

NO. 2 AND 9B TELEGRAPH SERVICEBOARDS DIRECT-LEG ARRANGEMENTS

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1. GENERAL

1.01 This section describes the direct-leg features of the No. 2 and 9B telegraph serviceboards. It supplements Section 666-101-100 for the No. 2 telegraph serviceboard and Section 666-102-100 for the No. 9 telegraph serviceboard.

These features have been made available to supplement the hub circuit arrangements which were originally provided for interconnecting the legs of networks at the serviceboard. Direct-leg arrangements require less equipment than do hub circuits. This provides a more economical way of interconnecting these circuits, but some loss in operating efficiency will be experienced due to the variety of interconnecting arrangements which must be considered when carrying out testing operations.

1.02 This section is reissued to delete reference to TWX. Since this section covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The overall plan for the improved serviceboard provides for the termination of 2-leg networks on a direct-leg basis, employing the conventional balanced loop (or neutral) principle of telegraph transmission. Direct-leg connections will apply to all full and half duplex private line terminal and through circuits, with the exception of those requiring regeneration, and through circuits employing 43A1 channel terminals. Two-leg networks requiring regeneration, through circuits involving 43A1 channel terminals, and all networks which include three or more legs will continue to be served on a hub circuit basis.

1.04 With the original hub circuit arrangements, the legs of all line or loop facilities were terminated in the service position. The facility position of the serviceboard served primarily as a lineboard and included line and loop jacks which provided for patches between the line conductors and the line repeaters and between the loop conductors and the loop repeaters, respectively.

1.05 Direct-leg arrangements are administered entirely at a facility position. The associated line and loop repeaters have no appearances at service positions. All relay-type line repeaters terminate in jacks in the facility position, where they are cross-connected or patched for either hub or direct-leg operation. For hub operation, the repeater is connected to a 144A1 coupling unit which is terminated in a service position. For direct-leg operation, the repeater is connected to a relay-type conversion repeater which connects via loop and equipment jacks at the facility position to the loop conductors for terminal operation. When a break feature is not important, the conversion repeater is a 13H1 loop repeater which includes a polar relay and is suitable for half or full duplex operation. When a break feature is desired, a 2-relay conversion repeater (90C1 loop repeater) is employed. Two relay-type line repeaters may be interconnected at a facility position for through

operation on a direct-leg basis. In order to arrange relay-type line repeaters so that they will serve hub or direct-leg circuits, the full duplex repeater termination heretofore employed for hub circuit operation has been retained.

1.06 A new feature has been added to relay-type line repeaters terminated in the facility board. This feature causes a space to be transmitted outward whenever the repeater is disconnected from the associated 144A1 coupling unit or direct-leg circuit. The new feature causes a spacing current of about 1 milliamperes to flow through the send relay windings at all times.

1.07 Two types of channel terminals are available. For hub applications, 43A1 channel terminals per SD-70552-01 (Fig. W) are employed and for direct-leg service, the neutral arrangement per SD-70552-01 (Fig. A) is used. These channel terminals may not be converted from one type to the other. Therefore, the required number of each type must be provided, with allowance for spares. The legs of 43A1 channel terminals which are arranged for hub operation terminate directly in a service position or, via line and equipment jacks, in a direct-leg facility position, which provides means for making substitutions at a facility position. Those arranged for direct-leg operation terminate in a facility position. Whenever through operation or regeneration is required in conjunction with 43A1 legs, the network is established on a hub circuit basis at a service position.

1.08 An attendant at a facility position communicates or tests over lines or loops by means of a communication direct-leg teletypewriter cord circuit, which is a cord-terminated circuit appearing in the keyshelf of the board and which connects to the leg and equipment jacks. This cord circuit provides means for splitting the line and loop circuits, and terminates the side to which transmission is not directed. A monitoring lamp responds to signals from the terminated circuit. Access to the position teletypewriter and TMS is provided. In addition to communication over the facility, the cord circuit provides means for the connection of a test signal cord circuit for transmitting test signals.

1.09 A direct-leg monitoring circuit serves private line direct-leg circuits. It is a cord-terminated circuit and connects to the leg and equipment jacks. In addition to its monitor-

ing functions, it indicates the direction of transmission. Access to the TMS for transmission measurements is provided.

2. DESCRIPTION OF CIRCUIT ARRANGEMENTS

2.01 Figs. 1 through 13 show in schematic form the various ways in which line repeaters having relay-type outputs, such as 40C1 channel terminals and those of the electronic type such as 43A1 channel terminals, are terminated in a facility position for direct-leg service.

A. Circuits Employing Relay-type Line Repeaters

2.02 Figs. 1 through 5 show the manner of terminating relay-type line repeaters for private line direct-leg service. The repeater legs are connected to leg and equipment jacks which may be assigned either to a 144A1 coupling unit for hub operation (see Fig. 6) or to a conversion repeater for private line service, as indicated in Figs. 1 through 3, inclusive. The leg and equipment jacks provide access to the circuits for communication and testing in either direction. Connection of the direct-leg teletypewriter cord to these jacks splits the circuit. Fig. 5 shows a spare repeater termination and the method of patching it for a substitution. In Fig. 1, a 13H1 repeater is used as the conversion unit serving a half duplex loop circuit. This arrangement does not provide a break feature. If a break feature is required, the arrangement of Fig. 2 which includes a 90C1 loop repeater is employed. It should be noted that the loop-return battery is negative in Fig. 1 and positive in Fig. 2. All loops usually return to positive battery, in accordance with Fig. 2. Since the line repeater in Fig. 1 furnishes positive battery for marking, it is necessary to return the loop to negative battery. By turning over the tip and ring conductors as in Fig. 1, the flow of the loop current is maintained in the proper direction at the station. In Fig. 3, a 13H1 repeater is used with a full duplex loop circuit. Here again it is desirable to turn over the connections to the receive loop jack circuit, in order to maintain the proper direction of current flow at the station. The loop jack circuits shown between the loop conductors and the conversion repeaters in Figs. 1, 2, and 3 provide for repeater substitution and for flexibility in patching loop conductors, either for direct-leg or hub circuit operation.

2.03 Two line repeaters may be connected together back to back for through operation, in the manner shown in Fig. 4. The polar operating current in each direction of transmission is approximately 15 milliamperes.

2.04 Fig. 7 shows a relay-type line repeater associated with a 13G1 loop repeater for sending polar signals to a group of subscriber station loops connected in parallel. A maximum of ten such station loops may be connected to a repeater. Negative battery is used for mark, and each leg draws approximately 10 milliamperes on a polar basis. Fig. 7B shows an individual current measuring circuit for parallel polar loops grounded at a subscriber station. The circuit may also be used for ground return station loops. In either case, the particular loop is split off from the group by a patch using a facility patch cord between the loop TGL jack and the PATCH jack. This terminates the loop in its equivalent marking battery via jack MEAS. CUR, to which the meter cord is connected.

B. Circuits Employing 43A1 Channel Terminals

2.05 All 43A1 channel terminals arranged for direct-leg operation are terminated on a full duplex basis in facility position leg and equipment jacks. The manner in which 43A1 channel terminals and subscriber loops are interconnected for private line service is shown in Figs. 8 and 9. It should be noted that the full duplex arrangement of Fig. 9 employs separate loop and equipment jacks for each loop, and a single leg and equipment jack. The resistors shown enclosed in the dashed rectangle in Fig. 9 provide the correct terminating resistance for the send loop and provide the correct value of signal voltages for driving the sending circuit of the channel terminal from the full duplex send loop. In the case of half duplex operation shown in Fig. 8, a single pair of leg and equipment and loop and equipment jacks is employed and the RL and SL leads are tied together. This causes the 43A1 channel terminal to function on a half duplex basis. No provision is made for interconnecting two neutral-type channel terminals for through operation, as this is done on a hub circuit basis.

2.06 Fig. 10 shows the manner in which a spare 43A1 channel terminal may be patched to serve a half duplex subscriber loop. Fig. 11

shows the manner in which a spare 43A1 channel terminal may be patched to serve full duplex subscriber loops.

2.07 Fig. 12 shows a neutral-type 43A1 channel terminal assigned to a hub circuit via a neutral-to-hub conversion circuit. Two 13G1 loop repeaters interconnect the sending (SL) and receiving (RL) legs of the line repeater to a 144A1 coupling unit which connects to the hub of the concentration group. Fig. 13 shows a hub-type 43A1 channel terminal appearing in the direct-leg facility position and serving hub circuits in a hub service position. The RL and SL leads connect to a single pair of leg and equipment jacks and the TL lead is cross-connected to the legs jack or legs relay circuit. This situation is not normally encountered, but is operationally feasible. Hub circuits usually appear in the service position only.

C. Direct-leg Teletypewriter Cord Circuit for Communication and Testing

2.08 *General:* Communication with direct-leg circuits is accomplished by the use of the direct-leg teletypewriter cord circuit at the facility position. The position teletypewriter normally associated with the teletypewriter cord circuit may be associated with this cord by operation of keys located in the keyshelf. A cord designated CONN. SIGS is provided for the connection of the test signals. Test signals may also be applied by the test signal cord circuit via a jack designated TST SIG CD. Access to the TMS for transmission measurements is provided, since the measuring circuit is normally associated with the position teletypewriter.

2.09 *Functions of Cords and Keys:* Connection of the cord circuit is made at the TGL-TGEQ leg and equipment jack circuit adjacent to the associated line repeater. Two cords are provided. The cord designated COM.MON is equipped with a double plug and is used for normal communication. The cord designated COM is equipped with a single plug and is provided for access to circuits one jack of which may be patched so that it is possible to connect to either the TGEQ or the TGL jack, but not to both. Connection of the cord circuit to an assigned facility terminates the facility in the cord circuit to permit communication or testing in either direction. A monitoring lamp (MON) circuit is

associated with the use of the COM.MON (double plug) cord. This lamp will light in response to space signals from the terminated line or station loop of the circuit under test. Selection of the particular cord is made by the COM.MON-COM key. This key permits only one cord to be used at a time, thus avoiding the accidental interconnection to two independent circuits simultaneously. Access to the position teletypewriter, arrangement of the cord circuit for the particular type of line or loop to be tested, and splitting the circuit for testing toward the line or drop are accomplished by operating the SP LINE-SP DROP and the RELAY REP-ELEC. REP keys. Both keys must be operated before communication or testing can be effected. Operation of the SP LINE-SP DROP key to either position provides termination of the sending and receiving circuit elements of the position teletypewriter set in a half duplex hub pot. The cord circuit is arranged for testing relay- or electronic-type circuits by the operation of the RELAY REP-ELEC. REP key. The CONN.SIG cord provides means for connecting test signals to the direct-leg teletypewriter cord, for sending to the circuit under test. Jack TEST SIG.CD provides means for patching the LEG cord associated with the test signal cord circuit, to provide a source of test signals. This releases the position teletypewriter from its association with the direct-leg teletypewriter cord circuit and permits connection of the test signal cord circuit elements for sending test signals when it is desirable to provide for the distant office to stop the test signals. The HDX-FDX key arranges the circuit for communication with a half or full duplex station, respectively.

2.10 Application to Direct-leg Circuits Using Relay-type Repeaters: Figs. 14 and 14B show a relay-type line repeater terminated in a leg and equipment jack circuit. The loop side of the circuit may include a half duplex loop circuit employing a 13H1 repeater (Fig. 14C), a half duplex loop circuit employing a 90C1 repeater (Fig. 14D), or a full duplex loop circuit employing a 13H1 repeater (Fig. 14E). Fig. 14A shows a relay-type line repeater assigned to FDX or HDX loop circuits for connection to Fig. 14B, 15, or 18.

(a) *Split to Line:* Fig. 14 shows the direct-leg teletypewriter cord circuit arrangement for communicating and testing with a

relay-type line repeater. A 144A1 coupling unit provides the necessary signal conversion between the position teletypewriter and the line repeater, as shown in the line communicating part of the circuit. The split-off loop is terminated in an equivalent line resistance, while the receiving circuit elements of the associated loop repeater connect to the MON lamp circuit.

(b) *Split to Drop:* Fig. 15 shows the cord circuit arrangement for communicating with relay-type repeater loops. Incoming signals from the station are impressed on the half duplex hub pot associated with the position teletypewriter via the REQ ring of the COM.MON cord and V1(A) and V4 tubes. Signals originating from the position teletypewriter are also impressed on the half duplex hub pot and transmitted to the station via V3 tube, contacts of K11 relay, the TEQ tip conductor of the COM.MON cord, and the sending circuit elements of the associated loop repeater. The split-off line repeater is terminated in an equivalent resistance and its receiving circuit elements connect to the MON lamp circuit.

