

## **VOICE CONNECTING ARRANGEMENTS TSPZ1 AND TSPXY**

### **1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance, and connection information for the J53050L interconnecting unit (IU) when used to provide Voice Connecting Arrangements (VCAs) TSPZ1 and TSPXY. VCAs TSPZ1 and TSPXY provide a means for connecting customer-provided equipment (CPE), station message detail recording equipment, to a telephone company PBX central office (CO) trunk.

**1.02** Whenever this section is reissued, the reasons for reissue will be listed in this paragraph.

**1.03** The VCA TSPXY permits the CPE to seize the CO line for dialing while the circuit is in the split mode, after the originating PBX station has been connected to the CPE.

**1.04** The VCA TSPZ1 permits the CPE to cut through the originating PBX station and automatically seize the CO line to allow the station to dial on the CO line.

**1.05** The J53050L IU is a unit which is wired in series with the trunk to the CO. This unit, under customer control, can split the connection to allow the PBX station user to dial additional digits. The IU also permits the customer to optionally dial into the CO and then cut the station through.

**1.06** This circuit is limited to use on ground-start one-way outgoing PBX CO trunks only.

**1.07** If the customer wants a copy of the technical reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or Marketing Representative.

**1.08** This issue of the section is based on the following drawing:

SD-1E295-01, Issue 2 (J-53050L IU)

If this section is to be used with equipment or apparatus reflecting a later issue(s) of the drawing, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

### **2. IDENTIFICATION**

#### **PURPOSE**

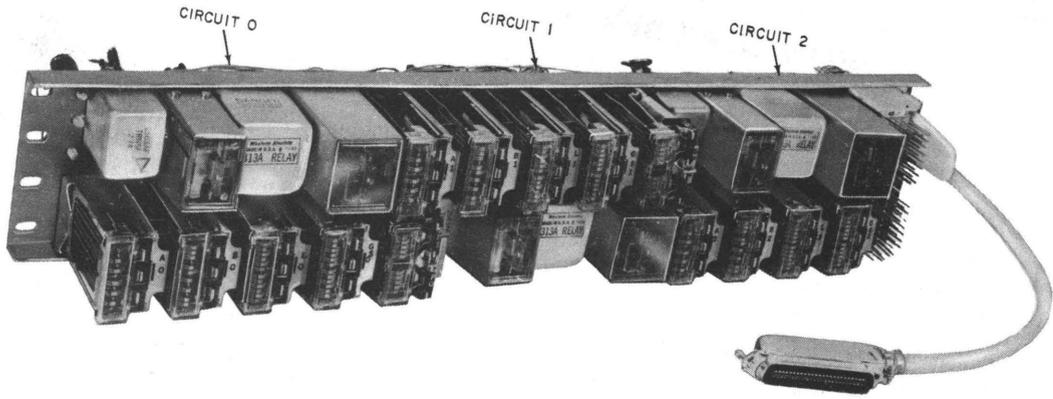
- Connects the PBX CO trunk to the CPE when seized for an outgoing call
- Provides a voice grade transmission path from PBX to CPE
- Provides dial pulse or TOUCH-TONE® signals from PBX station to CPE
- Provides trunk busy or idle status to CPE
- Provides cut-through or split indication to CPE
- Permits CPE to seize CO line while circuit is in a split condition
- Cuts PBX station through to CO line on signal from CPE
- Provides a metallic cut-through to the CO when customer equipment is disconnected or exhibits detectable failure indication.

#### **APPLICATION**

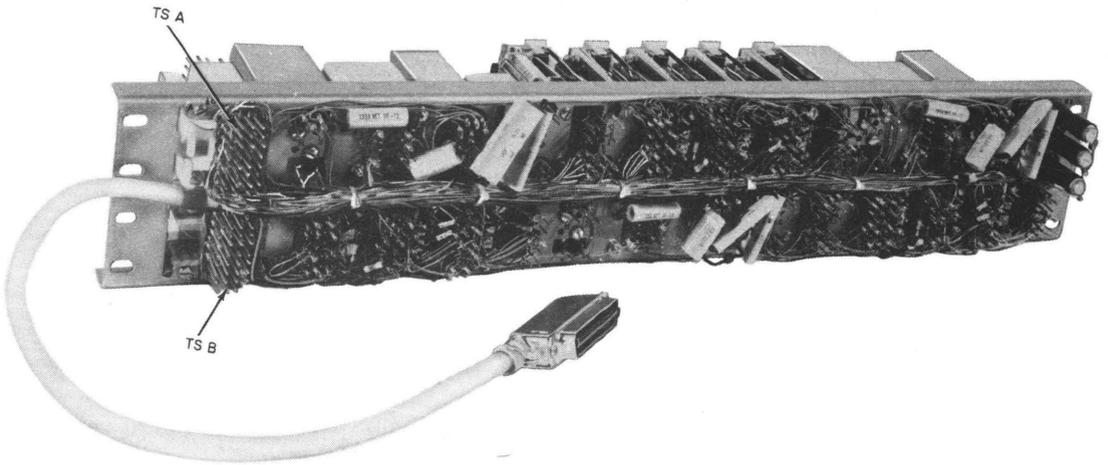
- For use on ground-start one-way outgoing PBX CO trunks only.

