as a ringing supply.

4.03 Where a private line terminates in non-key stations *only*, with all stations located on the same premises, the simple connections shown in Figure 10 (intercommunicating line) may be provided. A separate button and buzzer system must be provided for signaling. When busy signal is required use a 31A K.T.U. in place of 2A K.T.U.

4.04 Figure 11 shows a private line arrangement with ringdown signaling and busy lamp.

The circuit operates as follows:

#### Incoming Call

Generator from the distant station operates the station ringer.

When the called station removes the receiver from the hook, battery through the windings of the (BF) relay of the 31A K.T.U. and the station bridge operates the (BF) relay. The (BF) relay completes the path for lighting the busy lamp, provides a ground for the operation of the (TO) relay in the time-out circuit, (to prevent timing out of incoming calls on the same system) and cuts through the TIP and RING of the station to the TIP and RING of the private line.

The station may now converse, using a local battery feed. The station and line are coupled together through the (T) and (R) capacitors.

When the station hangs up the (BF) relay restores extinguishing the busy lamp, restoring the (TO) relay and returning the circuit to normal.

#### Outgoing Call

The station signal key is operated momentarily, operating the (PL) relay in the 7A K.T.U. which applies ringing current to the outgoing line signaling the distant station. From this point, the same operations take place as when the station answered an incoming call.

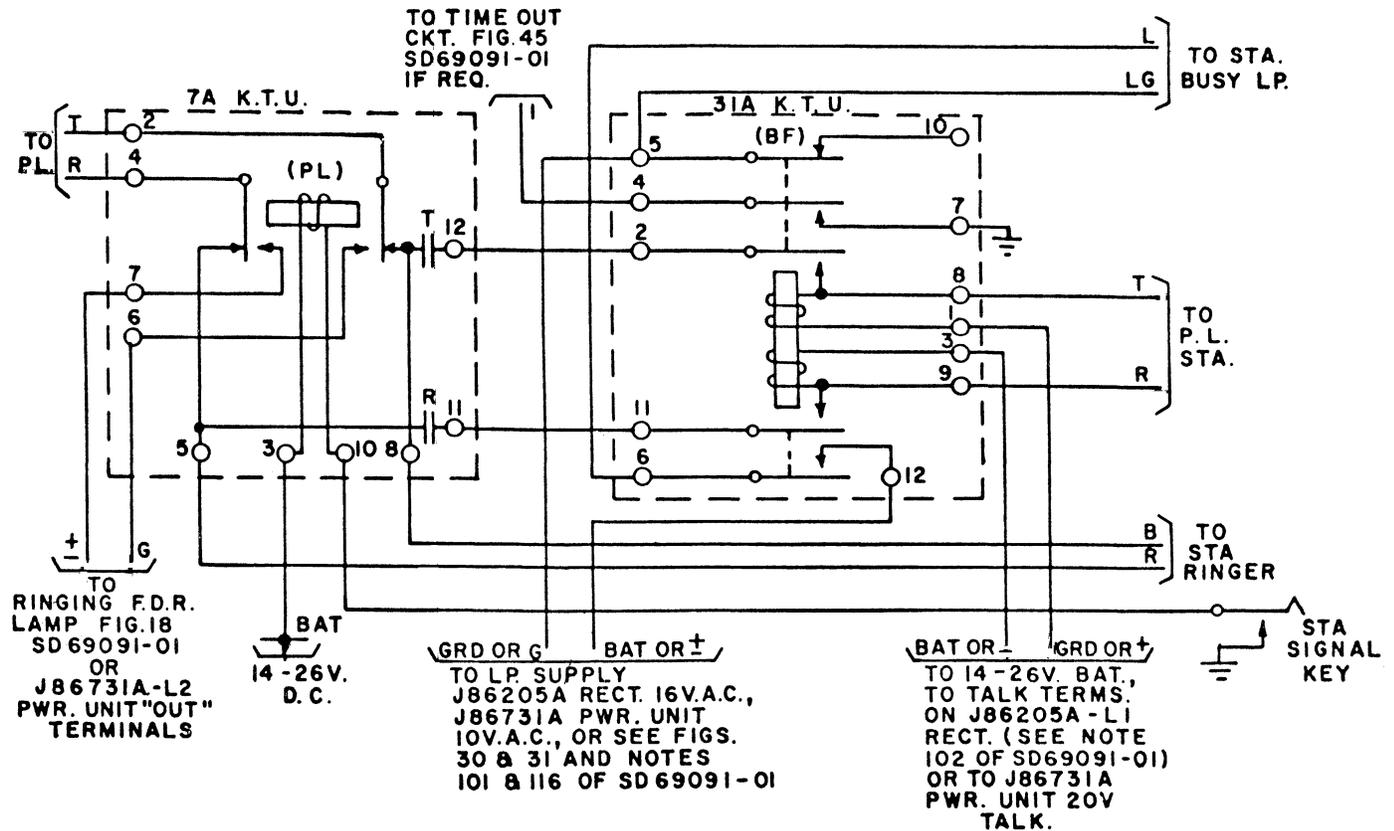


Fig. 11 - (Code R) P.L. - Ringdown Signaling With Busy Lamp (Time Out Control)

4.05 When local battery is used for talking and locked in line lamps are desired, Figure 12 may be used.

Operation is as follows:

#### Incoming Call

Ringing current from the distant station operates the (R) relay in the 14A K.T.U. Operation of the (R) relay lights the station line lamp and locks up the (R) relay in series with the (L1) relay winding of the 5A K.T.U. (operating the (L1) relay) and under control of operated (R) relay contacts, normal (BF) relay contacts and the thermal contacts in the 30A K.T.U. Operating the (L1) relay starts the heating of the thermal resistance in the 30A K.T.U. and operates the audible signal at the called station.

When the called party answers, battery through the windings of the (BF) relay in the 31A K.T.U. operates the (BF) relay. When the (BF) relay operates, it opens up the locking

path of the (R) and (L1) relays which extinguishes the line lamp, stops the audible signal, and the heating of the resistance in the time-out relay. The operated (BF) relay also operates the (TO) relay in the 30A K.T.U. (preventing incoming calls on the same system from being timed out) and cuts through the TIP and RING of the station to the TIP and RING of the private line. The stations may now converse using local battery. The (T) and (R) capacitors in the 7A K.T.U. couple the station line to the private line and prevent battery from going out on the line.