2.11 Application to Direct-leg Circuits Using 43A1 Channel Terminals: Figs. 16A and 16B show a 43A1 channel terminal terminated in a leg and equipment jack circuit. The loop side of the circuit may include a half duplex loop circuit (Fig. 16C), a full duplex loop circuit (Fig. 16D), or the special case of a pair of 13G1 loop repeaters associated with a 144A1 coupling unit arranged as a neutral-to-hub conversion circuit (Fig. 16E).

(a) *Split to Line:* Fig. 16 shows the direct-leg teletypewriter cord circuit arrangement for communicating and testing with a 43A1 channel terminal line repeater. Incoming line signals from the receiving circuit elements of the channel terminal are impressed on the half duplex hub pot associated with the position teletypewriter via the TLN tip conductor of the COM.MON cord and V5 tube. Signals originating from the position teletypewriter are also impressed on the half duplex hub pot and transmitted to the sending circuit elements of the channel terminal via V8 tube and the RLN ring conductor of the COM.MON cord. The split-off loop is terminated in an equivalent

line resistance circuit and the MON lamp circuit.

(b) *Split to Loop*: Fig. 17 shows the direct-leg teletypewriter cord circuit arrangement for communicating and testing with the loop circuit associated with a 43A1 channel terminal. In the case of a half duplex subscriber loop, a 96A1 loop repeater performs the necessary signal conversion to and from the position teletypewriter. In the case of full duplex circuits (Fig. 16D and 16E), incoming signals from the sending loop circuit or the 13G1 loop repeater (repeater B) are transmitted to the position teletypewriter via the REQ ring conductor of the COM.MON cord, V1(A) and V4 tubes, and the half duplex hub pot. The split-off line repeater is terminated on a half duplex basis in its equivalent loop resistance and the MON lamp circuit.

D. Direct-leg Monitoring Circuit

2.12 A direct-leg monitoring circuit is provided in the facility position for monitoring on private line direct-leg circuits. It is arranged for connection to the position teletypewriter or the auxiliary teletypewriter circuit and has access to the TMS for transmission measurements. The circuit appears in a cord equipped with a double plug. The plug is connected to the leg and equipment jack circuit adjacent to the line repeater. The new direct-leg monitoring circuit includes a "direction of transmission" feature which includes two lamps designated LINE and DROP.

2.13 The direct-leg monitoring circuit is designed to meet the following operating conditions.

- (a) Monitor in direct-leg circuits served by either relay-type or 43A1 repeaters.
- (b) Respond to signals from either the line or the drop.
- (c) Monitor either full or half duplex transmission.

Four 2-position keys located in the keyshelf arrange the circuit to perform the functions outlined above.

2.14 *Monitoring Direct-leg Circuits Using Relay-type Repeaters*: Fig. 18 shows the monitoring direct-leg circuit arrangement when

associated with relay-type repeaters. The presence of the ring-sleeve section of the cord in the TGL jack places the windings of polar relay (K3) in series with the sending side of the loop repeater. Thus, K3 relay will respond to signal current changes from the station. The resulting mark (+130V) and space (-130V) voltages on its contact are transmitted via V6 tube to the position teletypewriter and TMS for transmission measurements or to the auxiliary teletypewriter. Signals originating from the line will be sampled on a voltage basis by the presence of the sleeve section of the cord in the TGEQ jack. The direction of transmission will be recognized by the flashing of the DROP or LINE lamp in the plate circuit of V1 and V2 tubes, respectively.

2.15 *Monitoring Direct-leg Circuits Using 43A1 Channel Terminal*: Fig. 19 shows the

monitoring direct-leg circuit arrangement when associated with electronic direct-leg circuits. The presence of the ring-sleeve section of the cord in the TGL jack samples the signal voltages originated by the station, while the sleeve section of the cord samples the signal voltages originated by the line. The particular type of operation is selected by relays under the control of keys, as shown. Signal voltages from the line or drop are converted to suitable values and polarity by V4 and V5 tubes. The resulting signal voltages are transmitted to the position teletypewriter or auxiliary teletypewriter via V6 tube which provides the correct mark and space voltages. The direction of transmission will be recognized by the flashing of the DROP or LINE lamp in the plate circuit of V1 and V2 tubes, respectively.

E. Keyshelf Circuits in Direct-leg Arranged Serviceboard

2.16 Fig. 20 shows the communication and transmission measuring preference chain circuits associated with the cord circuits appearing in a facility or combined position of the No. 2 or 9 serviceboard. The direct-leg teletypewriter cord circuit and direct-leg monitoring circuit are shown in the chain of testing cord circuits and have access to the teletypewriter and the TMS on a left to right order of priority as the cords appear in the cord shelf, except that the teletypewriter cord circuit has first preference in the use of the position teletypewriter.

3. DESCRIPTION OF EQUIPMENT**A. Direct-leg Monitoring Cord Circuit**

3.01 The bay equipment for the direct-leg monitoring cord circuit is mounted on a 19-inch relay rack and occupies the space of three 1 3/4-inch mounting plates.

3.02 At the serviceboard, the direct-leg monitoring cord appears in the keyshelf in the manner shown in Figs. 21A and 21B for the No. 2 and 9B serviceboards, respectively.

3.03 Jacks and keys associated with the direct-leg monitoring cord circuit appear in the face of the serviceboard, as shown in Figs. 22A and 22B for the No. 2 and 9B serviceboards, respectively. For the No. 2 serviceboard, this equipment is mounted directly above the piling rail in the center panel. For the No. 9B serviceboard, this equipment is mounted in a miscellaneous jack strip in the jackfield of the keyshelf bay.

B. Direct-leg Teletypewriter Cord Circuit

3.04 Mounted on 19-inch relay rack, the bay equipment for the direct-leg teletypewriter cord circuit occupies the space of six 1 3/4 inch mounting plates.

3.05 At the serviceboard, the direct-leg teletypewriter cord circuit appears in the keyshelf in the manner shown in Fig. 23 for both the No. 2 and 9B serviceboards. A jack (TST SIG CD) is located in the jackfield of the face equipment as part of the miscellaneous jack group.

4. LIST OF FIGURES**4.01 Circuit Figures**

FIG. NO.	TITLE
1	Interconnecting Arrangements for Relay-type Line Repeater and HDX Subscriber Loop Using 13H1 Loop Repeater
2	Interconnecting Arrangements for Relay-type Line Repeater and HDX Subscriber Loop Using 90C1 Loop Repeater

FIG. NO.	TITLE
3	Interconnecting Arrangements for Relay-type Line Repeater and FDX Subscriber Loops Using a 13H1 Loop Repeater in the Send Leg
4	Relay-type Line Repeater Interconnected for Thru Operation
5	Spare Relay-type Line Repeater Termination in Facility Position
6	Relay-type Line Repeater Serving a Hub Ckt
7	Relay-type Line Repeater and 13G1 Loop Repeater Serving Parallel Polar Loop Ckts
7A	Terminating Ckt for Spare 13G1 Loop Repeater for Use in Fig. 7
7B	Current Measuring Ckt for Individual Parallel Polar Loop
8	43A1 Channel Terminal Serving HDX Private Line Subscriber Loop
9	43A1 Channel Terminal Serving FDX Private Line Subscriber Loops
10	Patching a Spare 43A1 Channel Terminal to a HDX Subscriber Loop
11	Patching a Spare 43A1 Channel Terminal to FDX Loops
12	Neutral-to-Hub Conversion Ckt Using Two 13G1 Loop Repeaters and a 144A1 Coupling Unit
13	Hub-type 43A1 Channel Terminal Appearing in Direct-leg Facility Position for Hub Operation at a Hub Service Position
14	DL TTY Cord Ckt Arranged for Split to Line (Relay-type Repeater)
14A	Relay-type Line Repeater Assigned to FDX or HDX Loop Ckts
14B	Leg and Equipment Jack Ckt
14C	HDX Loop Ckt with 13H1 Repeater
14D	HDX Loop Ckt with 90C1 Repeater
14E	FDX Loop Ckt with 13H1 Loop Repeater in the Send Leg
15	DL TTY Cord Ckt Arranged for Split to Drop (Relay-type Repeater)

FIG. NO.	TITLE	FIG. NO.	TITLE
16	DL TTY Cord Ckt Arranged for Split to Line (Electronic-type Line Repeater)	20	Communication and Transmission Measuring Preference Chain Ckts (SD-70860-01)
16A	43A1 Channel Terminal Assigned to FDX or HDX Loop Ckts	21A	Keyshelf Arrangement of Direct-leg Monitoring Cord Ckt at No. 2 Serviceboard Facility Position
16B	Leg and Equipment Jack Ckt	21B	Keyshelf Arrangement of Direct-leg Monitoring Cord Ckt at No. 9B Serviceboard Facility Position
16C	HDX Loop Ckt	22A	Face Equipment for Direct-leg Monitoring Cord Ckt at No. 2 Serviceboard Facility Position
16D	FDX Loop Ckt	22B	Face Equipment for Direct-leg Monitoring Ckt at No. 9B Serviceboard Keyshelf Bay Facility Position
16E	Neutral-to-Hub Conversion Ckt	23	Keyshelf Arrangement of Direct-leg Teletypewriter Cord Ckt at No. 2 Serviceboard Facility Position or No. 9B Serviceboard Keyshelf Bay Facility Position
17	DL TTY Cord Ckt Arranged for Split to Drop (Electronic-type Line Repeater)		
18	DL Monitoring Ckt Arranged for Relay-type Repeater Monitoring		
19	DL Monitoring Ckt Arranged for Electronic-type Line Repeater Monitoring		



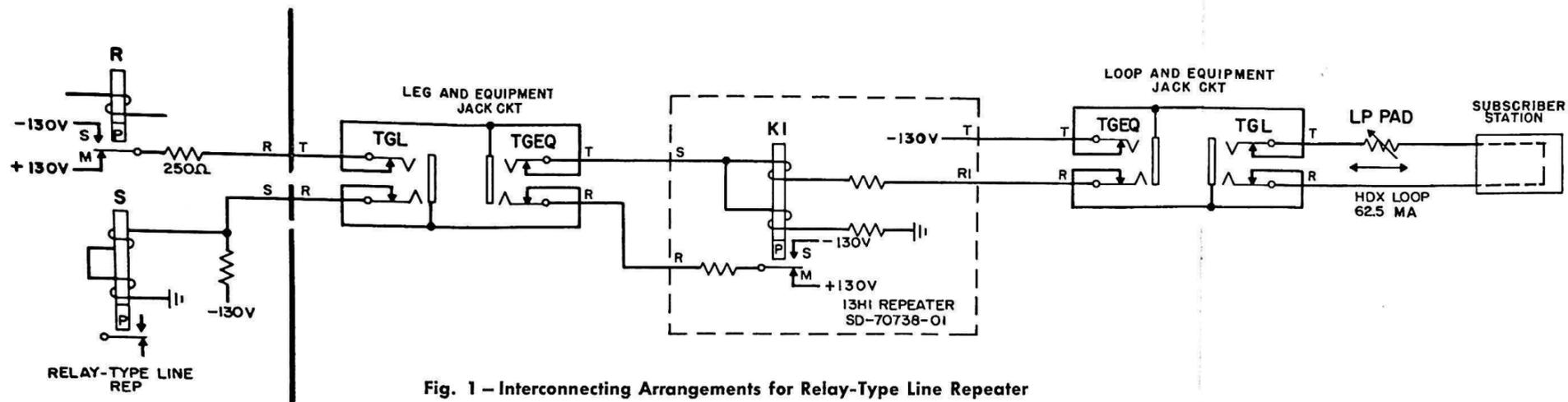


Fig. 1 - Interconnecting Arrangements for Relay-Type Line Repeater and HDX Subscriber Loop Using 13H1 Loop Repeater

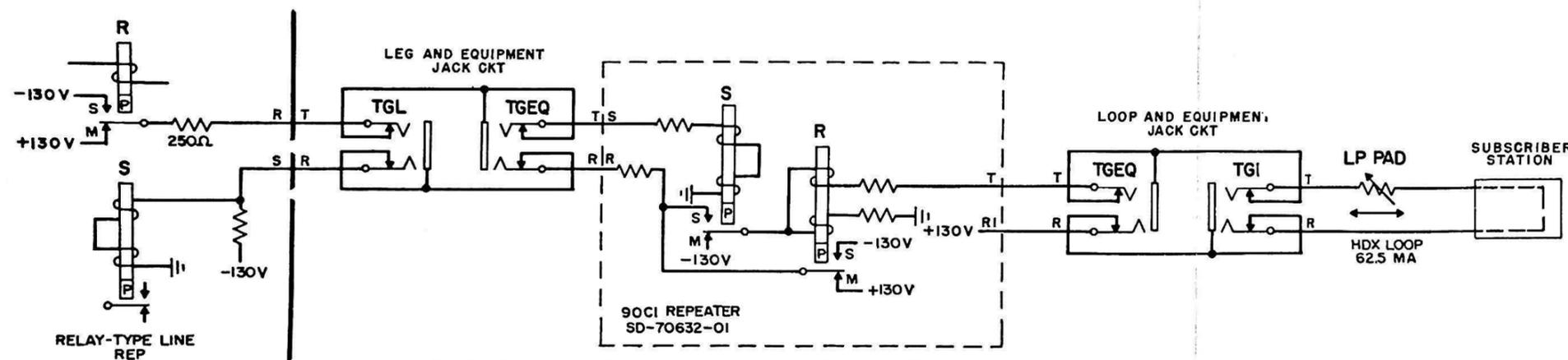


Fig. 2 - Interconnecting Arrangements for Relay-Type Line Repeater and HDX Subscriber Loop Using 90C1 Loop Repeater