#### **ORDERING GUIDE**

- J53050L, List 1 Interconnecting Unit (Fig. 1 and 2)
- KS-15620, List 23 Rectifier (or equivalent, if required where PBX power supply is



**Fig. 1—J53050L Interconnecting Unit (Front View)**



**Fig. 2—J53050L Interconnecting Unit (Rear View)**

insufficient). Can power a maximum of eight IUs.

**Note:** This rectifier meets acceptable noise requirements as explained under power supplies in Section 332-104-102. Other rectifiers may be used when specified by the local telephone company engineering department.

- ED-90273-70, Group 33, Adapter (two required), for mounting 19-inch rectifier on relay rack
- Adapter, 840573612 (two required), for mounting J53050L IU for 770 and 812A PBX cabinets
- ED-92868-70, Group G3, Adapter (two required) and Adapter, 840573638, (two required) for KS-15620, List 23 power supply in the 770 and 812A PBX cabinets
- KS-14532 Power Cord (or equivalent)

List 1—10 ft.

List 2—2 ft.

List 3—15 ft.

List 4—20 ft.

List 5—25 ft.

- Cable, Connector, A25B
- Cable, Wiring, D Inside, 6 pair or equivalent (for cabling tip and ring connections from IU to PBX)
- Block, Connecting, 66M1-50 (Fig. 3)

**Note:** Other type blocks may be used when specified by local supervision.

- Clip, Bridging, B (25 per pkg).

## DESIGN FEATURES

- 4-inch by 23-inch panel, mounts on a standard relay rack.
- Three circuits per unit.

- Provides D4A terminal strip for T and R connections.
- Provides plug-ended cable for connections to the interface connecting block.
- Provides option strapping terminals.
- Maximum current drain per circuit is 0.267 ampere at 48 volts.
- Typical current drain for one circuit is 0.138 ampere at 48 volts.
- Return to cut-through mode when power is interrupted or lead CSP is open.

## 3. INSTALLATION

**3.01** Locate the J53050L IU in an area free of dampness and excessive dust, with adequate room for access to front and rear of equipment. The J53050L IU typically mounts on a standard 23-inch relay rack or may be wall mounted in a 16-type apparatus mounting (or equivalent). Use existing rack space in PBX or equipment room if available.

**3.02** The IU is inserted in the transmission path between the CO line and the PBX trunk circuit (Fig. 4). Terminate one end of the 6-pair IW cable of the D4A terminal strip (TS A) per Table A using wire-wrap tools. The other end of the cable is terminated depending on the PBX distributing frame at the access points where the CO lines are strapped to the PBX trunks involved. Where necessary, use a 66M1-50 connecting block as a tie point for the IW cable from the IU and the cross-connect wiring from the PBX equipment.

**3.03** Mount the 66M1-50 interface connecting block within 25 feet of the J53050L IU. Use an A25B connector cable to extend the leads associated with the CPE to the interface block. Connect the connector cable to the plug on the J53050L IU and terminate the stub end on the interface block (on the telephone company side) according to the even count color code. Stencil circuit numbers and lead designations on interface block designation strip (see Fig. 3 and Table B).

**3.04** Place proper option straps per Table C using wire-wrap tools and 24-gauge wire. Options Z and W are factory-wired. Z option is used when