When the called station hangs up the (BF) and (TO) relays restore, returning the circuit to normal.

#### Outgoing Call

The calling station momentarily operates the signal key which operates the (PL) relay in the 7A K.T.U. sending ringing current out on the line, signaling the distant station.

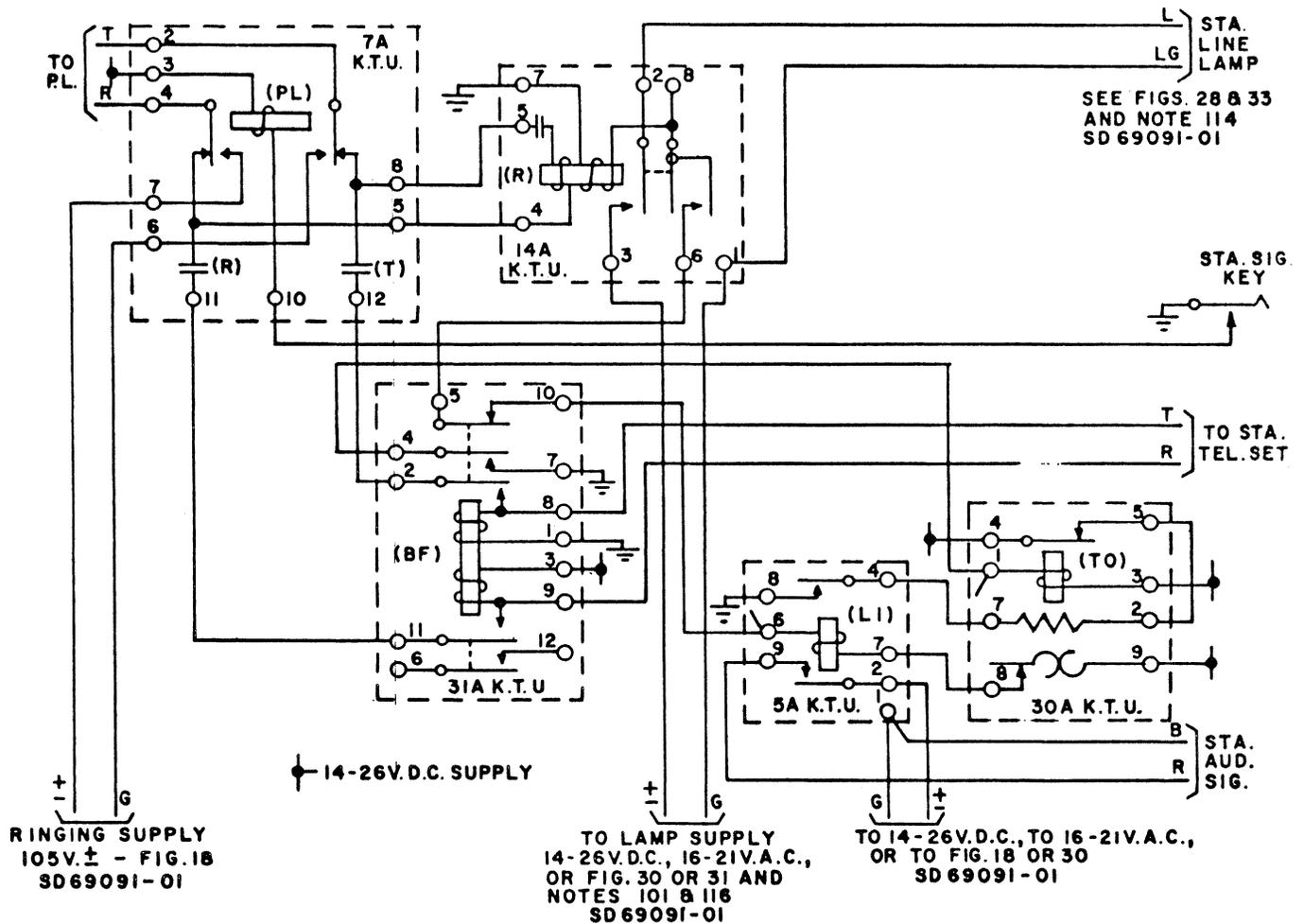


Fig. 12 - (Code R) P.L. - Ringdown Signaling With Locked-in Line Lamp

The calling party removes the receiver from the hook allowing battery through the (BF) relay windings and the station bridge to operate the (BF) relay. The (BF) relay operates the (TO) relay (which prevents the timing out of any incoming calls on the same system) and cuts through the station TIP and RING to the private line TIP and RING. The stations may converse as soon as the called party answers, using local battery for talking.

When the calling station hangs up the (BF) and (TO) relays restore, returning the circuit to normal.

4.06 Figure 13 may be used when ringdown signaling, local battery talking and combined line and busy lamps are required.

Operation is as follows:

#### Incoming Call

Ringdown current from the distant station operates the (R) relay of the 15D K.T.U. When the (R) relay operates, it locks up under control of the normal contacts of the (BF) relay in the 31A K.T.U. and the thermal contacts in the 30A K.T.U. (time-out relay). The operated (R) relay also starts the heating of the thermal resistance

in the 30A K.T.U., operates the (B) relay in the 19B K.T.U., (flashing unit) closes through the line lamp supply to the (B) relay in the flashing unit and operates the steady audible signal. When the (B) relay in the flashing circuit operates, it lights the line lamp and operates the (A) relay in the 19B K.T.U. When the (A) relay operates, it restores the (B) relay and extinguishes the line lamp. The operation and restoral of the (B) and (A) relays cause the line lamp to flash.

When the called party answers battery through the windings of the (BF) relay in the 31A K.T.U. and the station bridge operates the (BF) relay. Operation of the (BF) relay restores the (R) relay, operates the (TO) relay in the 30A K.T.U., (to prevent timing out of incoming calls on the same system) lights the steady busy lamp and closes through the TIP and RING of the station to the TIP and RING of the line. Restoral of the (R) relay stops the heating of the thermal resistance and the audible signal, restores the (B) relay of the flashing circuit and removes the lamp supply from the (B) relay contact. The stations may now converse using local battery for talking. The (T) and (R) capacitors couple the station to the private line and prevent the battery from going out on the line.