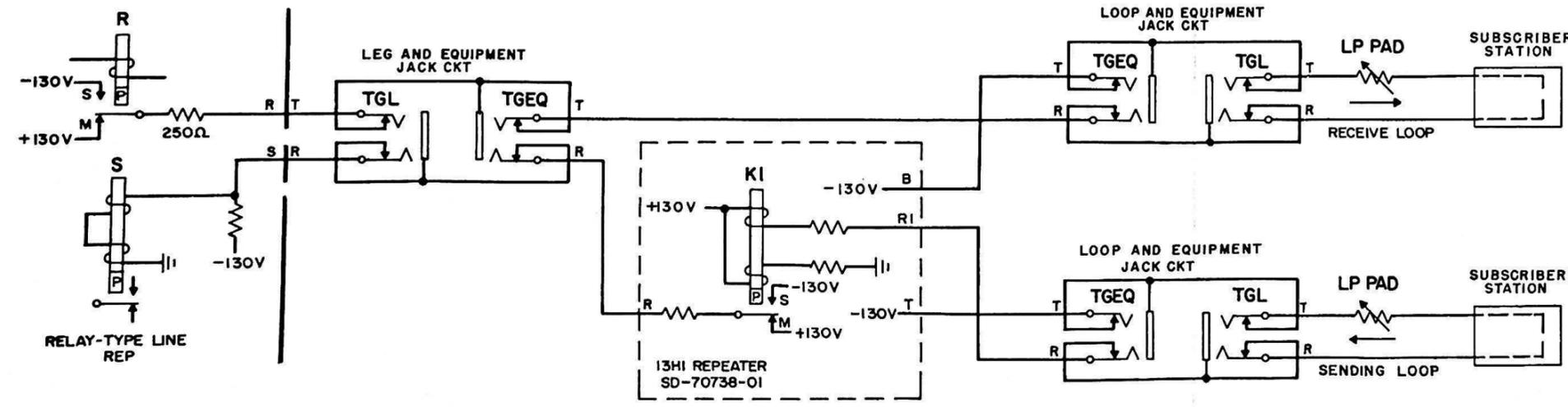


Fig. 3 - Interconnecting Arrangements for Relay-Type Line Repeater and FDX Subscriber Loops Using a 13H1 Loop Repeater in the Send Leg

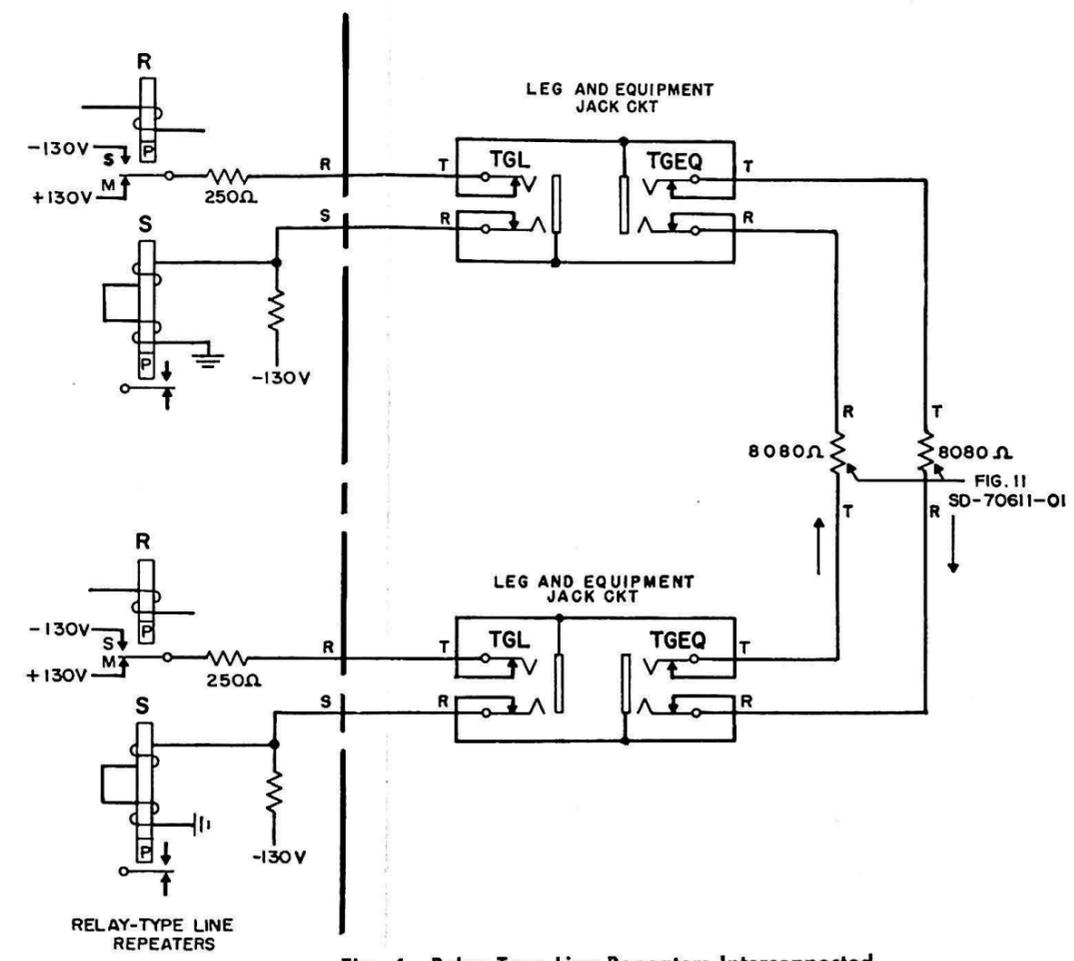


Fig. 4 - Relay-Type Line Repeaters Interconnected for Thru Operation

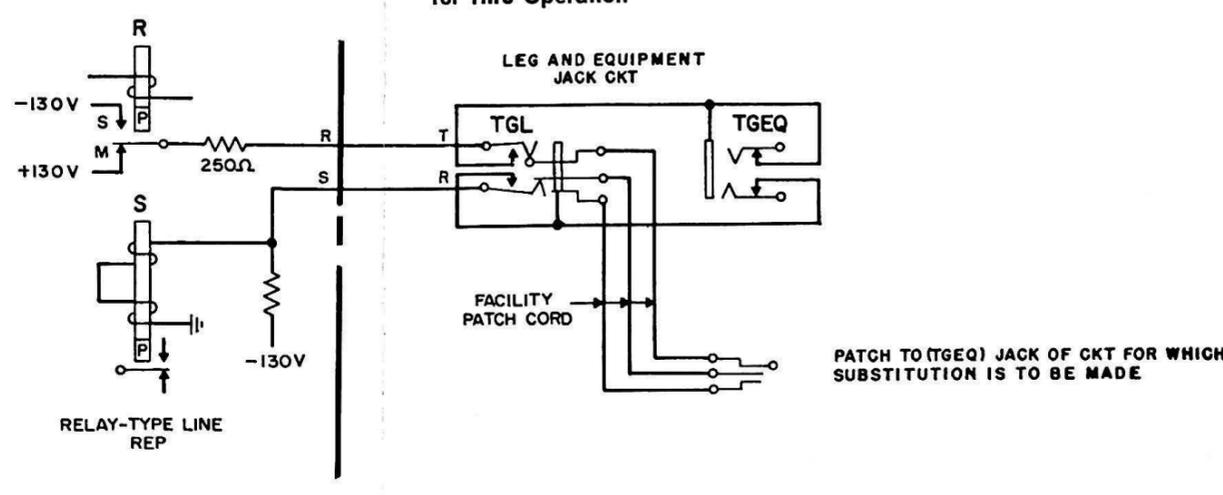


Fig. 5 - Spare Relay-Type Line Repeater Termination in Facility Position

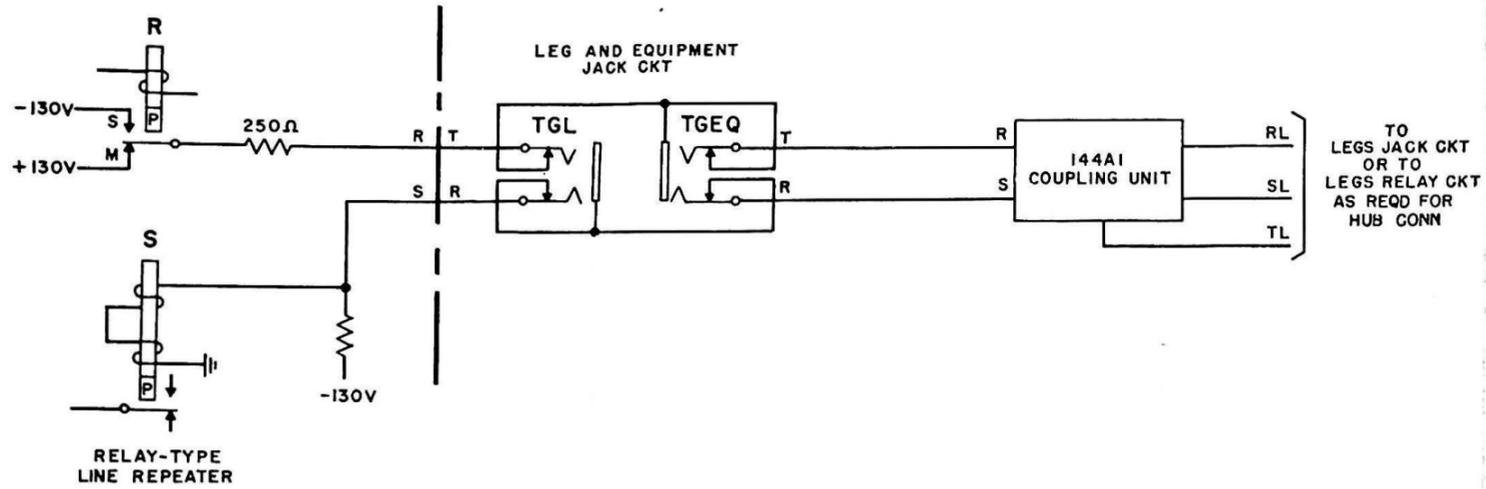


Fig. 6 - Relay-Type Line Repeater Serving a Hub Ckt

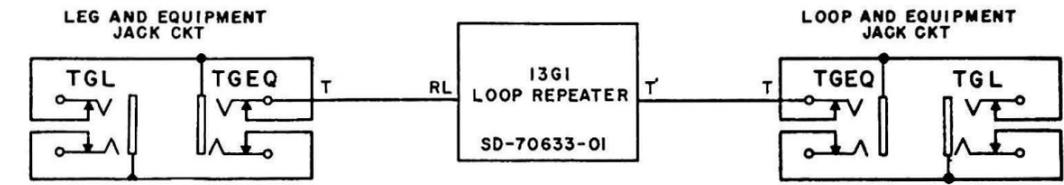


Fig. 7A - Terminating Ckt for Spare 13G1 Loop Repeater for Use in Fig. 7

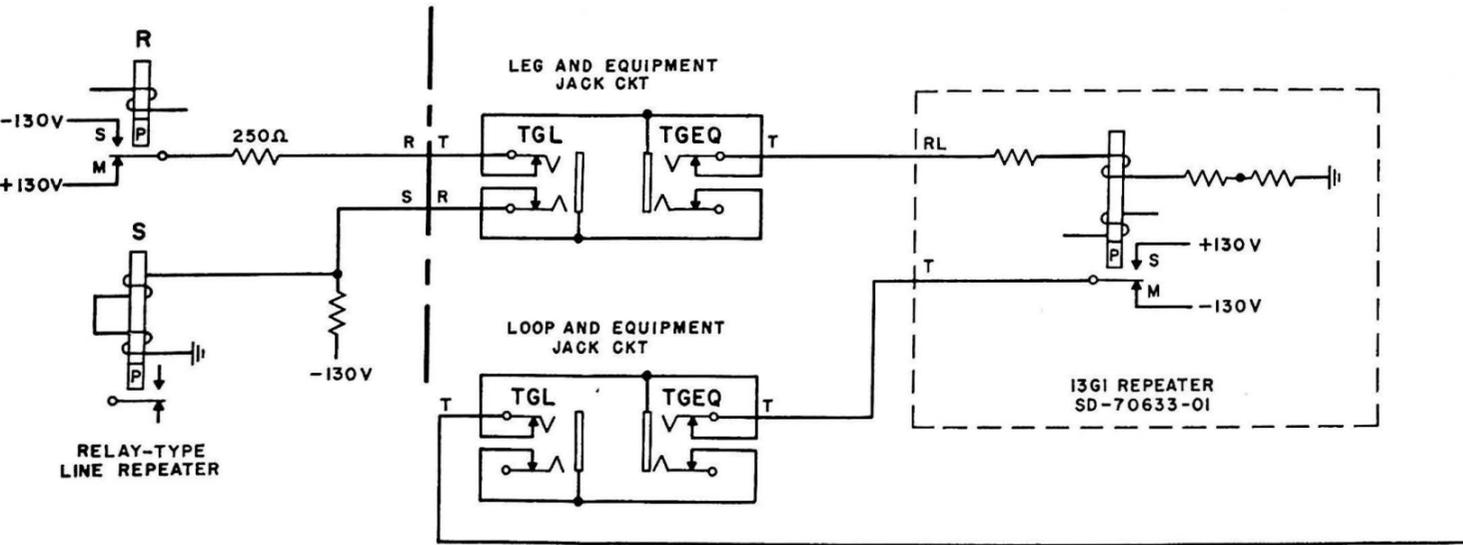


Fig. 7 - Relay-Type Line Repeater and 13G1 Loop Repeater Serving Parallel Polar Loop Ckts