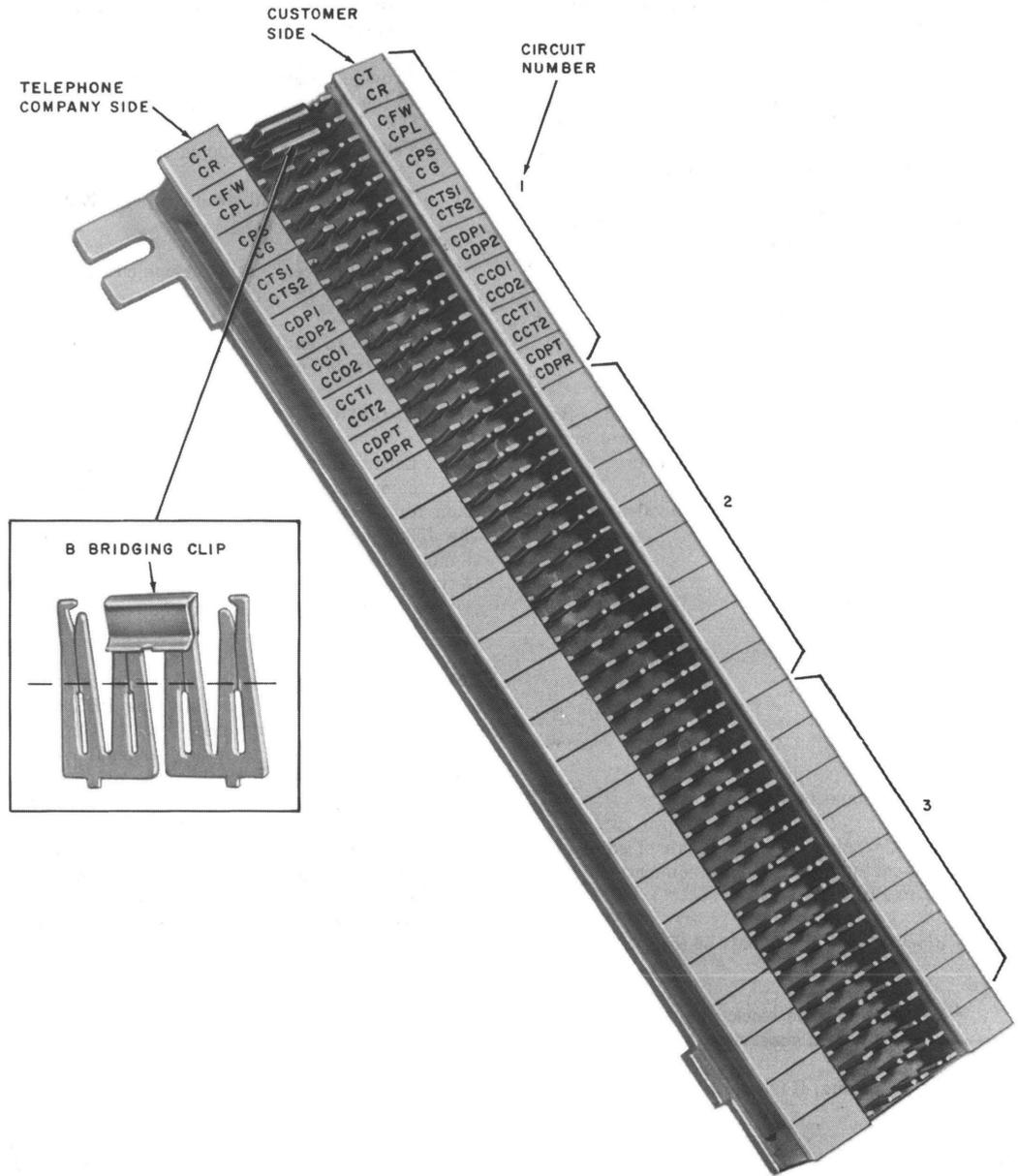
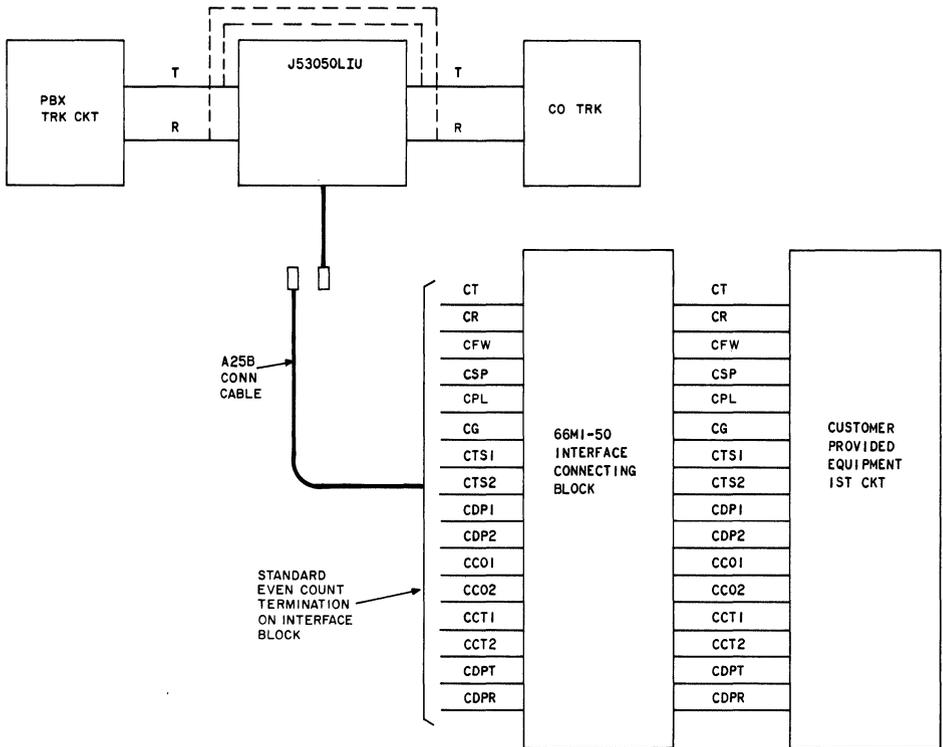