When the called party hangs up the (BF) relay restores, extinguishing the busy lamp and restoring the (TO) relay, returning the circuit to normal.

#### Outgoing Call

The calling station momentarily operates the signal key, operating the (PL) relay in the 7A K.T.U. Operation of the (PL) relay applies ringing current to the outgoing line, signaling the distant station.

The calling station removes the receiver from the hook allowing battery through the (BF) relay windings and the station bridge to operate the (BF) relay. The (BF) relay operates the busy lamp, the (TO) relay, (to prevent timing out of incoming calls on the same system) and cuts through the TIP and RING of the station to the TIP and RING of the private line. When the called party answers, the stations may converse using local battery for talking.

When the calling party hangs up the (BF) relay restores causing the busy lamp to be extinguished and the (TO) relay to restore returning the circuit to normal.

4.07 Where a private line is being added to a 1A key telephone system using the 50 type key equipment and push button signaling is desired, Figure 3 of SD-69136-01 may be used.

4.08 Where a 1A1 key telephone system is involved and a push button signaling private line is desired, Figure 3 of SD-69203-01 may be used.

4.09 Where an on premises or short loop private line (intercommunicating circuits) with 2-way automatic signaling and combined line and busy lamps is desired, Figure 14 may be used. This circuit would not be used on long loops since it requires three pairs to each station.

#### Operation is as follows:

When station (A) removes the receiver from the hook, battery through the (A1) relay windings and the (A) station bridge operates the (A1) relay. Operation of the (A1) relay lights the busy lamp at station (A), starts the flashing circuit, provides a flashing line lamp and audible signal at station (B) and cuts through the TIP and RING conductors to the (B1) relay.

When station (B) answers by removing the receiver from the hook, battery through the (B1) relay windings and the (B) station bridge operates the (B1) relay. Operation of the (B1) relay stops the flashing line lamp and audible signal at station (B), lights the busy lamp at station (B) and cuts through the TIP and RING conductors of the line to station (B). The stations may then converse using local battery supplied through the (A1) and (B1) relay windings.

If either station disconnects, nothing happens since either station bridge will keep the (A1) and (B1) relays operated. When both stations hang up the (A1) and (B1) relays will restore extinguishing the busy lamps and returning the circuit to normal.

Station (B) originating a call would produce the same results only at the opposite station.

