

COMMON SYSTEMS  
TRANSFER TRUNK CIRCUIT  
FOR TRANSFERRING INCOMING TRUNKS  
FROM THE DESK TO A SWITCHBOARD POSITION  
INFORMATION DESK NO. 3, 3A, 3B  
4, 4A, 4B, 6A, 6B, 6C, 6D, 6E OR 6F

## CHANGES

## B. CHANGES IN APPARATUS

B.1	Superseded		Superseded By		
	U6086 relay	} Fig. 1	} Fig. 9		
	8C thermistor			U651 relay	.02 UF capacitor
	U209 relay	} Fig. 2	} Fig. 10		
	UA39 relay			U651 relay	B410 relay
	8C thermistor			.02 UF capacitor	
	307N inductor			274L inductor	

B.2 Added - .02 UF capacitor - Fig. 11

## D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 Figs. 1, 2 and D, and 8 are rated Mfr. Disc. and are superseded by Figs. 9, 10 and 11, respectively, which are added.
- D.2 "R" option is designated, rated Mfr. Disc. and is superseded by "Q" option which is added.
- D.3 The above changes are made to eliminate the need for the switchboard operator to answer a call within approximately 4 seconds as required by the incoming trunk circuit. If the operator did not answer within the prescribed time the incoming trunk would disconnect from this circuit and hunt for another idle transfer trunk circuit.
- D.4 "T" option is designated, rated Mfr. Disc. and is superseded by "S" option which is added in Fig. 8 to eliminate the possibility of a false disconnect that may occur when the operator attempts to remove suburban or machine transfer tone. This change is made for record purposes since the above change also performs the same function.
- D.5 Notes 101, 102 and 103 and the Options Used table are expanded and Note 104 is added in reference to the above changes.

All other headings under Changes, no change.

## 1. PURPOSE OF CIRCUIT

1.1 This circuit was designed to provide means for transferring trunks at the selector banks from an information desk to a DSA or toll switchboard so that incoming traffic, normally terminating at an information desk, can be handled at a switchboard during periods of light load.

## 2. WORKING LIMITS

2.1 The maximum rated external sleeve resistance is 200 ohms for Fig. 1 and 9, 590 ohms for Fig. 2 and 10 and 115 ohms for Fig. 8 and 11.

## 3. FUNCTIONS

- 3.01 Provides for transferring incoming trunks at the selector banks from an information desk operator's telephone and trunk circuits to a switchboard.
- 3.02 Provides for preventing the transfer of a trunk from an information desk position when the desk position is occupied.
- 3.03 Provides for preventing the transfer of a trunk from a switchboard back to an information desk position during the time the call is being handled at the switchboard.
- 3.04 Provides a lamp signal to indicate when the trunks are transferred from an information desk to a switchboard.
- 3.05 Provides for functioning the start circuit.
- 3.06 Provides for lighting trunk multiple lamps when this circuit is seized by an incoming trunk circuit.
- 3.07 Provides for functioning the incoming trunk circuit when the call is handled at the switchboard.
- 3.08 Provides for flashing originating operator.
- 3.09 Provides for disconnecting the incoming trunk circuit from this circuit if the operator disconnects first.
- 3.10 Provides for giving the operator a disconnect signal when the calling party disconnects first.
- 3.11 Provides for peg count registration.
- 3.12 Provides for having this circuit test busy at the selector banks of incoming trunk circuits when a plug of a cord circuit is connected to an associated answering jack.

4. CONNECTING CIRCUITS

When this circuit is listed on a key-sheet the connecting information thereon is to be followed.