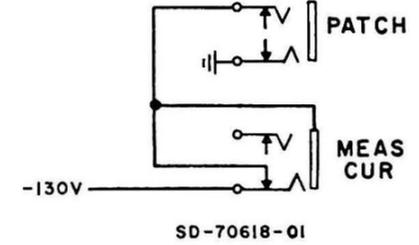


Fig. 7B - Current Measuring Ckt for Individual Parallel Polar Loop

TO OTHER LOOP AND EQUIPMENT JACK CKTS AS REQUIRED (MAX. OF 10 LOOPS)

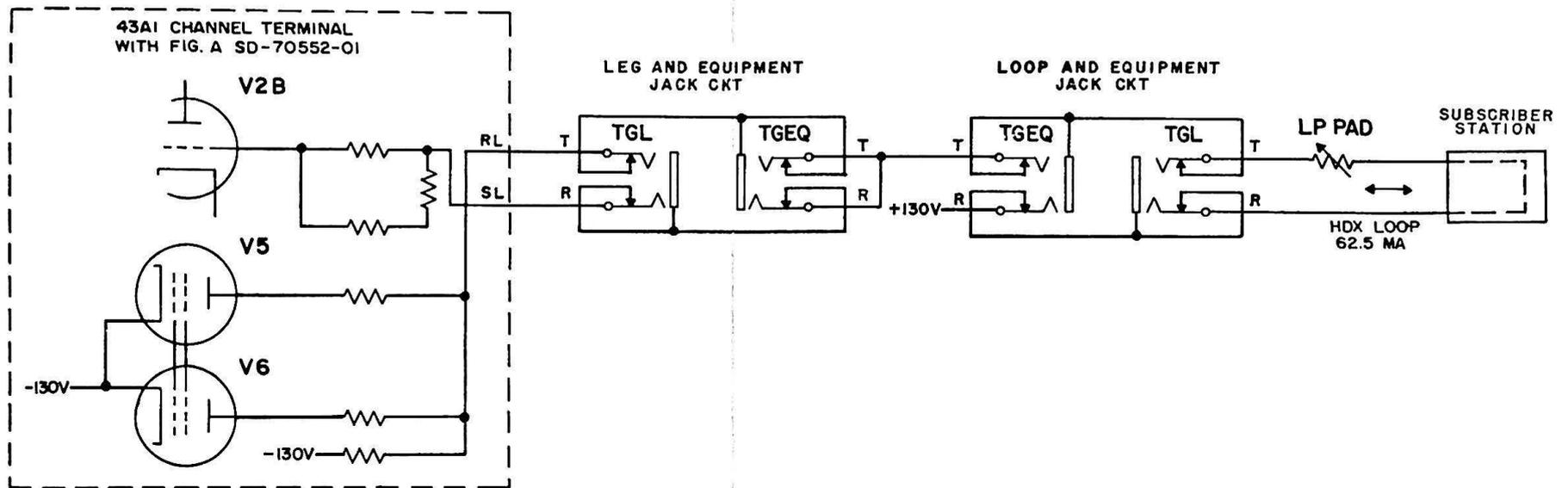


Fig. 8 - 43A1 Channel Terminal Serving HDX Private Line Subscriber Loop

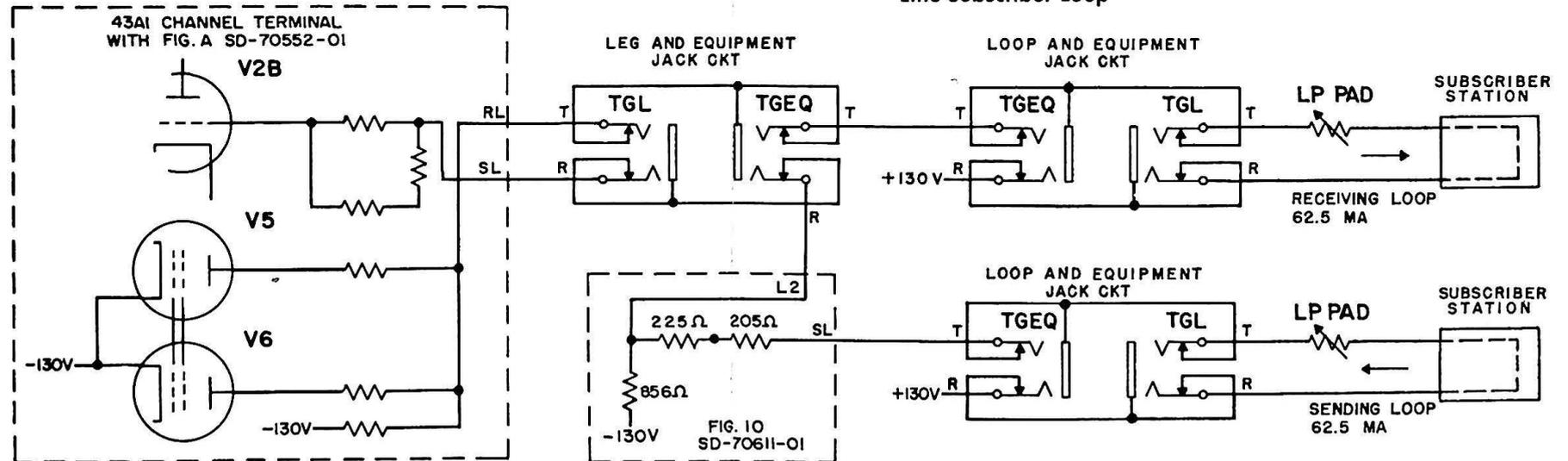


Fig. 9 - 43A1 Channel Terminal Serving FDX Private Line Subscriber Loops

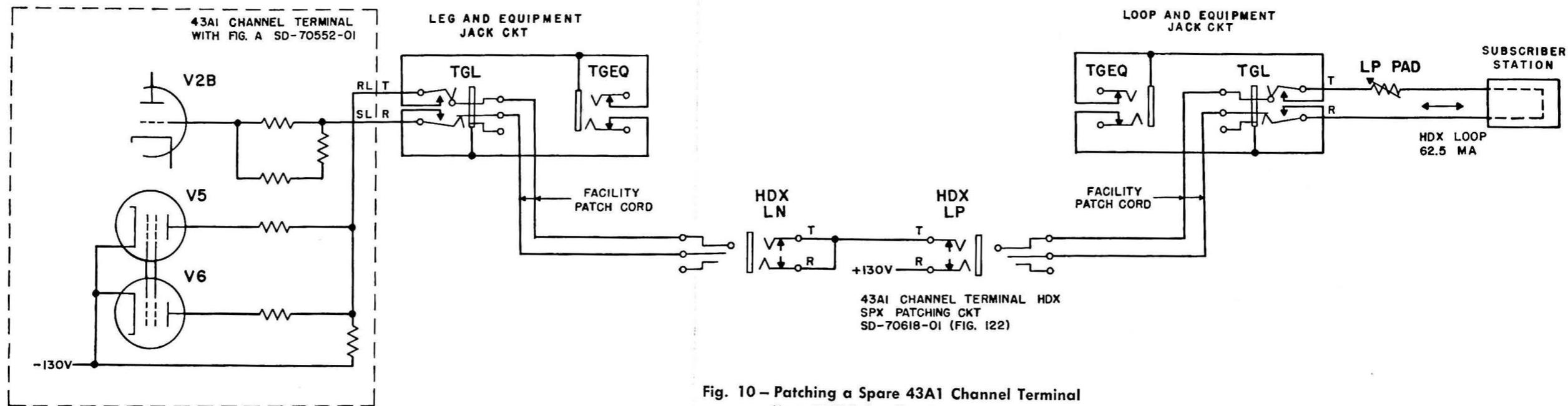


Fig. 10 - Patching a Spare 43A1 Channel Terminal To a HDX Subscriber Loop

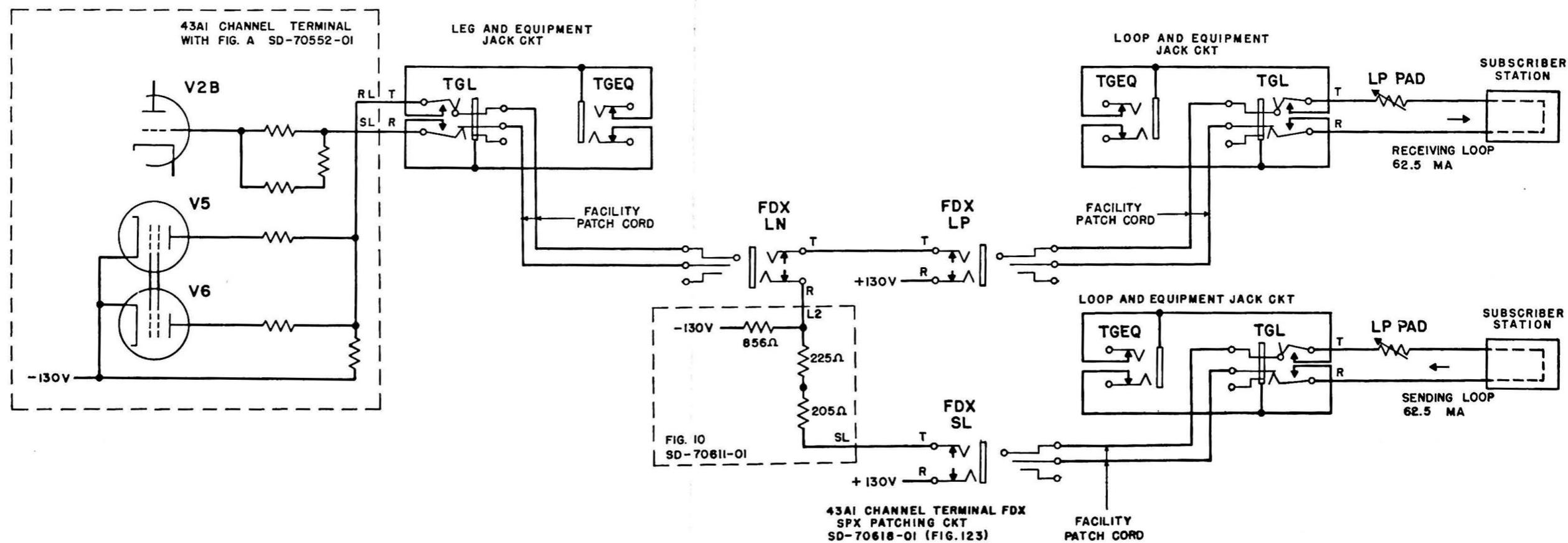


Fig. 11 - Patching a Spare 43A1 Channel Terminal to FDX Loops

Figs. 10 and 11

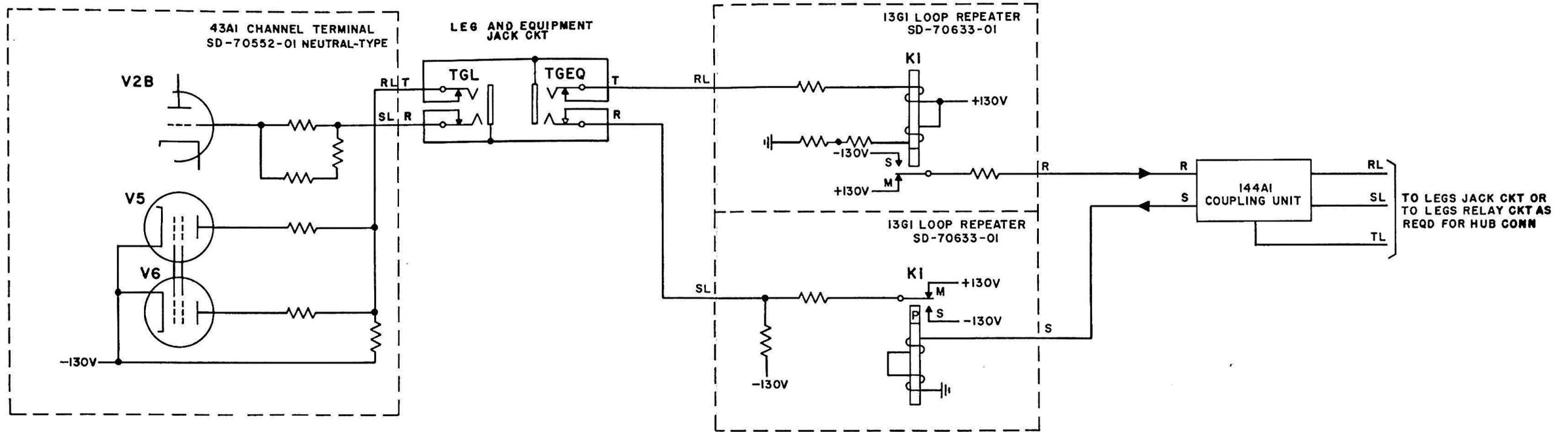


Fig. 12 - Neutral-To-Hub Conversion Ckt Using Two 13G1 Loop Repeaters and a 144A1 Coupling Unit