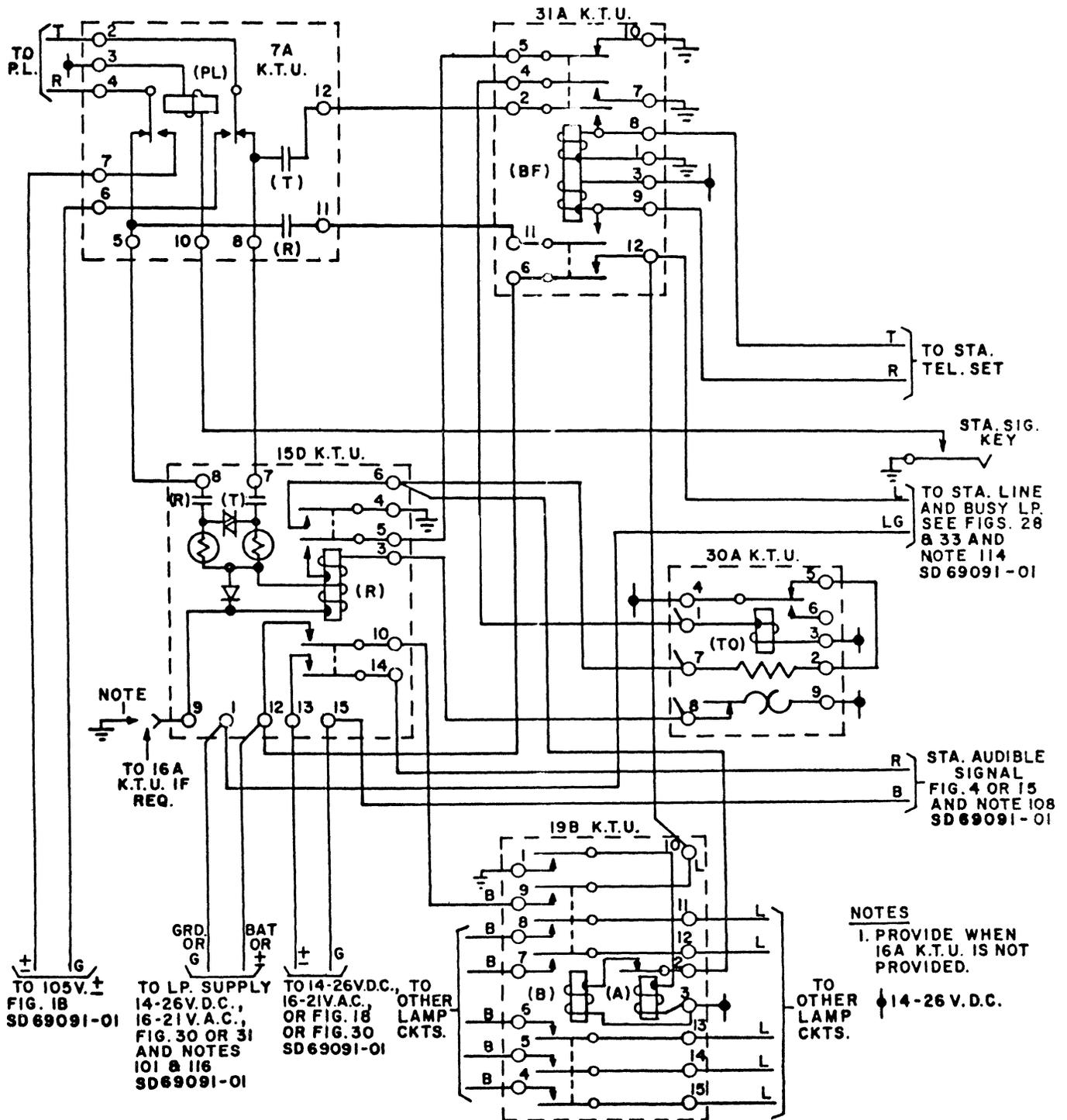


Fig. 13 - (Code R) P.L. - Ringdown Signaling and Line and Busy Lamp

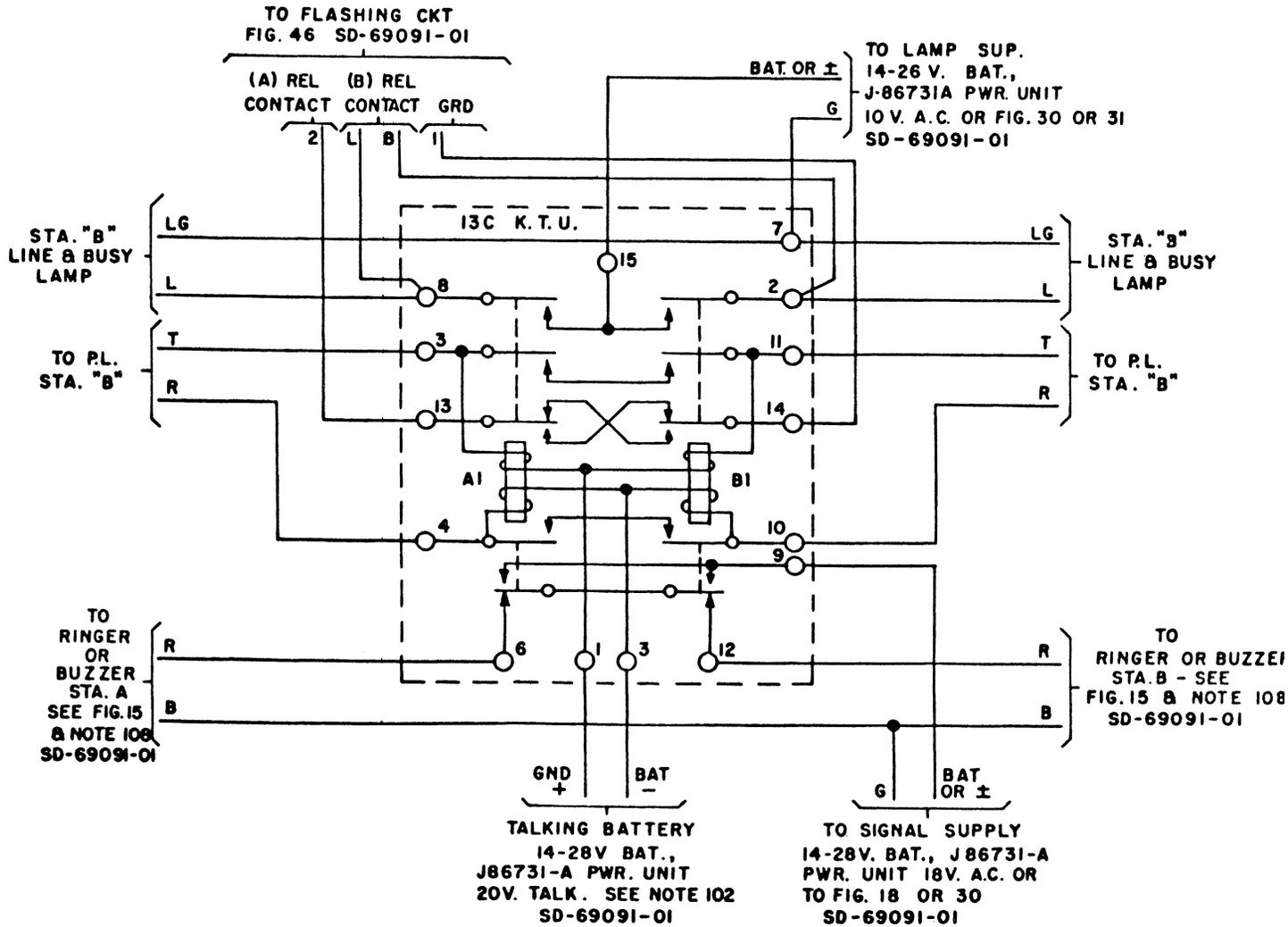


Fig. 14 - (Code Y) P.L. - 2-Way Automatic Signaling With Combined Line and Busy Lamps

4.10 Where it is necessary for any reason to provide a hand generator for signaling, Figure 15 may be used. Use "X" wiring and apparatus if a 14-26 volt D.C. supply is available from a battery or rectifier. "Y" wiring and apparatus may be used where dry cells are required.