Fig. 3—66M1-50 Interface Connecting Block



**Fig. 4—Block Diagram—Voice Connecting Arrangement TSP**

TSPZ1 is ordered. X and Y options are used when TSPXY is ordered. Check continuity of option straps after placing.

**3.05** Battery and ground are obtained from the power supply for the PBX. The -48V lead may be connected to the PBX fuse panel to a separate 1-1/3 ampere fused circuit, or to a -48V terminal through a separate fuse. Use 22-gauge cross-connect wire twisted pair for power supply leads and connect -48 volts to terminal 31 and ground to terminal 11 on TS A using wire-wrap tool. (See Table D.)

**3.06** If the PBX reserve power is insufficient to supply the J53050L IUs, provide a separate power unit of sufficient capacity for the number

of IUs being installed. Connect power through a separately fused lead to each IU as above.

**3.07** When using separate power units, the customer must provide a separately fused (15-ampere) 105- to 130-volt 60-Hz outlet for each power unit within reach of the power cords (see ordering guide for cord lengths). The outlet should not be under control of a wall switch. Refer to the appropriate section in Division 518 for proper grounding of power plants. Grounding of power unit and equipment is important to prevent damage from lightning surges on both the tip and ring and power connections.

**3.08** Perform the operating tests shown in Part 5 after installation.

**TABLE A**  
**LINE CONNECTIONS**

LINE NO.	LEAD DESIG	TS A TERM. NO.
1	T(CO)	48
	R(CO)	38
	T(PBX)	28
	R(PBX)	18
2	T(CO)	46
	R(CO)	36
	T(PBX)	26
	R(PBX)	16
3	T(CO)	44
	R(CO)	34
	T(PBX)	24
	R(PBX)	14

#### 4. OPERATION (Fig. 5)

##### GENERAL

**4.01** When a PBX station seizes a CO trunk for an outgoing call, the IU circuit, if in the split mode, will connect the PBX station and the CO line to the CPE. A transmission path is provided between the CPE and the PBX station. The transmission path between the PBX station and CO line is open. Line status and trunk seizure information is provided to the CPE. When the CPE receives the call information from the PBX station, it signals the IU to cut the PBX station through to the CO line (Z option). The station receives dial tone and the call is completed in the normal manner. When option X or Y is used, the CPE may seize the CO line and dial the destination code before requesting the IU to cut the station through to the CO line. When cut through, the CPE may signal the IU to revert back to the split mode and disconnect the call. The IU is normally held in the split mode by the CPE during idle condition but will revert to the cut-through mode during power failure permitting outgoing calls from the PBX in the normal manner until power is restored.

#### VOICE CONNECTING ARRANGEMENT TSPXY

##### Outgoing Call (Option X or Y)

**4.02** During idle condition the trunk is normally split with relay SP operated by ground on lead CSP. When the PBX trunk is seized by a PBX station, the trunk places ground on the R lead. The A relay operates from this ground and operates P and B relays. B relay operated connects the secondary winding of A relay to lead T to return ground to the PBX CO trunk. The A relay will remain operated from loop current. B relay also connects resistor R1 and R2 to the T and R leads to indicate line status to the CPE. Contact M8 of B relay closes the CTS1 and CTS2 leads to indicate trunk seizures to the CPE and also prepares an operate path for GS relay. The PBX station now has a 2-way transmission path to the CPE through transformer T1 and the CT and CR leads.

##### CPE Seizes CO Line (Split Mode)

**4.03** After receiving the administrative information and destination code from the PBX station, the CPE provides a momentary contact closure between the CG and CFW leads. GS relay operates from ground on the CFW lead and disconnects transformers T1 from the PBX CO trunk and holds the A relay operated. The GS relay also connects ground to the R lead to seize the CO line. The CO returns ground on the T lead to operate the H relay through its primary winding. H relay operated operates L relay to close the loop to the CO. The S relay operates from loop current and provides a lockup path for the L relay. L relay operated releases H relay and provides a closure on the CCO1 and CCO2 leads to indicate CO line seizures to the CPE. The CO line is now connected to the CPE through transformer T1, and CO dial tone is present on the CT and CR leads. The CPE may then pulse the destination code into the CO with TOUCH-TONE® signaling on the CT and CR leads (X option) or with rotary dial pulsing on the CPL lead (Y option, lead CPL closed to ground).