- 4.01 Incoming Trunk Circuit - Information Desk No. 3, 4, 6A or 6B - SD-90000-01, SD-96014-01.
- 4.02 Incoming Trunk Circuit - Information Desk No. 3A, 4A, 6C or 6E - SD-96352-01.
- 4.03 Incoming Trunk Circuit - Information Desk No. 3B, 4B, 6D or 6F - SD-96355-01.
- 4.04 Incoming Trunk Circuit - Information Desk No. 3A, 3B, 4A, 4B, 6C, 6D, 6E or 6F - ES-95495-01, SD-95462-01, SD-96363-01.
- 4.05 Operator's Telephone and Trunk Circuits - Information Desk No. 3, 4, 6A or 6B - SD-96103-01.
- 4.06 Operator's Telephone and Trunk Circuits - Information Desk No. 3A, 4A, 6C or 6F - SD-96351-01.
- 4.07 Operator's Telephone and Trunk Circuits - Information Desk No. 3B, 4B, 6D, or 6F - SD-96307-01.
- 4.08 Start Circuit - SD-90006-01.
- 4.09 Answering Jack Circuit - DSA Switchboards - SD-90467-01.
- 4.10 Answering Jack Circuit - No. 1, 3, 3C or 3CL Toll Switchboard - SD-64545-01.
- 4.11 Night Alarm Circuit - SD-62182-01.
- 4.12 Traffic Register Circuit - Crossbar No. 1 Office - SD-25317-01.
- 4.13 Traffic Register Circuit - Crossbar No. 5 Office - SD-25890-01.
- 4.14 Miscellaneous Register Circuit - Panel Office - SD-21537-01.
- 4.15 Cord Circuit - Switchboard No. 3 - SD-63556-01.
- 4.16 Cord Circuit - Switchboard No. 3C or 3CL - SD-64737-01.
- 4.17 Cord Circuit - Switchboard No. 13C - SD-20423-01, SD-21435-01.
- 4.18 Cord Circuit - Switchboard No. 13D - SD-21526-01, SD-21529-01.
- 4.19 Cord Circuit - Switchboard No. 14C - SD-30271-01, SD-31391-01.
- 4.20 Cord Circuit - Switchboard No. 14D - SD-31316-01.

4.21 Cord Circuit - Switchboard No. 15C - SD-90453-01, SD-90454-01.

4.22 Cord Circuit - Switchboard No. 15D - SD-96131-01.

4.23 Cord Circuit - Toll Switchboard No. 1 - SD-64821-01.

DESCRIPTION OF OPERATION

5. GENERAL

5.1 Transfer of Trunks - Figs. 3, 4 and 5

When the (TR) key in Fig. 3 is operated the (TR) relay in Fig. 4 operates and the (TR) lamp lights indicating that the associated trunks are transferred from the information desk to a switchboard. If the associated information desk positions are not occupied, ground will be connected to each "TR" lead in Fig. 4 by its associated operator's telephone and trunk circuits. Under this condition the operation of the (TR) relay causes the (PT) relay in Fig. 5 to operate. A Fig. 5 will be used for each trunk arranged to be transferred. The operation of the (PT) relay transfers the "T" and "R" and "TS" leads on the selector banks of the associated incoming trunk circuits from a desk position to this circuit. The operation of the (PT) relay also connects ground to the "G" lead to function the start circuit and connects the winding of the (PT) relay to a contact of the (L) relay so as to guard against the release of the (PT) relay while handling a call at a switchboard position.

6. INCOMING CALL - USING FIG. 1 OR 9

6.1 Fig. 1 Furnished

Using Fig. 1, a call over an incoming trunk circuit will cause the trunk to hunt for battery through the (PG) relay in Fig. A or B on the "TS" lead. When the brushes of the rotary selector on the incoming trunk stop on the terminals connected through the (PT) relay contacts to this figure the (PG) relay operates in series with a relay in the incoming trunk circuit. After certain functions have been performed in the incoming trunk circuit the tip and ring leads of the trunk are extended to Fig. 1. The operation of the (PG) relay lights the associated answering lamps and if Fig. 7 is used, operates the (PC) relay and (PC) peg count message register in series provided the associated (PC) key is operated. If Fig. 7 is not used peg count registration may be obtained over the "GR" or "PC" lead when the (PG) relay operates.

6.11 Operator Answers Call

When the switchboard operator inserts the plug of the answering cord of a DSA cord circuit in an associated answering jack in

response to the lamp signal the (SL) relay operates. The operation of the (SL) relay bridges the two windings of the (L) relay in series across the tip and ring, extinguishes the trunk lamps, opens leads to the (SL1) relay contacts and operates the (SL1) relay. The (L) relay operates through both windings in series with two relays in the incoming trunk circuit which operate from battery over the ring and ground over the tip in the latter circuit. The operation of the (L) relay operates the (L1) relay and connects a locking ground to the (PT) relay. The operation of the (SL1) relay which locks under control of the (L1) relay, opens the operating circuit for the (PG) relay, connects the ground to the "TS" lead when the (L1) relay is released to make this circuit test busy to other incoming trunk circuits, opens a link in the ground path to the "TO" and "TO1" leads, short circuits the (SL1) thermistor if provided, and closes a link in the operating path of the (AC), (W) and (Z) relays. The release of the (PG) relay will release the peg count register.