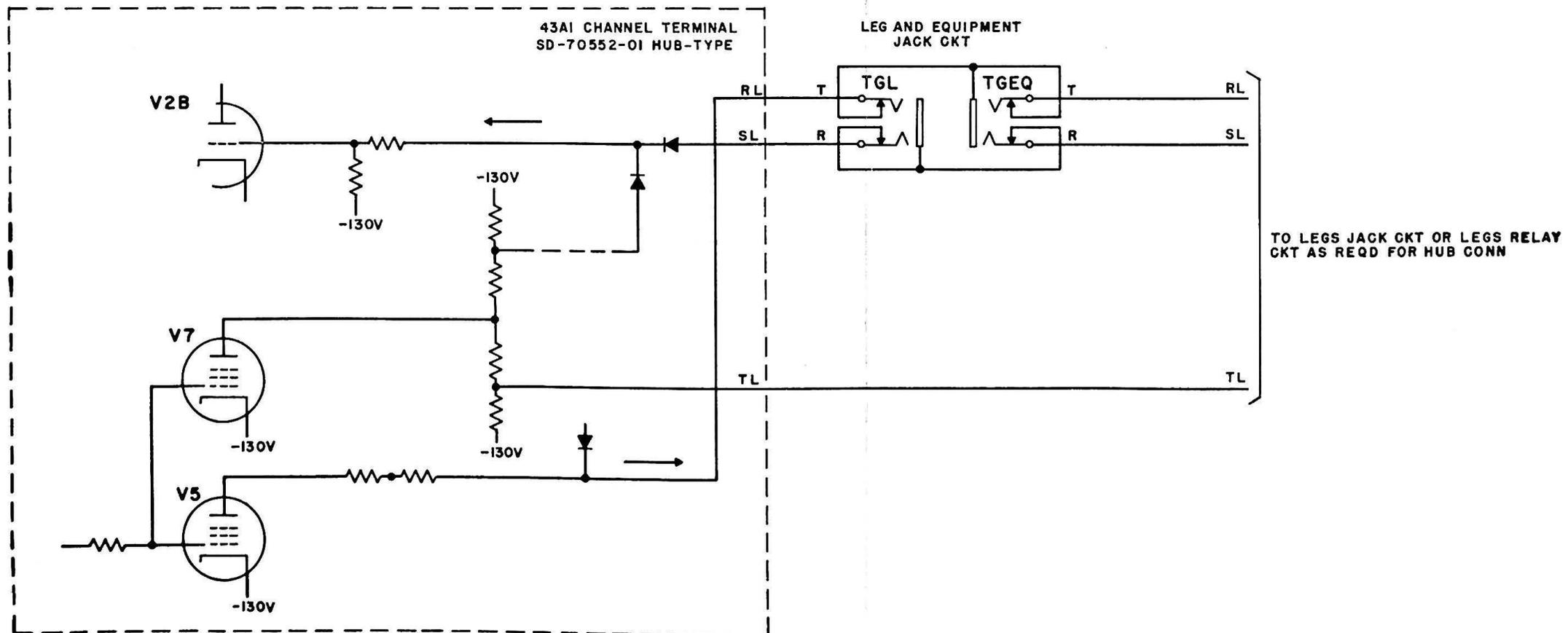


Fig. 13 - Hub-Type 43A1 Channel Terminal Appearing in Direct-Leg Facility Position for Hub Operation at a Hub Service Position

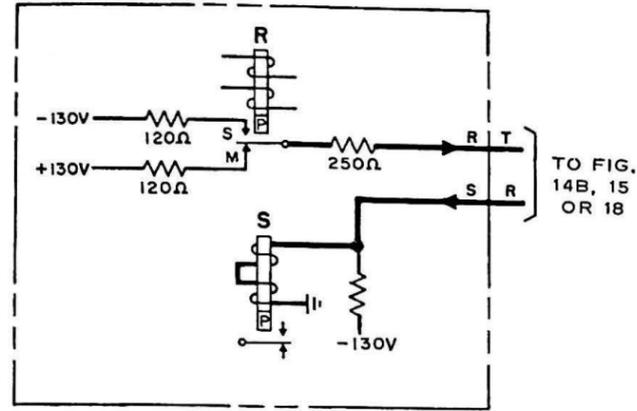


Fig. 14A - Relay-Type Line Repeater Assigned To FDX or HDX Loop Ckts

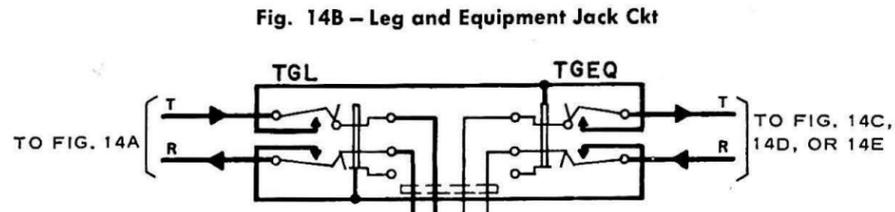


Fig. 14B - Leg and Equipment Jack Ckt

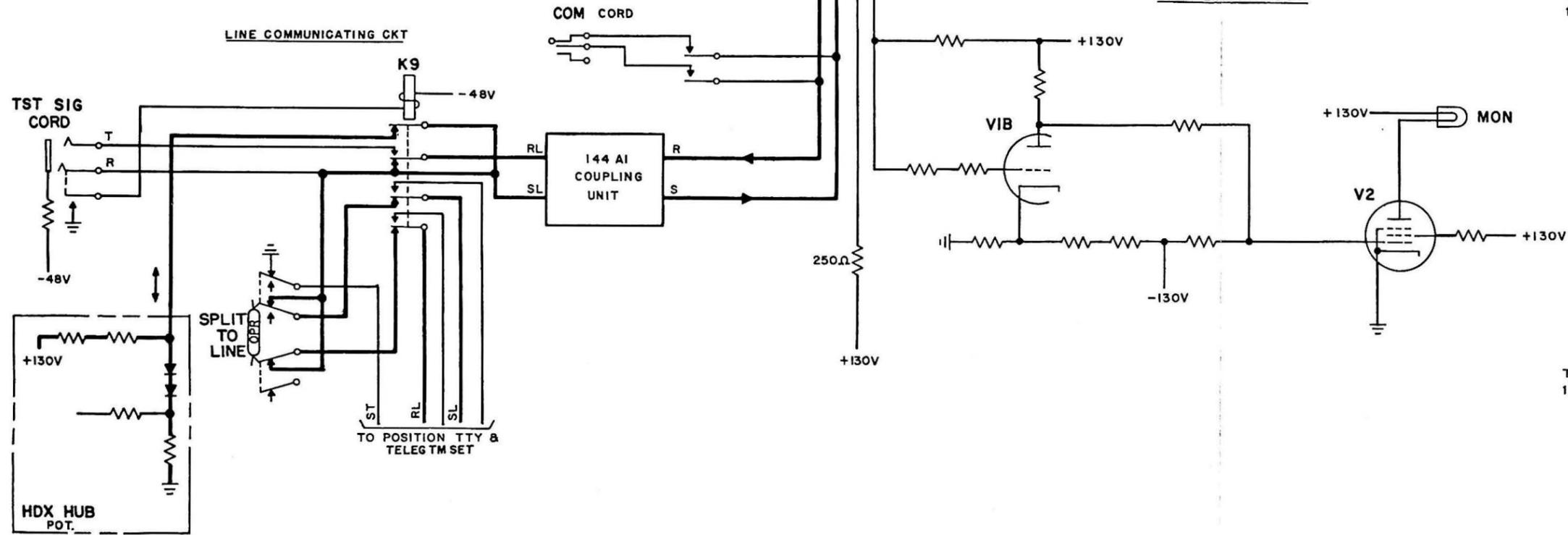


Fig. 14 - DL TTY Cord Ckt Arranged for Split To Line (Relay-Type Repeater)