##### CPE Requests Station Cut-Through

**4.04** After signaling is completed, the CPE requests PBX station cut-through by opening the contact closure on the CSP and CG leads. When ground is removed from the CSP lead, the SP relay and the GS relay will release. SP relay released connects the PBX station directly to the

**TABLE B**  
**CONNECTIONS FOR PLUG TO CPE**

CIRCUIT NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66MI-50 INTERFACE CONN BLK ROW NO.
1	CT	26	W-BL	1
	CR	1	BL-W	2
	CFW	27	W-O	3
	CSP	2	O-W	4
	CPL	28	W-G	5
	CG	3	G-W	6
	CTS1	29	W-BR	7
	CTS2	4	BR-W	8
	CDP1	30	W-S	9
	CDP2	5	S-W	10
	CCO1	31	R-BL	11
	CCO2	6	BL-R	12
	CCT1	32	R-O	13
	CCT2	7	O-R	14
	CDPT	33	R-G	15
	CDPR	8	G-R	16
2	CT	34	R-BR	17
	CR	9	BR-R	18
	CFW	35	R-S	19
	CSP	10	S-R	20
	CPL	36	BK-BL	21
	CG	11	BL-BK	22
	CTS1	37	BK-O	23
	CTS2	12	O-BK	24
	CDP1	38	BK-G	25
	CDP2	13	G-BK	26
	CCO1	39	BK-BR	27
	CCO2	14	BR-BK	28
	CCT1	40	BK-S	29
	CCT2	15	S-BK	30
	CDPT	41	Y-BL	31
	CDPR	16	BL-Y	32

TABLE B (Cont)

CIRCUIT NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK ROW NO.
3	CT	42	Y-O	33
	CR	17	O-Y	34
	CFW	43	Y-G	35
	CSP	18	G-Y	36
	CPL	44	Y-BR	37
	CG	19	BR-Y	38
	CTS1	45	Y-S	39
	CTS2	20	S-Y	40
	CDP1	46	V-BL	41
	CDP2	21	BL-V	42
	CCO1	47	V-O	43
	CCO2	22	O-V	44
	CCT1	48	V-G	45
	CCT2	23	G-V	46
	CDPT	49	V-BR	47
	CDPR	24	BR-V	48
	SPARE	50	V-S	49
25		S-V	50	

\* Stencil lead designations on fanning strip.

**TABLE C**  
**OPTION TABLE**

USOC CODE	FEATURE OR OPTION	OPTION	STRAP TERMINALS		
			CKT 1	CKT 2	CKT 3
TSPZ1 or TSPXY	SXS Type CO	V	TS B 18 to 28	TS B 16 to 26	TS B 14 to 24
	Panel, Crossbar or No. 1 ESS Type CO	W*	TS B 28 to 38	TS B 26 to 36	TS B 24 to 34
TSPXY	TOUCH-TONE® Dialing to CO from CPE with IU in Split Mode	X	TS A 27 to 37 TS B 17 to 27	TS A 25 to 35 TS B 15 to 25	TS A 23 to 33 TS B 12 to 23
	Rotary Dialing to CO from CPE with IU in Split Mode	Y		NONE†	
TSPZ1	Rotary or TOUCH-TONE Dialing to CO from PBX Station with IU in Cut-Through Mode	Z*	TS A 27 to 37 TS B 17 to 27 37 to 47	TS A 25 to 35 TS B 15 to 25 25 to 45	TS A 23 to 33 TS B 13 to 23 33 to 43

\* Z and W options are factory-wired

† Customer provides this wiring option at the interface block.

**TABLE D**  
**POWER CONNECTIONS**

-48V	TS A 31
GRD	TS A 11

CO line to remove the split condition and closes a break contact on the CCT1 and CCT2 leads to indicate to the CPE that the IU is cut through to the CO line. The SP relay also opens the PBX loop to release the A relay. The A relay released will release B relay which will release the P relay. The GS relay released disconnects transformer T1 from the CO line. While cut through, the CFW lead must be open so that the circuit can return to the split mode on disconnect or request by the CPE.

#### **CPE Requests IU to Split After Cut-Through**

**4.05** When the CPE desires to have the trunk split after cut-through, it closes the contact on leads CSP and CG. Ground on lead CSP operates

SP relay through CR2. The SP relay operated opens the loop to the CO and the S relay releases. The SP relay opens the CCT1 and CCT2 leads to indicate to the CPE that the trunk is split. SP relay also connects the PBX CO trunk to the A relay and primary winding of transformer T1 to maintain battery on the PBX trunk and prevent it from releasing. The A relay operates from loop current and operates the B and P relays. B relay operated maintains continuity on the T lead with contact M1 after L relay releases. The PBX station is now connected to the CPE through transformer T1 and the CT and CR leads. S relay previously released opens its M3 contact to release L relay. Contact M7 of L relay opens to indicate to the CPE that the CP line is released.