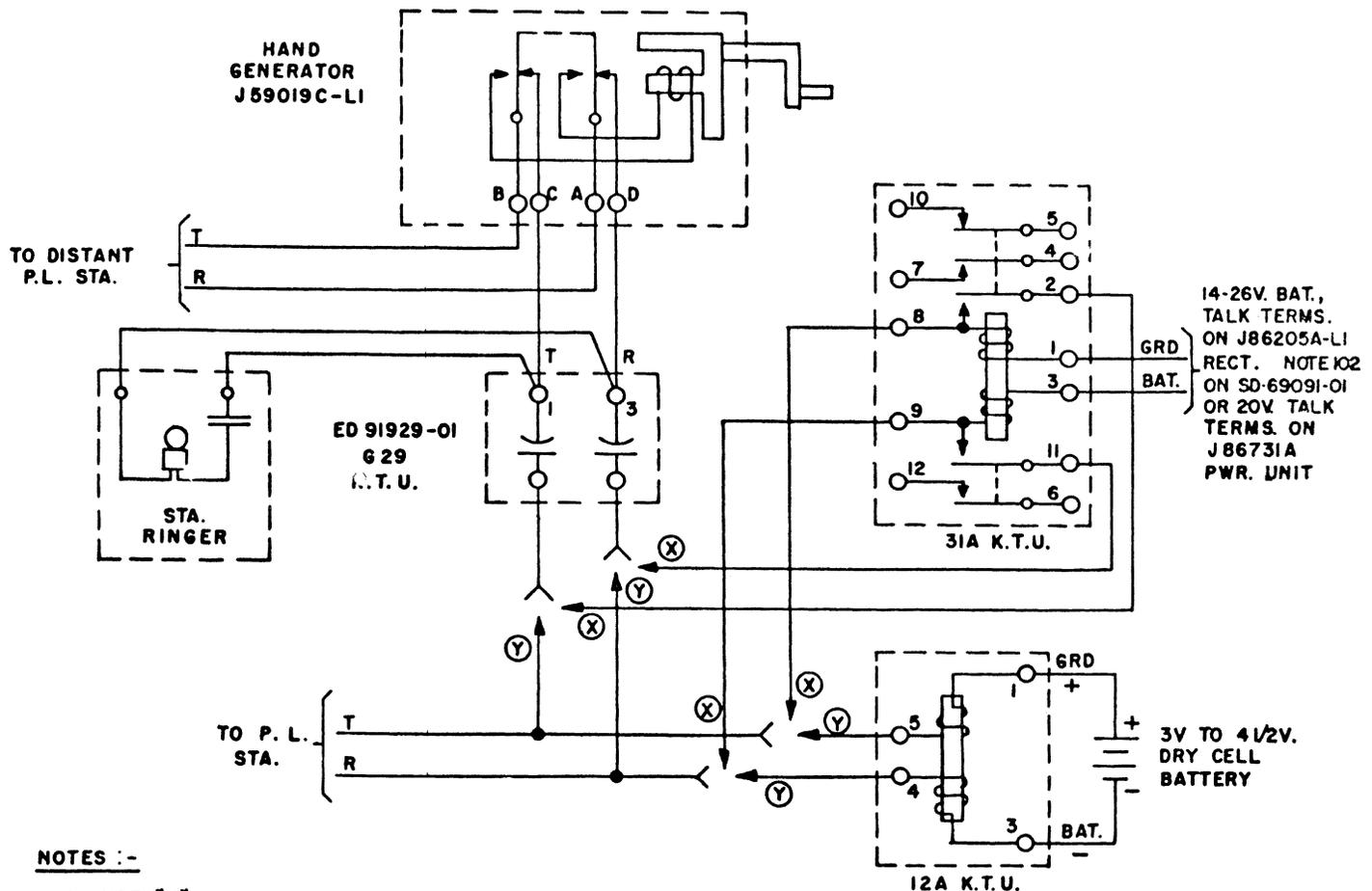
4.11 Where it is necessary to provide a hand generator for signaling and a locked in line lamp and busy lamp is desired, Figure 16 may be used.

Operation is as follows:

**Incoming Call**

Ringling current from the distant station operates the (R) relay in the 14A K.T.U. and the station ringer. The operated (R) relay locks up under control of the (BF) relay of the 31A K.T.U. and lights the line lamp, signaling the called station.

When the station receiver is removed from its hook, battery through the windings of the (BF) relay and the station bridge operates the (BF) relay. The operated (BF) relay restores the (R) relay (extinguishing the line lamp) and



**NOTES :-**

- I. USE "X" WIRING AND APP. WHEN 14-26 V. D.C. OR RECT. SUPPLY IS AVAILABLE.  
USE "X" WIRING AND APPARATUS WHEN 14-26V. D.C. IS NOT AVAILABLE.

**Fig. 15 - (Code W) P.L. - Hand Generator Signaling**

lights the busy lamp. The stations now converse using a local battery source. The station is coupled to the line through the (T) and (R) capacitors of the ED-91929-01, G29 K.T.U. and the contacts of the (BF) relays.

When the P.L. station hangs up the (BF) relay restores, extinguishing the busy lamp and restoring the circuit to normal.

**Outgoing Call**

The hand generator is operated sending ringing current out over the line. (Generator contacts close as generator is operated.)

When the station receiver is removed from the hook, battery through the windings of the (BF) relay, lighting the busy station bridge, operates the (BF) relay, lighting the busy lamp. The stations may now converse using a local battery source.

When the private line station hangs up the (BF) relay restores, extinguishing the busy lamps, returning the circuit to normal.

**4.12** In order to eliminate the necessity of providing a hand generator at each station of a private line, (where it is desired to