The operation of the (L1) relay opens a ground link to the "TO" and "TO1" leads, opens the operating path for the (PG) relay, connects ground to the "TS" lead, connects a locking ground to the (SL1) relay and closes the (S) inductor across the tip and ring which causes the cord supervisory lamp to extinguish. When the (L1) or (SL1) relays in all Figs. 1 used are operated, ground will be removed from the multiplied "TO" and "TO1" leads, thus preventing the start circuit from functioning to have other incoming trunk circuits hunt for a switchboard position.

### 6.12 Flashing (Mfr. Disc.)

If the call was originated by an operator and the switchboard operator desires to flash the distant operator, she will remove the plug of the answering cord from the jack and reinsert it, repeating the operation several times. This causes the (SL) relay to release and reoperate in unison with the removal and reinsertion of the plug in the jack. The release of the (SL) relay causes battery to be connected to the tip side of the trunk holding relay (L) operated while releasing the supervisory relay in the incoming trunk circuit to pass back a flashing signal. The (AC), (W) and (Z) relays may also operate while flashing, but they perform no function at this time.

### 6.13 Disconnection

#### 6.131 Operator Disconnects First

When the operator disconnects first the (SL) relay releases, connecting battery to the tip side of the trunk, causing the lighting of the supervisory lamp at the originating operator's position if the call is from an operator and connects machine ringing current to the (AC) relay. The

connection is held by battery connected to the tip which holds the (L) relay and various relays in the incoming trunk circuit operated. The circuit will now start timing for the disconnect. The (AC) relay operates from machine ringing current which is on for a period of two seconds every six seconds. The (AC) relay operated operates the (W) relay which locks. The (Z) relay does not operate, as it is shunted through its own back contact by ground from the (AC) relay. When the (AC) relay releases, this shunting ground is removed and the (Z) relay operates. When the (AC) relay operates on the next ringing period the (W) relay is shunted by ground through the front contact of the (Z) relay and releases. With the (W) relay released and the (Z) relay operated, the bridge across the tip and ring is closed and ground is connected to the midpoint of this bridge. This ground holds the (L) relay operated and operates the relay in the ring side of the incoming trunk circuit which performs no useful function. The ground also releases the relay in the tip side of the incoming trunk circuit, which disconnects the trunk from this circuit, causing the (L) relay to release. The release of the (L) relay releases the (L1), (SL1), (Z) and (AC) relays, making the circuit again receptive to incoming calls.

#### 6.132 Calling Party Disconnects First

If the calling party disconnects first the incoming trunk circuit releases, thus releasing the (L) relay, which in turn releases the (L1) relay. The release of the (L1) relay opens the circuit through the (S) inductor in order to give the switchboard operator a disconnect signal. When the operator disconnects the (SL) relay releases, in turn releasing the (SL1) relay, thus restoring Fig. 1 to normal.

#### 6.2 Fig. 9 Furnished

Using Fig. 9, a call over an incoming trunk circuit will cause the trunk to hunt for battery through the (PG) relay in Fig. A or B on the "TS" lead. When the brushes of the rotary selector on the incoming trunk stop on the terminals connected through the (PT) relay contacts to this figure the (PG) relay operates in series with a relay in the incoming trunk circuit. The (PG) relay operated operates the (PC) relay and (PC) peg count message register in series provided the associated (PC) key is operated and locks through its own contact to the "TS" lead. If Fig. 7 is not used peg count registration may be obtained over the "GR" or "PC" lead when the (PG) relay operates. After certain functions have been performed in the incoming trunk circuit the tip and ring leads of the trunk are extended to Fig. 9. Relay (L) operates at this time through its primary winding in series with a relay in the tip side of the incoming trunk circuit. The (L) relay operated connects ringing tone to the tip side of the trunk, provides a locking ground for relay (PT) and operates relay (L1).

The operation of the (L1) relay lights the associated answering lamps, opens a ground link to the "TO" and "T01" leads, opens the operating path for the (PG) relay, connects a future locking ground to the (SL1) relay and closes the (S) inductor across the tip and ring toward the answering jack circuit. When all the (L1) or (SL1) relays are operated, ground will be removed from the multiplied "TO" and "T01" leads, thus preventing the start circuit from functioning to have other incoming trunk circuits hunt for a switchboard position.

Some of the incoming trunk circuits will open the circuit to the "TS" lead shortly after the tip and ring of the trunk are closed through while another type of incoming trunk circuit will connect ground to the "TS" lead shortly after the tip and ring of the trunk are closed through. If the former type of incoming trunk is being used the (PG) relay will release when the circuit to the "TS" lead is opened while in the latter case the (PG) relay will not release until relay (SL1) has operated. The (PG) relay released releases the peg count register.