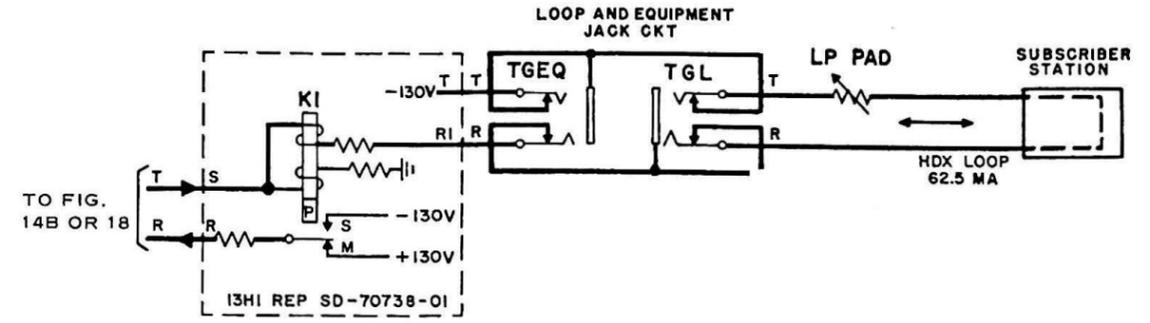


Fig. 14C - HDX Loop Ckt with 13H1 Repeater

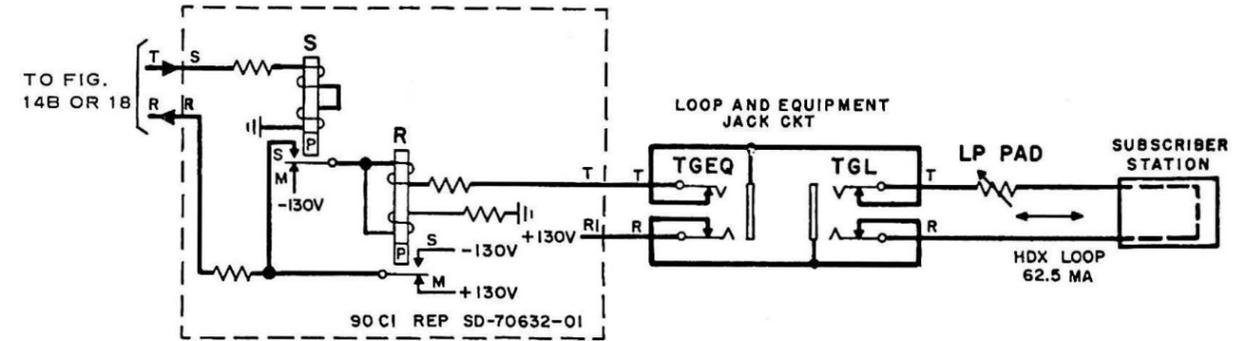


Fig. 14D - HDX Loop Ckt with 90C1 Repeater

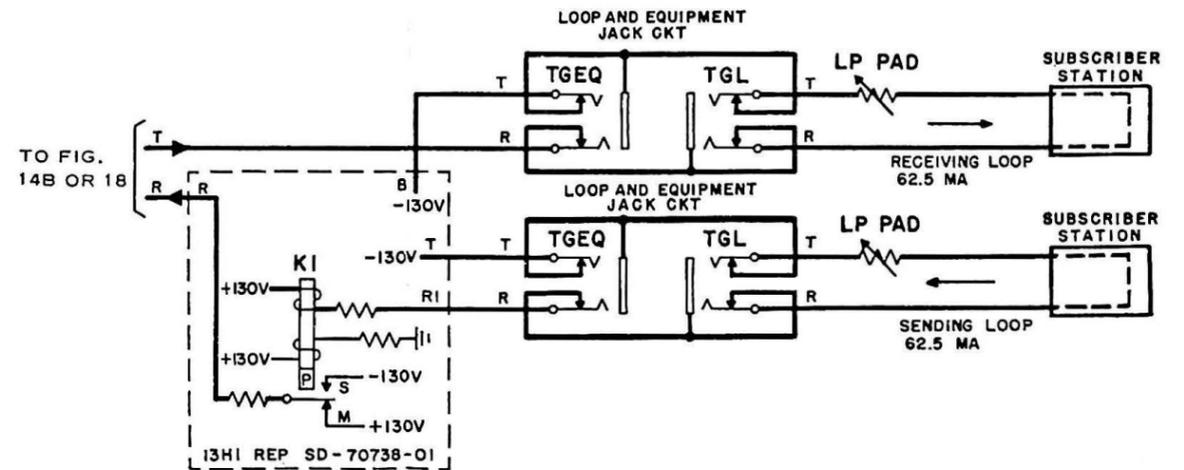


Fig. 14E - FDX Loop Ckt with 13H1 Loop Repeater in the Send Leg

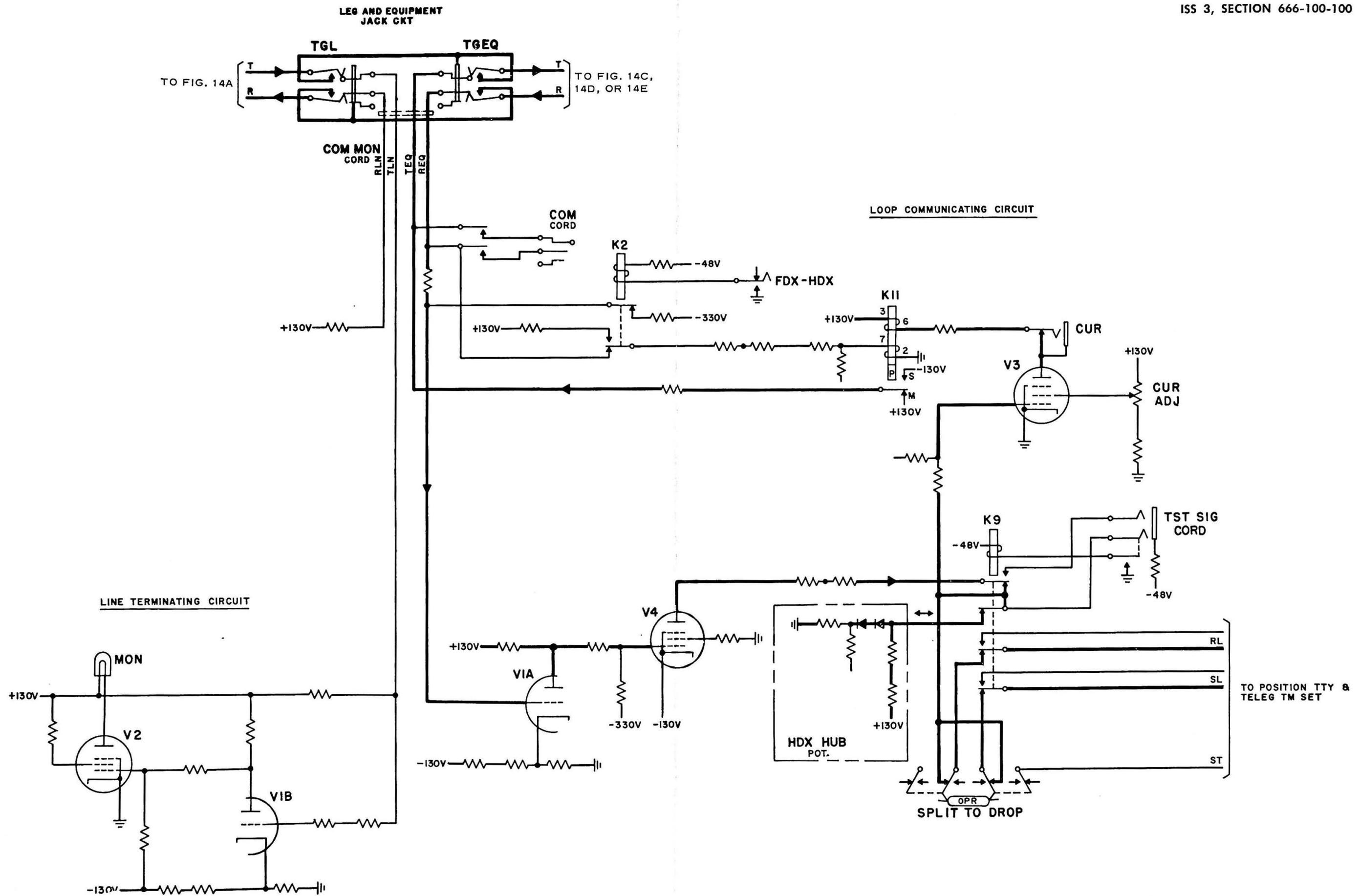


Fig. 15 - DL TTY Cord Ckt Arranged for Split to Drop (Relay-Type Repeater)

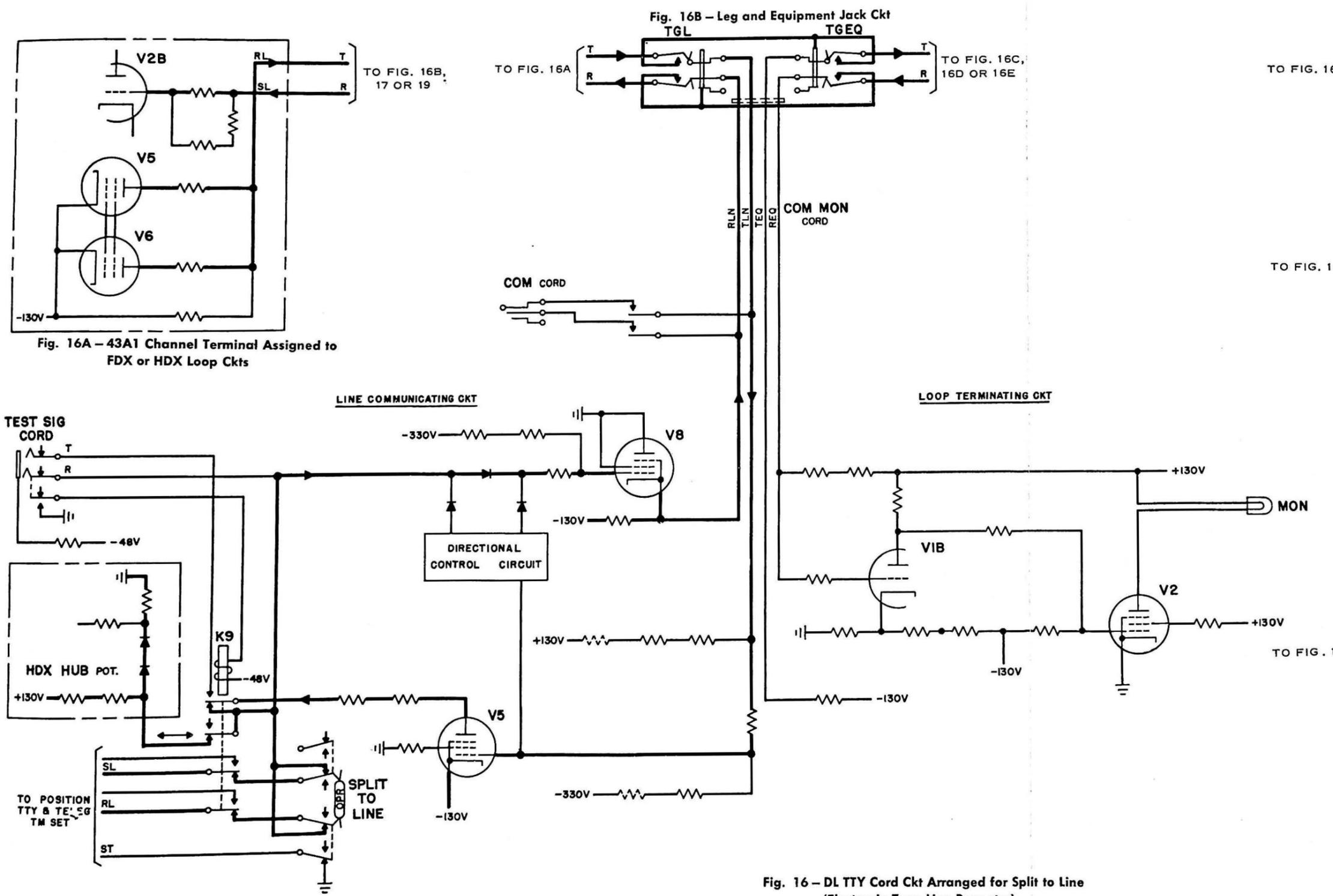


Fig. 16 - DL TTY Cord Ckt Arranged for Split to Line (Electronic-Type Line Repeater)