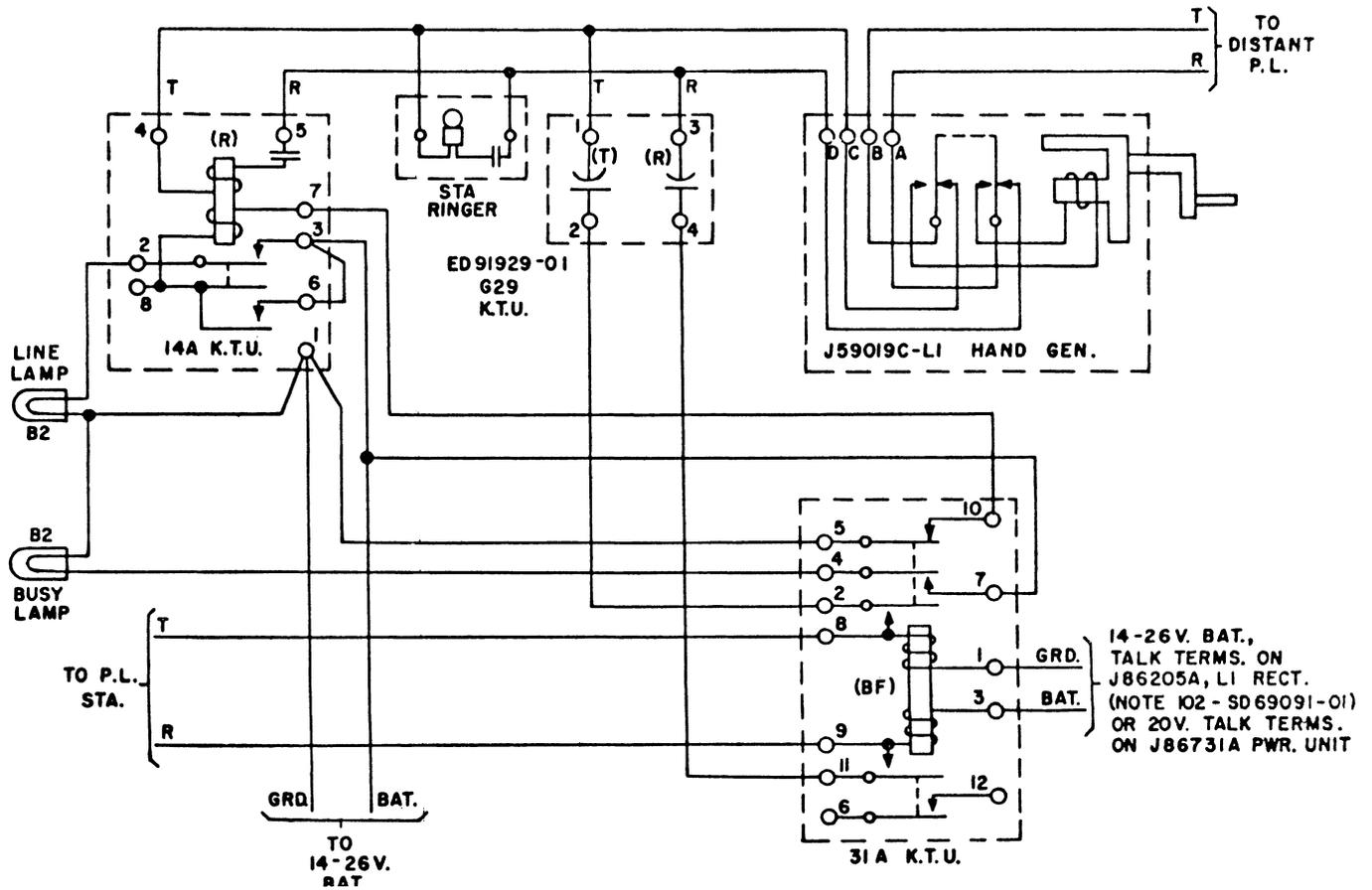


Fig. 16 - (Code W) P.L. - Hand Generator Signaling With Line and Busy Lamps

use a ringing generator at one station only) Figure 17 may be used.

Operation is as follows:

**Incoming Call**

A coded ring will operate all station ringers on the system, the proper party will remove the receiver from the hook. Battery through the 12A K.T.U. windings, the *two windings* of the (G1) relay and the station bridge provide talking battery for the station but do not operate the (G1) relay since it is differentially wound. Stations disconnect by hanging up.

**Outgoing Call**

The station operates the ringing key. This places a ground on the ring side of the private line allowing battery to flow through one wind-

ing of the 12A K.T.U. and one winding of the (G1) relay. This causes the (G1) relay to operate since only one winding of the differentially wound relay is energized. The (G1) relay operates the (SW) relay in the 17B K.T.U. which applies generator to the tip side of the private line causing all the ringers at the private line stations to operate. Code ringing must be used if there are more than two stations on the private line. Restoral of the ringing key restores the (G1) relay which restores the (SW) relay returning the circuit to normal.

The stations may now converse using the battery supply from the 12A K.T.U. and through the *two* windings of the (G1) relay which does not operate.

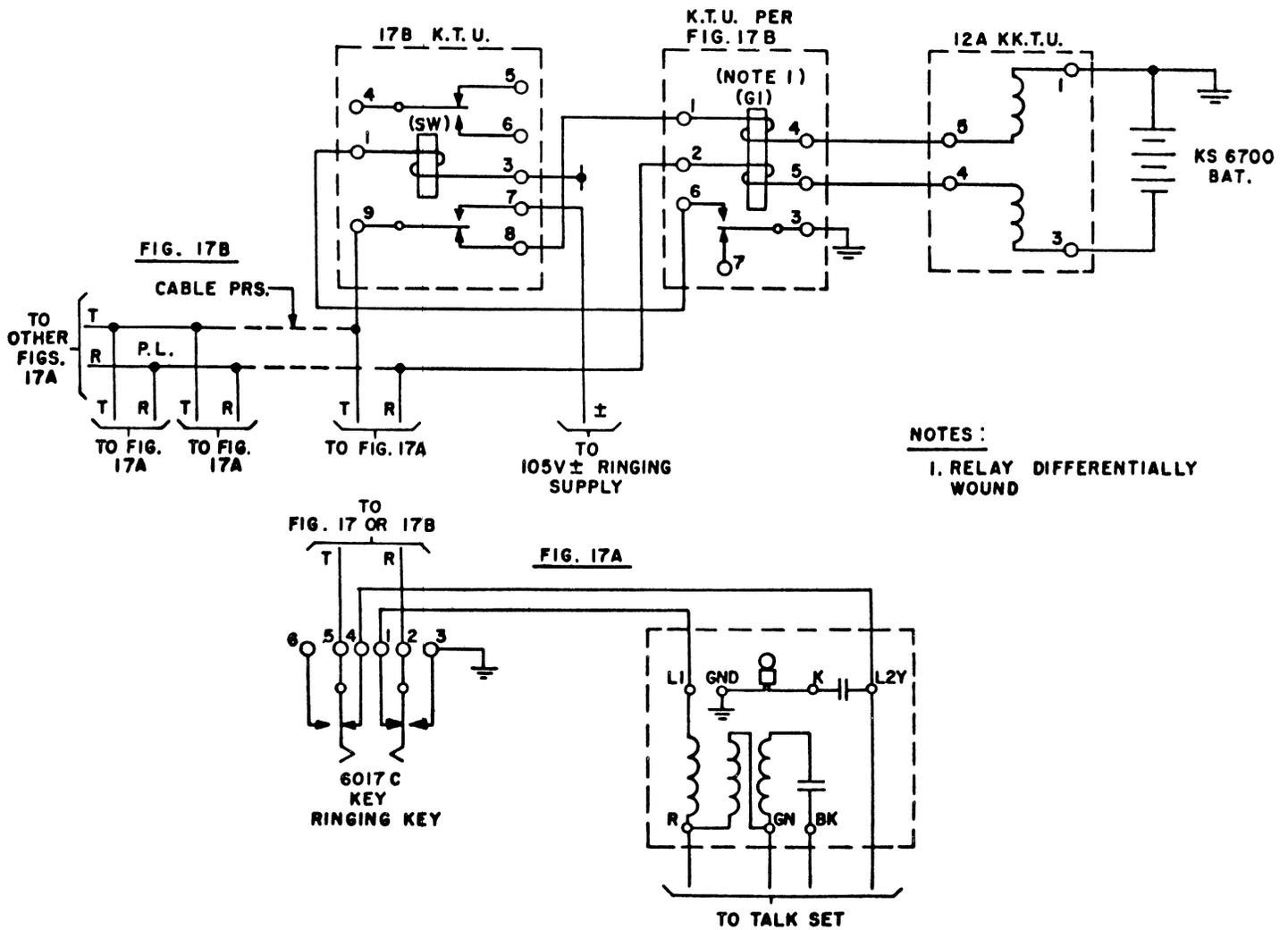
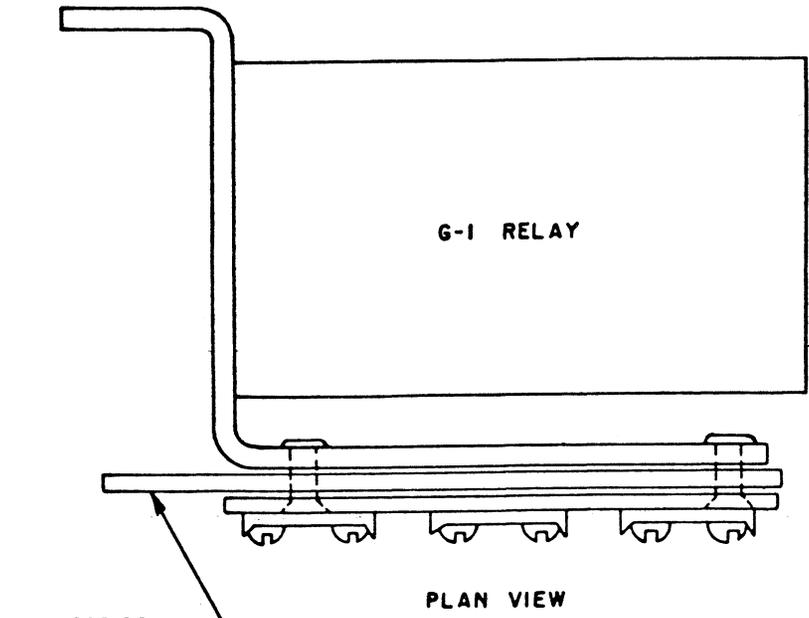