#### 6.21 Operator Answers Call

When the switchboard operator inserts the plug of the answering cord in an associated answering jack in response to the lamp signal the (SL) relay operates. The operation of the (SL) relay operates relay (SL1) and removes battery from the windings of the (L) relay allowing the supervisory relay in the ring side of the incoming trunk to operate in series with relay (L) and the relay in the tip side of the incoming trunk. The (SL1) relay operated locks to relay (L1), opens the circuit to the (PG) relay which releases if not already released, connects ground to the "TS" lead as a busy signal, removes the ringing tone from the trunk and extinguishes the trunk lamps.

#### 6.22 Disconnection

The operation is the same as described in Sections 6.131 and 6.132 except that the bridge across the tip and ring is permanently closed.

### 7. INCOMING CALL USING FIG. 2 OR 10

#### 7.1 Fig. 2 Furnished

Using Fig. 2 instead of Fig. 1, the operation is the same as described in section 6.1 when an incoming trunk circuit seizes this circuit, except that the operation of the (PG) relay in addition connects battery to the "F" lead to function the night alarm circuit.

#### 7.11 Operator Answers Call

When the switchboard operator inserts the plug of an answering cord of a toll

cord circuit in an associated answering jack to answer the call the (SL) relay operates through its primary and secondary windings. The operation of this relay operates the (SL1) relay and when Fig. D is furnished bridges the two windings of the (L) relay in series across the tip and ring conductors. The operation of the (SL1) relay bridges the two windings of the (L) relay in series across the tip and ring conductors, when Fig. C is furnished, opens a link in the ground path to the "TO" and "T01" leads, releases the (PG) relay, extinguishes the trunk lamps, connects ground to the "TS" lead to make the trunk test busy to other incoming trunk circuits and short circuits the (SL1) thermistor. The (L) relay operates through both windings in series with two relays in the incoming trunk circuit which operates, ground being supplied over the tip and battery over the ring. The operation of this relay operates the (L1) relay and connects a locking ground to the (PT) relay. The operation of the (L1) relay removes ground from the primary winding of the (SL) relay, opens a link in the ground path to the "TO" and "T01" leads, connects the holding ground to the (SL1) relay winding, opens a link in the (PG) relay operating circuit and connects ground to the "TS" lead, when Fig. C is furnished. Ground removed from the primary winding of the (SL) relay causes the cord circuit supervisory lamp to extinguish, indicating that the circuit is cut through for communication. When the (L1) or (SL1) relay in all Figs. 2 used are operated, ground will be removed from the multiple "TO" and "T01" leads, thus preventing the start circuit from functioning to have other incoming trunk calls hunt for a switchboard position.

#### 7.12 Flashing (Mfr. Disc.)

If the call was originated by an operator and the switchboard operator desires to flash the distant operator, she will operate and release the transfer or flashing key in the toll position circuit. This operates and releases the (FL) relay in unison with the movement of the key, causing a relay in the incoming trunk circuit to function to flash the originating operator. During the flashing period the (L) relay will be held operated through its primary winding in series with a relay in the incoming trunk circuit.

#### 7.13 Disconnection

##### 7.131 Operator Disconnects First

When the toll operator disconnects first the (SL) relay releases and connects ground to the primary and secondary windings of the (L) relay. The (L) relay remains energized through its secondary winding over the ring while the primary winding of the (L) relay and the relay in the tip of the associated incoming circuit are short circuited. This causes the incoming trunk

circuit to release and in turn releases the (L) relay. The release of the (L) relay releases the (L1) relay which releases the (S1) relay. The release of the (SL1) relay causes this circuit to become receptive to other incoming calls.

#### 7.132 Subscriber Disconnects First

If the subscriber disconnects first the incoming trunk circuit releases, thus releasing the (L) relay which in turn releases the (L1) relay. The release of the (L1) relay closes the circuit through the primary winding of the (SL) relay in order to give the toll operator a disconnect signal. When the toll operator disconnects the (SL) relay releases in turn releasing the (SL1) relay, thus restoring the circuit to normal.

#### 7.2 Fig. 10 Furnished

Using Fig. 10 instead of Fig. 9 the operation is the same as described in Section 6.2 when an incoming trunk circuit seizes this circuit, except that the operation of the (L1) relay connects battery to the "F" lead to function the night alarm circuit and the (S) inductor is not provided.

#### 7.21 Operator Answers Call

The operation is the same as described in Section 6.21 except that relay (SL1) removes battery from the windings of relay (L) instead of relay (SL).