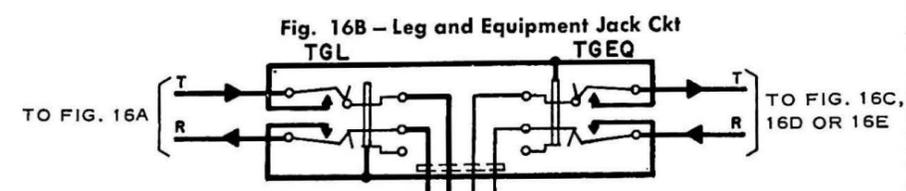


Fig. 16B - Leg and Equipment Jack Ckt

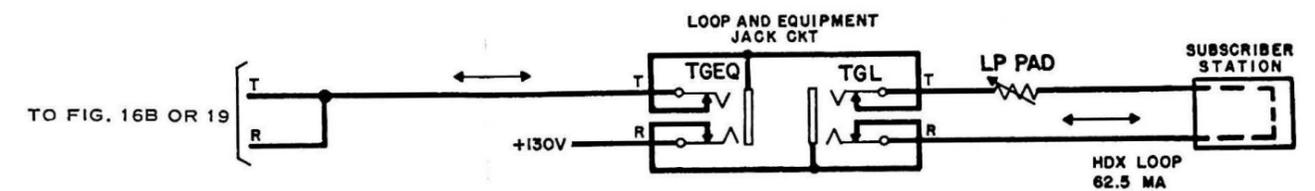


Fig. 16C - HDX Loop Ckt

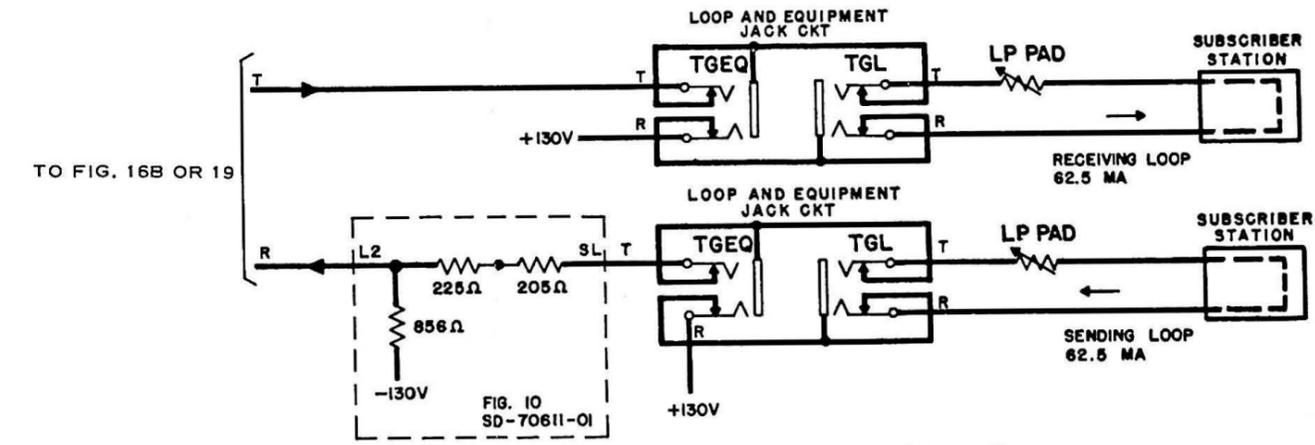


Fig. 16D - FDX Loop Ckt

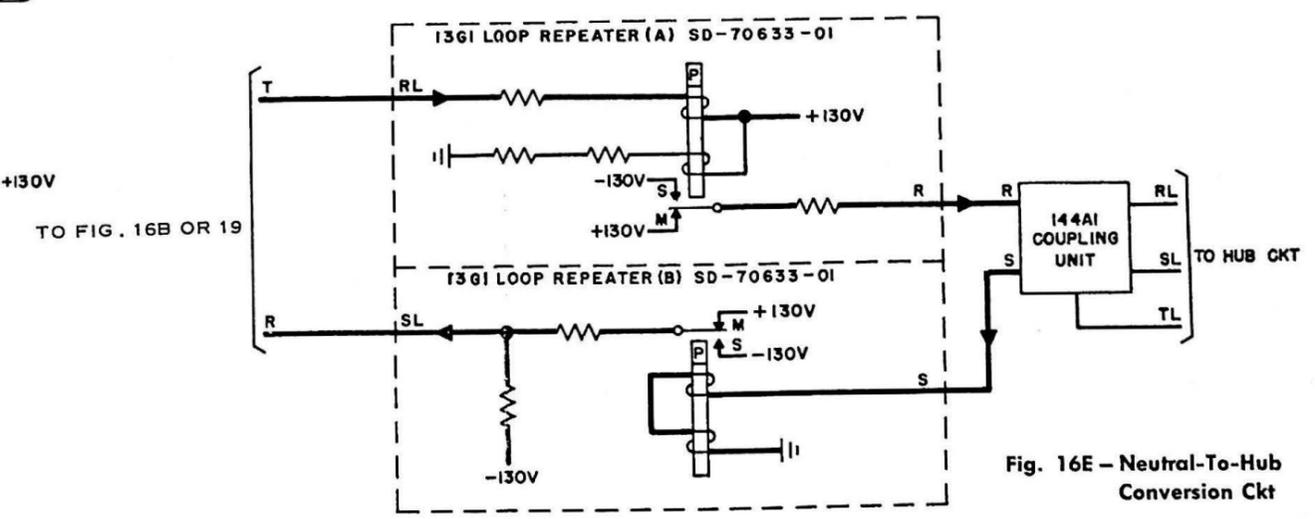


Fig. 16E - Neutral-To-Hub Conversion Ckt

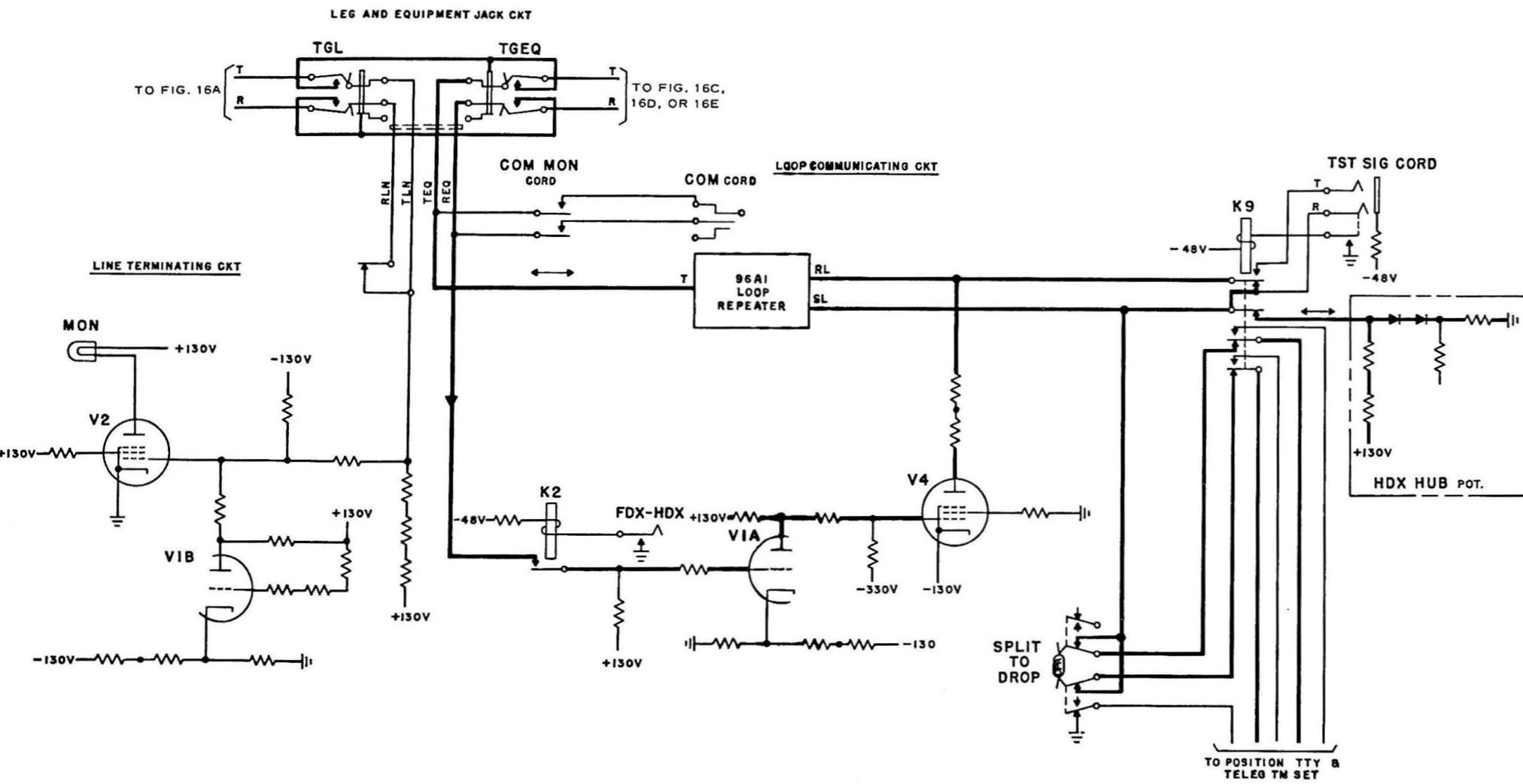


Fig. 17 - DL TTY Cord Ckt Arranged for Split to Drop (Electronic-Type Line Repeater)