#### **Disconnect After Cut-Through**

**4.06** When a call is established and the station is cut through, the L and S relays are operated. When the PBX station or CO disconnects and opens the loop, the S relay releases and causes L relay to release. L relay released opens contact M7 on the CCO1 and CCO2 leads to indicate that



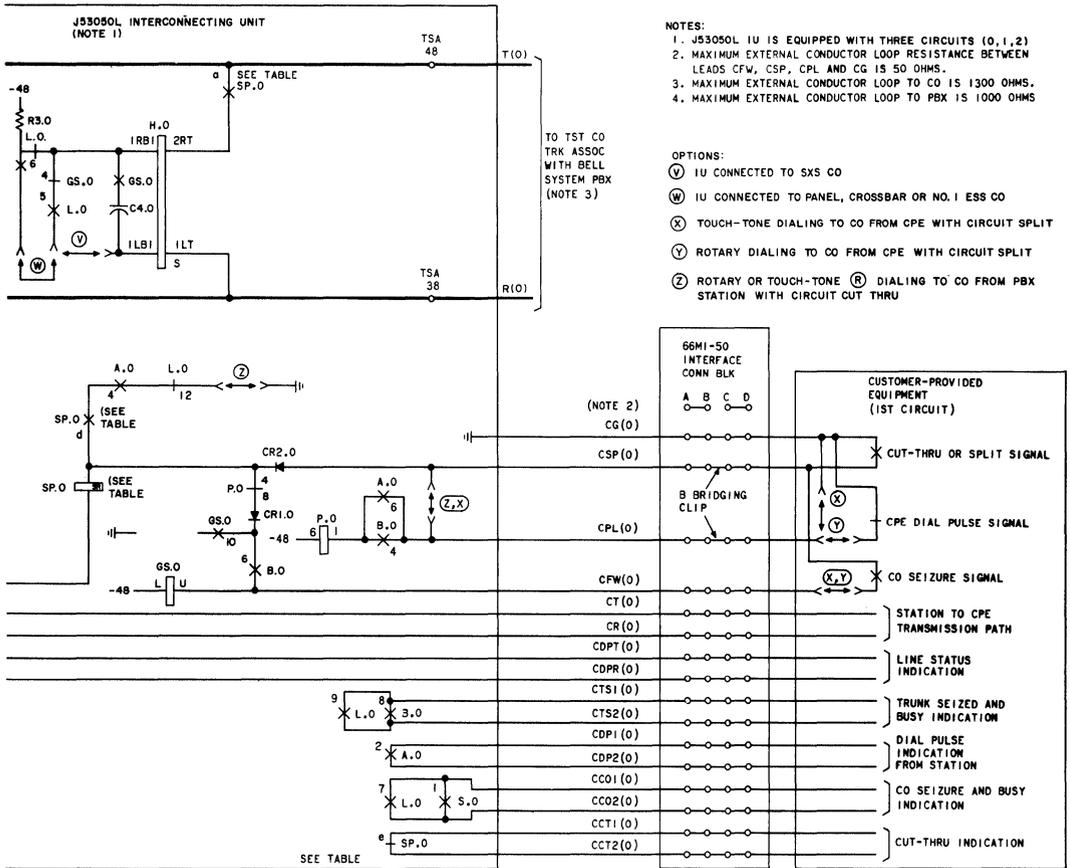


Fig. 5—Schematic Diagram-Voice Connecting Arrangement TSP (Sheet 2)

the CFW and CSP leads, the GS relay operates from ground on the CSP lead and connects ground to resistor R4 through contact B7 of the unoperated B relay. This will shunt the winding of SP relay. The CPE contact closure on the CSP and CG leads cannot operate the SP relay and the IU will remain cut through. If the PBX station or CO disconnects, the circuit will revert to the idle condition and

remain cut through until the contact closure on the CFW lead is removed.