#### 7.22 Disconnection

The operation is the same as described in Sections 7.131 and 7.132.

### 8. INCOMING CALL - USING FIG. 8 OR 11

#### 8.1 Fig. 8 Furnished

Using Figure 8 the incoming trunk hunts for an idle trunk at the switchboard the same as described in Section 6.1 and 7.1.

#### 8.11 Operator Answers Call

When the switchboard operator inserts the plug of an answering cord of a toll cord circuit at toll switchboard No. 1 in an associated answering jack in response to the lamp signal the (SL) relay operates. The operation of the (SL) relay bridges the two windings of the (L) relay in series across the tip and ring, extinguishes the trunk lamps, opens leads to the (SL1) relay contacts and connects ground to a contact on the (L1) relay and also on the (SL1) relay. The (L) relay operates through both windings in series with two relays in the incoming trunk circuit which operate from battery over the ring and ground over the tip in the latter circuit. The operation of

the (L) relay operates the (L1) relay and connects a locking ground to the (PT) relay.

The operation of the (L1) relay operates the (SL1) relay, opens a ground to the "TO" and "T01" leads, opens the operating path for the (PG) relay, connects ground to the "TS" lead when "X" wiring is furnished, connects a locking ground to the (SL1) relay and opens the (D) and (C) resistors from contacts on the (SL1) relay. The operation of the (SL1) relay which locks under control of the (L1) and (SL) relays, opens the operating path for the (PG) relay, connects ground to the (TS) lead when the (L1) relay is released, "X" wiring, or directly when "W" wiring is furnished to make this circuit test busy to other incoming trunk circuits, opens a link in the ground path to the "TO" and "T01" leads, closes a link in the operating path of the (AC), (W) and (Z) relays, and completes a second circuit to the windings of the (L) relay when "S" option is furnished. The release of the (PG) relay will release the peg count register.

When the (L1) or the (SL1) relays in all Figures 8 used are operated ground will be removed from the multiplied "TO" and "T01" leads thus preventing the start circuit from functioning to have other incoming trunk circuits hunt for a switchboard position.

#### 8.12 Flashing (Mfr. Disc.)

When using Figure 8 the operation for flashing the originating operator is the same as described in Section 6.13.

#### 8.13 Disconnection

#### 8.131 Operator Disconnects First

When the operator disconnects first the circuit functions as described in Section 6.131.

#### 8.132 Calling Party Disconnects First

When the calling party disconnects first the incoming trunk circuit releases thus releasing the (L) relay which in turn releases the (L1) relay. The release of the (L1) relay connects ground through one side of the (C) resistor to the tip and connects battery through the (D) resistor to the ring, causing a relay in the associated cord circuit to operate to give the operator a disconnect signal. When the operator removes the plug of the cord circuit from the associated jack the (SL) relay releases, causing the (SL1) relay to release, restoring Figure 8 to normal.

#### 8.2 Fig. 11 Furnished

Using Fig. 11 instead of Fig. 9 the operation is the same as described in Section 6.2 when an incoming trunk circuit

seizes this circuit, except that the operation of the (L1) relay connects battery to the "F" lead to function the night alarm circuit, connects ringing tone to the trunk and the (S) inductor is not provided.

#### 8.21 Operator Answers Call

The operation is the same as described in Section 6.21.

#### 8.22 Disconnection

The operation is the same as described in Sections 6.131 and 8.132.

#### 9. TONE REMOVAL

Some of the incoming trunks may have suburban tone provided on them or they may be associated with the circuits which have suburban or machine transfer tone provided on them. To remove the tone the switchboard operator performs the same operation

as she would for flashing. The circuit operation is the same as explained in Sections 6.12, 7.12 and 8.12 except that the supervisory relay in the incoming trunk will function to remove the tone instead of passing a flash signal.

#### 10. DISCONNECT DUE TO DELAY IN OPERATOR ANSWER (MFR. DISC.)

When an incoming trunk circuit seizes an idle transfer trunk circuit a test of the "T" and "R" leads is made to insure their continuity. If the test is not satisfied in approximately 4 seconds, as evident by the operation of the (S1) and (S) relays in the tip and ring sides of the incoming trunk, the start circuit will function to disconnect the incoming trunk from this circuit and hunt for another idle transfer trunk circuit. Since the (L) relay windings are not closed until the switchboard operator answers a false disconnect will occur unless the operator answers within the 4 seconds time limit.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2321-FPP-AAB-RA