Fig. 17 - (Code R) P.L. - Requiring Ringing Current at One Station Only



P265190  
UNIT ASSEMBLY

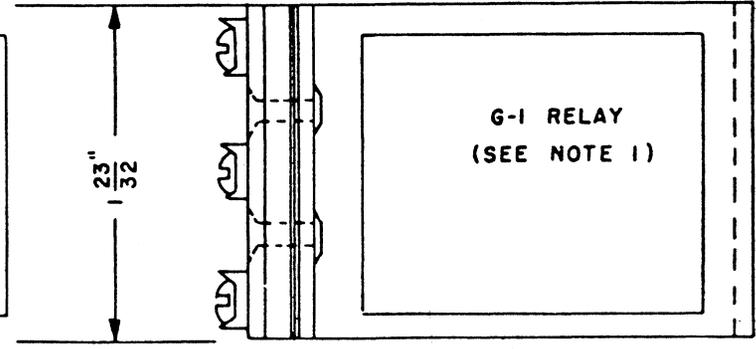
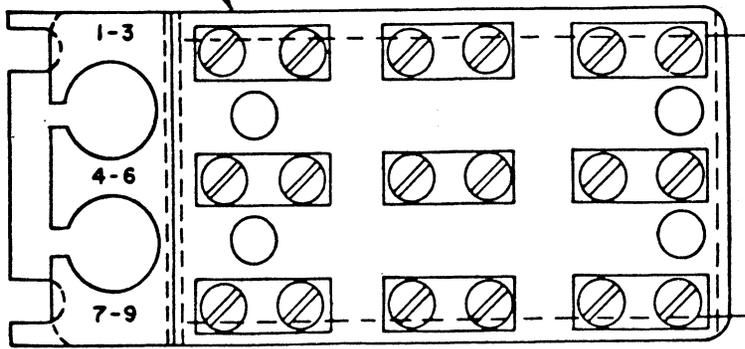