**VOICE CONNECTING ARRANGEMENT TSP1**

**Outgoing Call (Z Option)**

**4.08** The sequence of events for trunk seizure is the same as in 4.03. After receiving the administrative information from the PBX station, the CPE opens the contact closure on the CSP and CG leads, and the P relay releases (fast release). The P relay released operates the GS relay from ground through diode CR1. The GS relay operated connects ground to the R lead to the CO, and the CO returns ground on the T lead to operate the H relay and GS relay locks up to ground through its own contact M10. The H relay operated closes contact M1 to operate L relay from ground. The L relay operated closes contact M11 to connect the primary winding of T1 to the CO line, opens the hold path to the SP relay, and removes ground from the R lead. S relay operates from CO line current and closes contact M1 on the CCO1 and CCO2 leads to indicate CO line seizure to the CPE. The S relay also provides a lock up path for the L relay through its M3 contact. The SP relay released cuts through the PBX station to the CO line and provides a closure on the CCT1 and CCT2 leads to the CPE to indicate the split has been removed. The SP relay released causes the A relay to release. The A relay releases B relay. B relay released causes the GS and P relays to release. The PBX station receives CO dial tone and may proceed to dial. If the CPE should request the IU to split after cut-through, the sequence of events would be the same as in 4.05.

**Power Failure and CPE Out of Service**

**4.09** When the trunk is split and a power failure occurs or the CPE is out of service and the CSP and CG leads are open, the SP relay will release. The SP relay released connects the T and R leads from the PBX CO trunk circuit directly to the CO line. This will permit outgoing calls during the power failure condition. A request signal from the CPE to split the trunk will have no effect until power is restored. If a call is in progress and power is restored and the CSP and CG leads are closed, the SP relay will operate causing the CO to disconnect and the PBX station will receive PBX dial tone.

**4.10 *Interface Lead Designations and Functions:***

- (1) The CT and CR leads provide a transmission and TOUCH-TONE® signaling path from the CPE to either the PBX station or the CO. Excessive transmission levels will be limited by RV1 and RV2 across T1.

- (2) The CFW and CG leads provide a ground start signal to the IU when requested by the CPE. The CPE contact closure on these leads is normally open and is closed when the CPE desires to seize the CO line in the split mode. This contact must close and then open after cut-through. If this contact is not opened after cut-through, the circuit will remain cut through.
- (3) The CSP and CG leads provide the split or cut-through signal from the CPE. The CPE contact closure on these leads is a normally open contact and is closed in the idle or split condition and opened to cause cut-through.
- (4) The CPL and CG leads are used for rotary dialing from CPE to CO.
- (5) The CTS1 and CTS2 leads provide a contact closure to the CPE to indicate that the PBX CO trunk has been seized and is busy.
- (6) The CDP1 and CDP2 leads provide a contact closure to the CPE to indicate dial pulsing from the PBX station while in the split mode.
- (7) The CCO1 and CCO2 leads provide a contact closure to the CPE to indicate that the associated CO line has been seized and current is flowing in the loop to the CO.
- (8) The CCT1 and CCT2 leads provide a contact closure to the CPE to indicate that the PBX CO trunk has been cut through and the split condition is removed.
- (9) The CDPT and CDPR leads provide line status information (busy, dial pulsing, TOUCH-TONE® signaling, etc) when the circuit is in the split or cut-through condition.

**5. MAINTENANCE**

- 5.01** When trouble is reported, check for blown fuses, loose or broken connection.
- 5.02** Precautions should be taken when performing tests to avoid affecting service to the customer. Local instructions should be followed with reference to notifying the customer before performing tests.

**5.03** Open the 16 leads to the circuit under test by removing the B bridging clips at the 66M1-50 interface connecting block. Make all test connections on the telephone company side of the interface connecting block.

**5.04 Tests—J53050L Interconnecting Unit:**  
(See Fig. 6)

(a) **Outgoing call**—If necessary, arrange PBX so that trunk under test will be first choice. From a PBX station, dial the access code for the one-way outgoing trunk. Dial tone should be received from the CO. If not, check trunk circuit and connections to IU. If dial tone is received, dial 1000-Hz test tone and verify satisfactory transmission. Check that continuity is present between leads CCT1 and CCT2 and leads CCO1 and CCO2 at the interface connecting block.

(b) **Restricted call**—Strap leads CSP and CG at the interface block. SP relay will operate transferring the PBX CO trunk and 1013A hand test set from the CO line to the CT and CR leads. Continuity should be present between leads CDP1 and CDP2 and leads CTS1 and CTS2.

(c) **CO seizure**—Strap leads CFW and CG at the interface block. GS relay will operate to ground the ring side of the CO line, and CO dial tone will be heard on the CT and CR leads at the interface block. Continuity should be present between leads CCO1 and CCO2 at the interface block and 48V line voltage present on the CDPT and CDPR leads. If CPE is using rotary dialing (option Y), momentarily strap leads CPL and CG. P relay will operate to break dial tone and CO dial tone will no longer be heard on the CT and CR leads. If CPE is using TOUCH-TONE dialing (option X), tests can be made on the CR and CT leads to see if tone address signals are being passed from the CPE to the CO. If dialing to the CO from the PBX station with the IU in the cut-through mode (option Z), remove strap between the CSP and CG leads. The PBX CO trunk is connected to the CO line. Leads CCT1 and CCT2 will provide a closure to the CPE to indicate the circuit is in the cut-through mode.