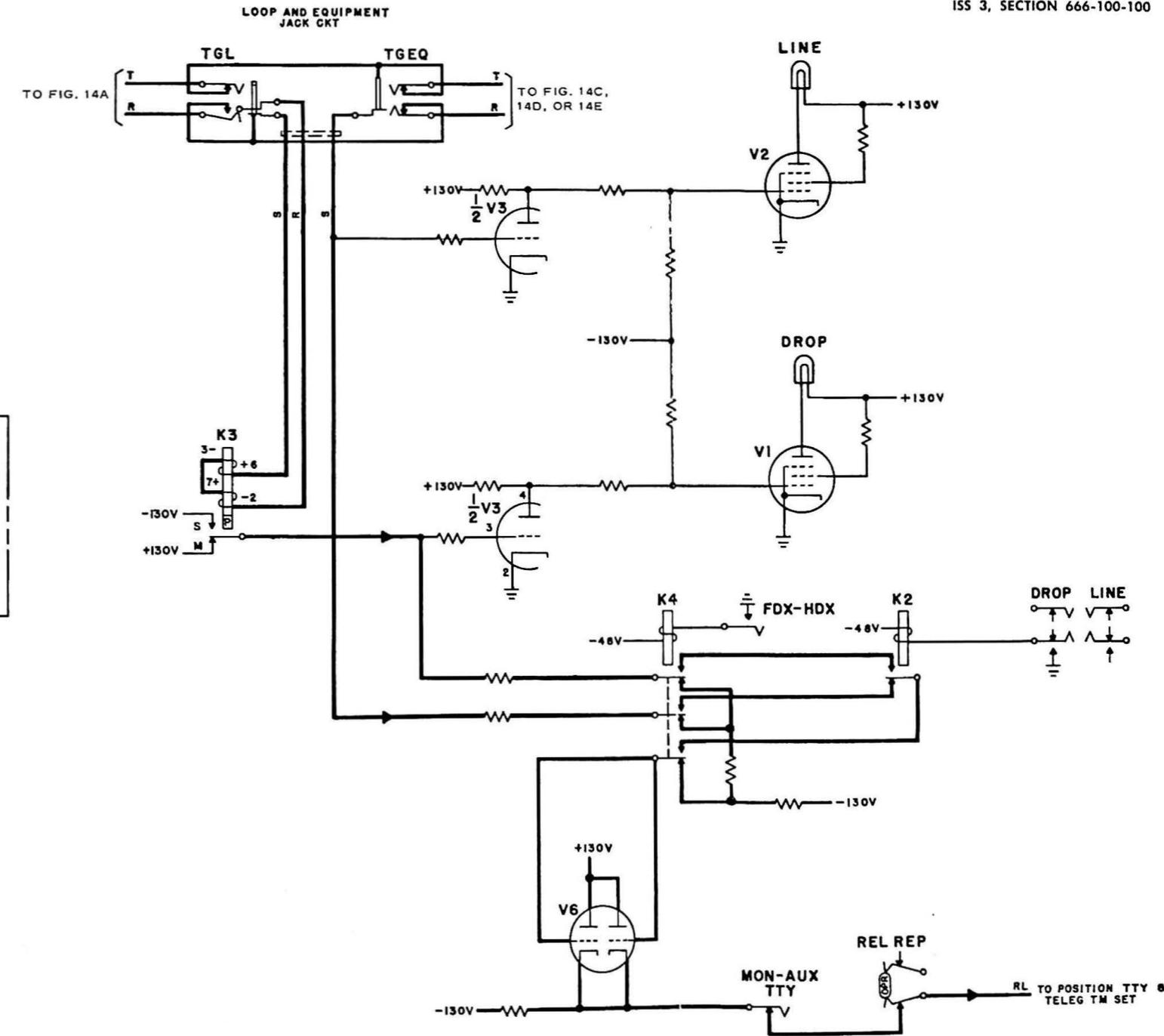


Fig. 18 - DL Monitoring Ckt Arranged for Relay-Type Repeater Monitoring

Figs. 17 and 18

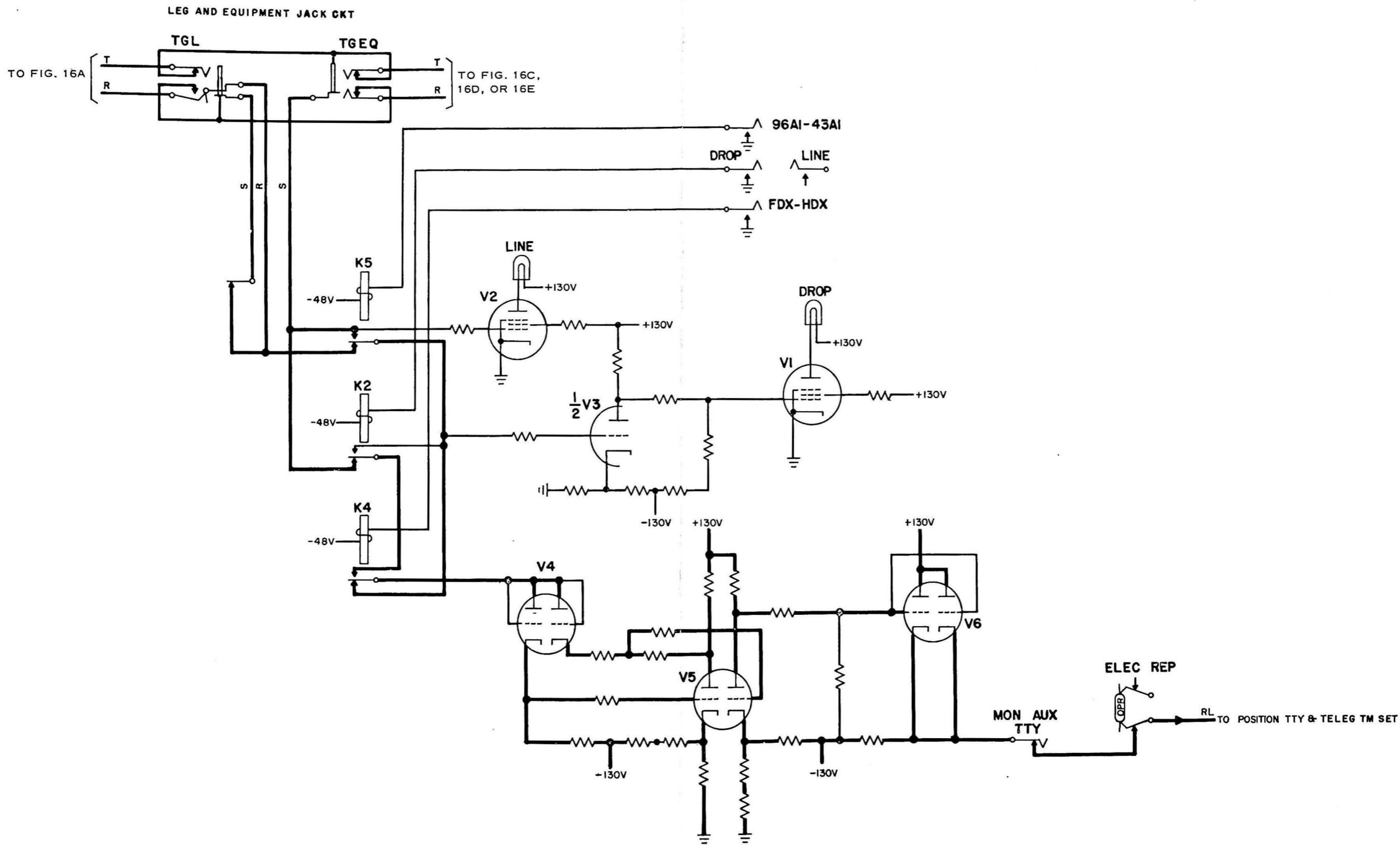
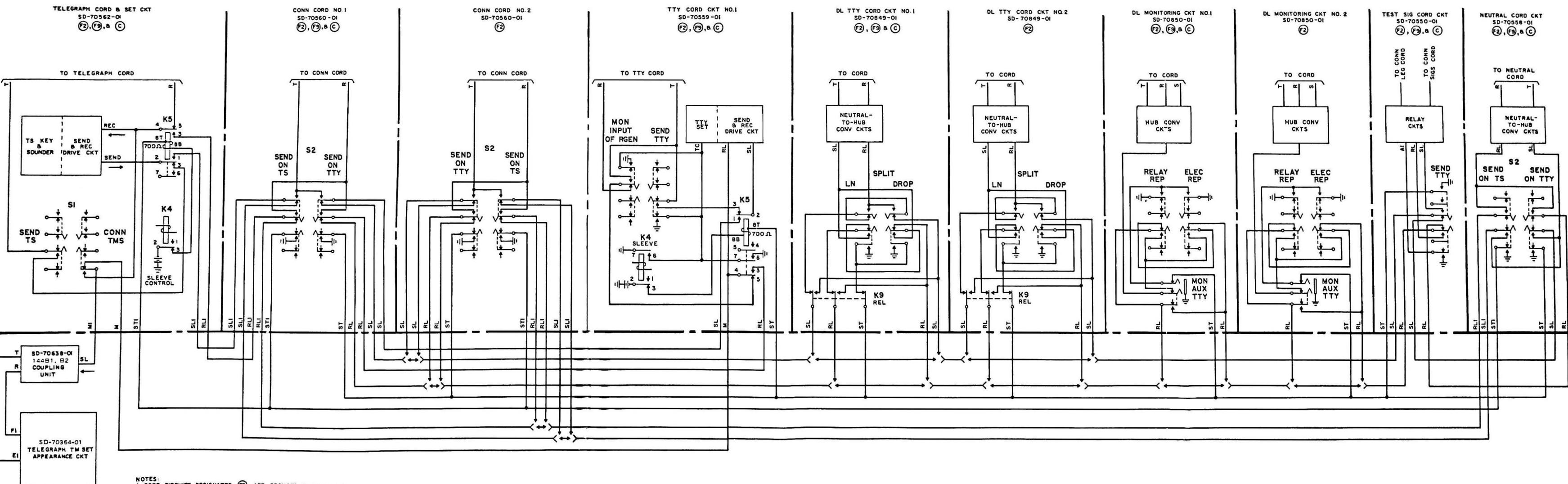


Fig. 19 - DL Monitoring Ckt Arranged for Electronic-Type Line Repeater Monitoring



NOTES:
 1. CORD CIRCUITS DESIGNATED (F2) ARE PROVIDED IN NUMBER 2 SERVICEBOARD FACILITY POSITION.
 CORD CIRCUITS DESIGNATED (F9) ARE PROVIDED IN NUMBER 98 SERVICEBOARD FACILITY POSITION.
 CORD CIRCUITS DESIGNATED (C) ARE PROVIDED IN NUMBER 98 SERVICEBOARD COMBINED POSITION.

Fig. 20 - Communication and Transmission Measuring Preference Chain Ckts (SD-70860-01)

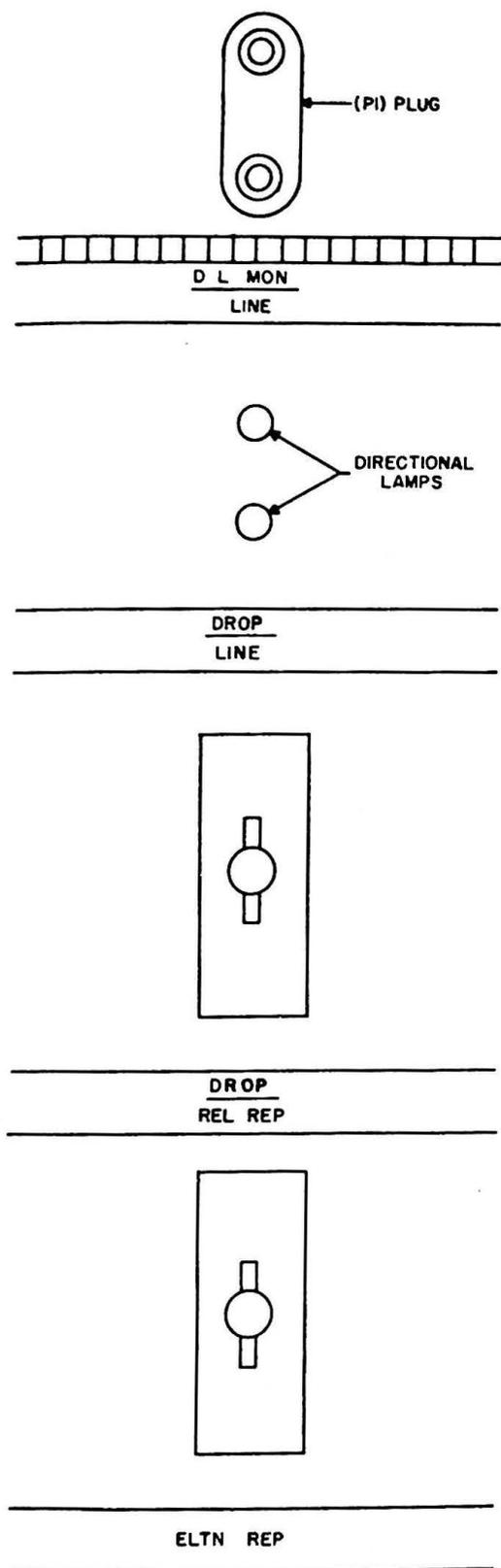


Fig. 21A - Keyshell Arrangement of Direct-Leg Monitoring Cord Ckt at No. 2 Serviceboard Facility Position

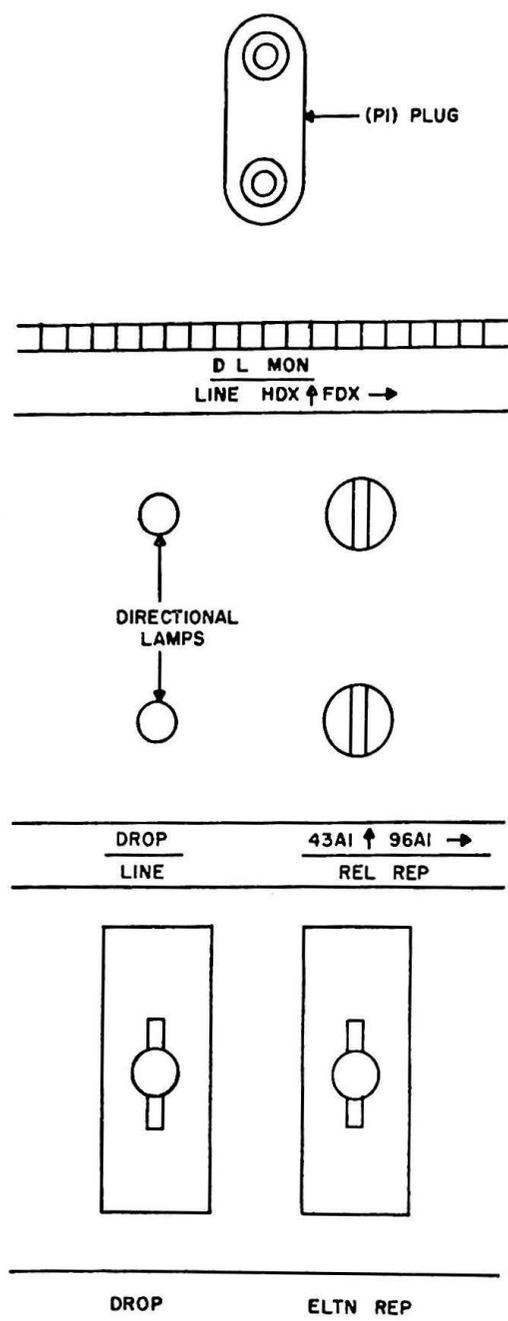


Fig. 21B - Keyshell Arrangement of Direct-Leg Monitoring Cord Ckt at No. 9B Serviceboard Facility Position

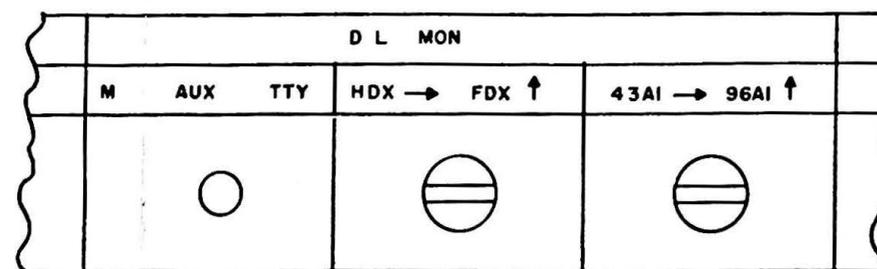


Fig. 22A - Face Equipment for Direct-Leg Monitoring Cord Ckt at No. 2 Serviceboard Facility Position

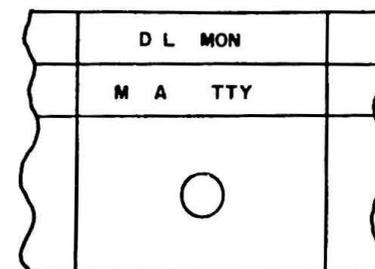


Fig. 22B - Face Equipment for Direct-Leg Monitoring Cord Ckt at No. 9B Serviceboard Keyshelf Bay Facility Position

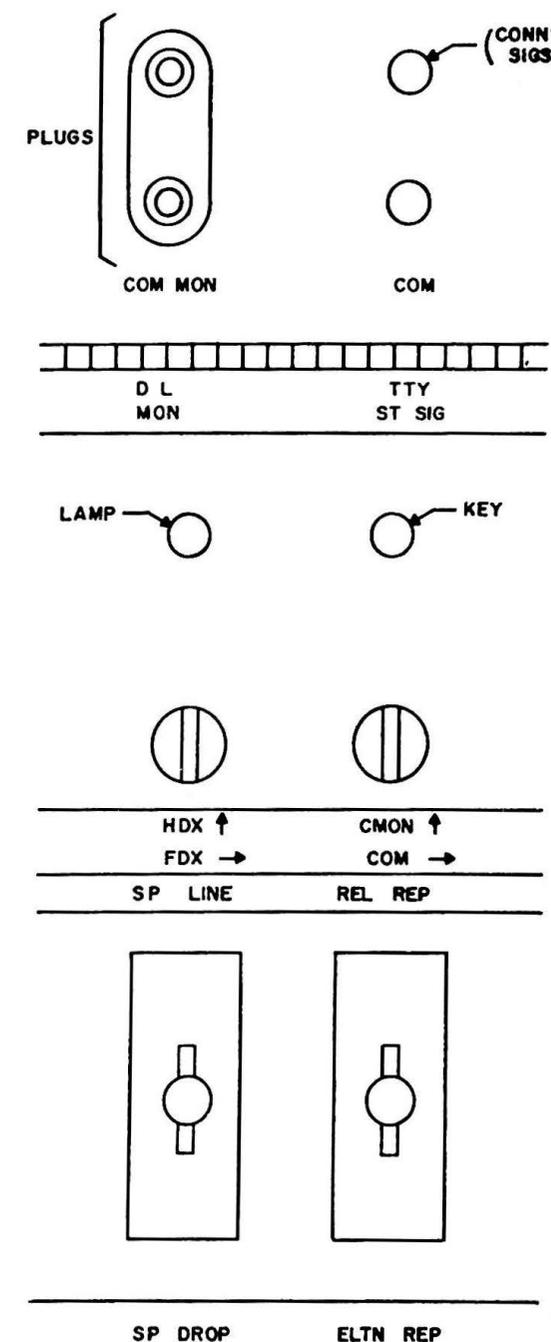


Fig. 23 - Keyshell Arrangement of Direct-Leg Teletypewriter Cord Ckt at No. 2 Serviceboard Facility Position or No. 9B Serviceboard Keyshelf Bay Facility Position