FIG. 1  
APPARATUS

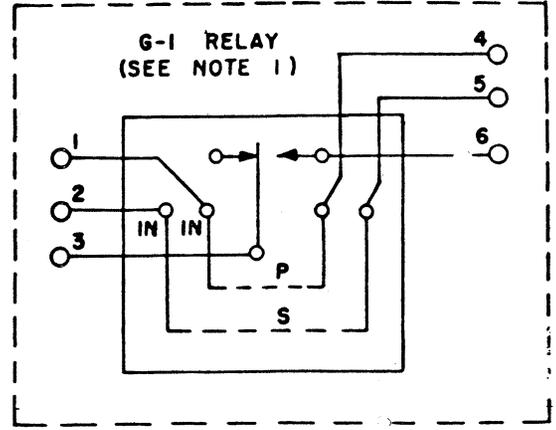


FIG. 2  
WIRING

NOTES:  
I. DO NOT SUBSTITUTE

Fig. 17B - G1 Relay Assembly

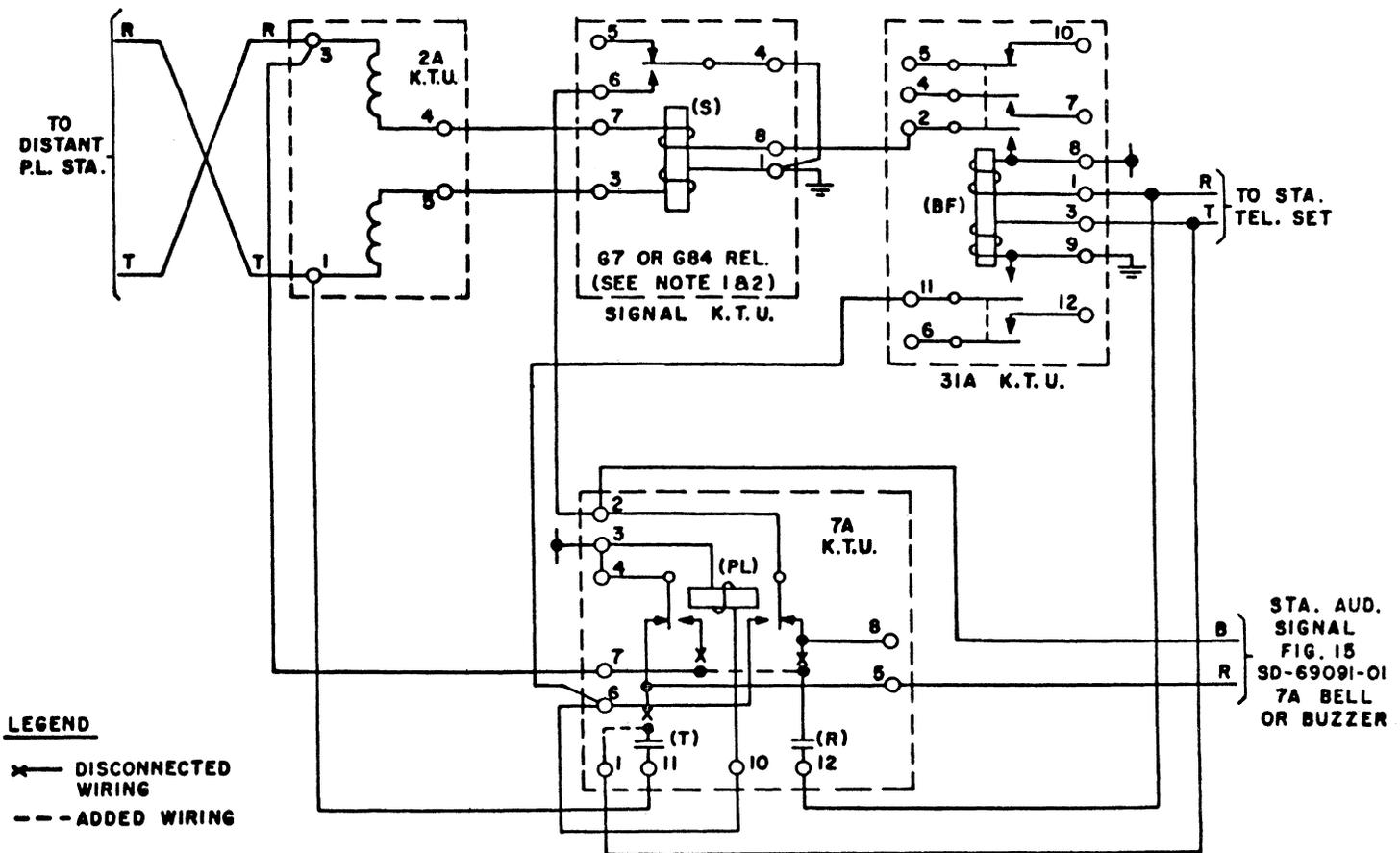
4.13 When automatic signaling is required, Figure 18 may be used. Signaling is accomplished by removing the receiver from the hook. Identical equipment is used at either end. Operation is as follows:

**Originating a Call**

When the station removes the receiver from the hook, battery through the windings of the (BF) relay in the 31A K.T.U. and the station

bridge operates the (BF) relay. The (BF) relay operates the (PL) relay in the 7A K.T.U. and applies battery to one winding of the (S) relay of the signal K.T.U. which will cause it to operate to ground through one winding of the (S) relay at the distant station which also operates.

The operation of the (S) relay at the distant station closes a circuit for operating the buzzer or bell. The operation of the (S) relay at the originating end does not operate its cor-



**NOTES:-**

1. PROVIDE PER UNIT ASSEMBLY P-265190 DRILLED AND EQUIPPED FOR G84 OR G7 RELAY IN POSITION 12 SURFACE WIRED PER ED-69101-01 AND WIRED AS SHOWN.
2. CIRCUIT SHOULD OPERATE OVER A LOOP OF 2000 OHMS WHEN EQUIPPED WITH A G84 RELAY OR A LOOP OF 3800 OHMS WHEN EQUIPPED WITH A G7 RELAY WITH 14V. MINIMUM AND ZERO GROUND POTENTIAL.

14-26 V. D.C.

**Fig. 18 - (Code \*-Special Assembly) P.L. - Automatic Signaling (Use the same equipment at both stations for compatibility)**

responding bell or buzzer since the operating path of this signal is opened by the operation of the associated (PL) relay which locks up under control of the operated (S) relay.

When the distant station answers by removing the receiver from the hook its (BF) relay operates and closes a circuit through the other winding of both (S) relays and operates the called station (PL) relay which locks up under control of the (S) relay. The (PL) relay opens up the operating path of the buzzer or bell, silencing the signal.

The stations may now converse using a local battery feed. The stations are coupled to the line through the (T) and (R) condensers in the 7A K.T.U.

The signals at both ends will remain silent until both stations have hung up. As long as one station has its receiver off the hook both (S) relays remain operated and hold their associated (PL) relays operated. After both stations have hung up all relays restore to normal and either station may again signal by removing their receiver from its hook.

**4.14** Where a private line is being added to a 1A key telephone system using the 50 type key equipment and automatic signaling is required, Figure 2 of SD-69136-01 may be used.

**4.15** Where a 1A1 key telephone system is involved and an automatic signaling tie line is desired, Figure 2 of SD-69203-01 may be used.

**4.16** Where a private line is being added to a 1A key telephone system using the 50 type key equipment and the distant end is to terminate in a non-key station, Figure 4 of SD-69136-01 may be used. This circuit will signal automatically when the non-key station lifts the receiver from the hook. Signaling of the non-key station is accomplished by key signaling with ringing current. Battery for the non-key station is provided from the Figure 4 equipment.

**4.17** Where a 1A1 key telephone system is involved and one station is a non-key station, Figure 4 of SD-69203-01 may be used. The non-key station signals automatically by removing the receiver from the hook. Signaling of the non-key station is accomplished by key signaling with ringing current. Battery for the non-key station is provided from the Figure 4 equipment.

**4.18** Where a private line terminates in equipment such as 101A key, 200 line order turrets, order tables, etc., the private line terminating equipment for the particular equipment involved will be employed. Inasmuch as this equipment is generally installed on a special installation basis, these circuits will not be included in this practice.