**5.05** If tests are satisfactory, remove all test connections to return the circuit to normal

and replace the B bridging clips on the 66M1-50 interface connecting block.

**5.06** When trouble is suspected in the J53050L IU, isolate the trouble and clear it using standard maintenance procedures.

**5.07** When trouble is indicated in the transmission path to CO or PBX, use normal practices to perform circuit transmission tests.

**5.08** When in the judgment of the repairman the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).



*Do not attempt any tests or repairs on the CPE.*

## 6. CONNECTIONS

**6.01** For connecting information refer to Fig. 4 and Tables A, B, and D.

**6.02** The CPE should always have CPL connected to CG in the idle condition.

**6.03** The following are typical one-way outgoing CO trunk circuits.

PBX	TRUNK CIRCUIT
701 and 740 PBX	SD-5E001-01 and SD-65657-01
756 PBX	SD-65752-01
770 PBX	SD-1E340-01
800A PBX	SD-1E013-01 and SD-1E013-02 SD-1E015-01 and SD-1E015-02
801A PBX	SD-1E306-01
805A PBX	SD-1E213-01
812A PBX	SD-1E402-01

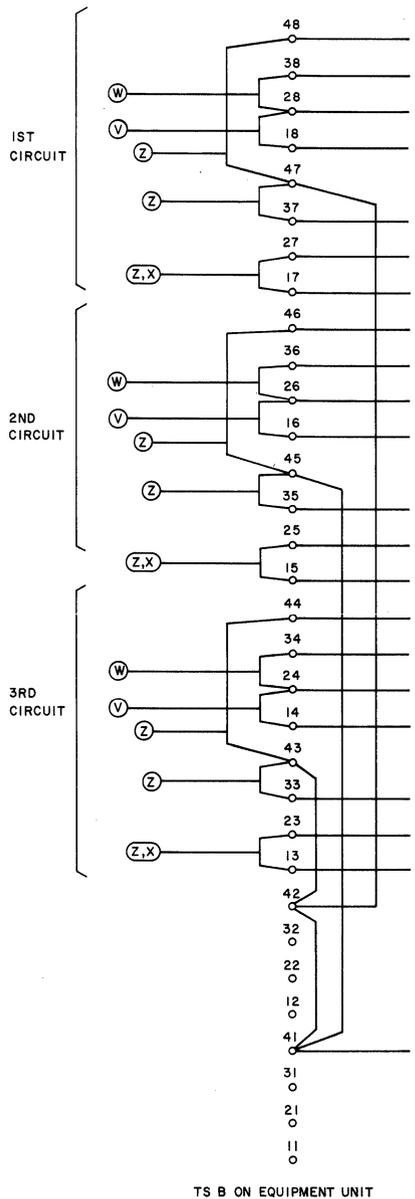
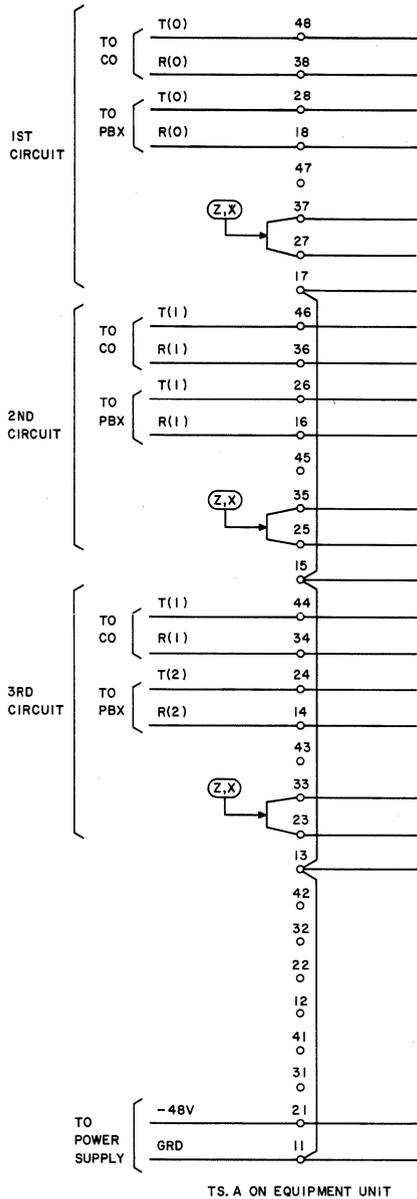


Fig. 6—Voice Connecting Arrangement TSPXY and TSPZ1—Connections