

PROTECTIVE CONNECTING ARRANGEMENTS

RDMZR AND RDY

1. GENERAL

1.01 This section provides identification, installation, operation, maintenance and connection information for the KS-20721, List 1 and List 2 general purpose station couplers when used in Protective Connecting Arrangements (PCA) RDMZR and RDY.

1.02 This section is reissued to:

- Change test procedure
- Revise Ordering Guide
- Remove extra circuit packs from Fig. 5
- Add note to Table B
- Clarify use of KS-20721, List 12 voice control—see 4.03(c)
- Replace the term Voice Connecting Arrangement (VCA) with Protective Connecting Arrangement (PCA).

1.03 The KS-20721 station coupler (Fig. 1) is used to provide services similar to those provided by the KS-19522 recorder coupler for answering sets and recorders. However, the plug and wiring connections may be different and substitution should not be made without customer approval.

1.04 The customer should be informed by the manufacturer or supplier of the equipment as to the proper PCA to be used with his equipment.

1.05 If the customer wants a copy of the Technical Reference which covers any of the above PCAs, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

1.06 *Lettered Steps:* A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

1.07 The KS-20721 station coupler is a general purpose station coupler used with several different PCAs. Only features and options used with the arrangements in Table A are covered. Avoid alteration of the PCAs to provide services other than their design intent.

1.08 *Protective Connecting Arrangements RDMZR and RDY:* These connecting arrangements provide the means for automatically connecting customer-provided (CP) answer-only terminal equipment; typically, answering sets, recorded dictation equipment, and loudspeaker paging systems, to the telecommunications network. PCA RDY has all the features of RDMZR and, by means of the List 12 voice control, provides automatic volume limiting on incoming calls and voice controlled disconnect for customer-provided equipment (CPE) that are not equipped with that feature.

1.09 An associated telephone company telephone set may make a normal outgoing call with either of the arrangements when the station coupler is not in operation.

1.10 The KS-20721, List 15 test set is used to test the station coupler.

1.11 This issue of the section is based on the following drawing:

SD-69903-01, Issue 5B—KS-20721 Station Coupler

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

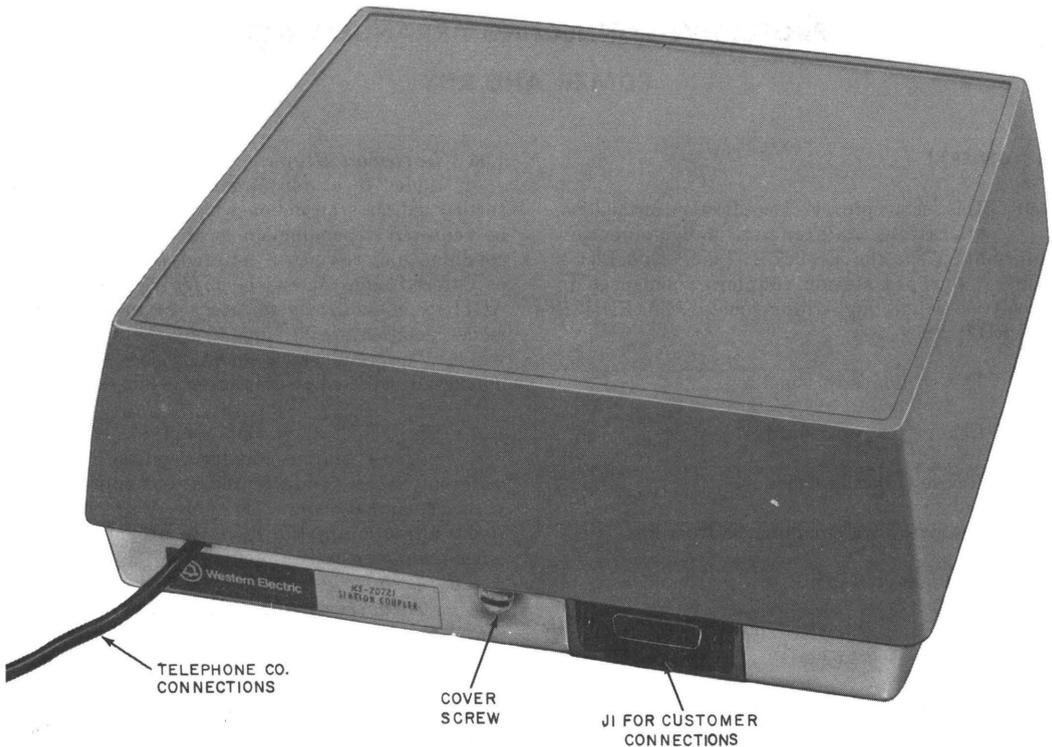


Fig. 1—KS-20721, List 1 and List 2 Station Coupler

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

2. IDENTIFICATION

PURPOSE

- To provide facilities for connecting various types of CPE to the telephone line
- To limit excessive signal levels from CPE and to provide protection for telephone company personnel and facilities against hazardous voltages to insure longitudinal balance and to repeat network control signaling.

APPLICATION

- Used to connect a CP recorder and/or announcement set to an exchange line for 2-way transmission.

ORDERING GUIDE

◆ Basic Units

- Coupler, Station, KS-20721, L1 (Fig. 1 and 2)—used for PCA RDMZR
- Coupler, Station, KS-20721, L2 (Fig. 1 and 3)—used for PCA RDY

The List 2 comes factory equipped with the KS-20721 L1 station coupler, KS-20721 L12 voice control, and KS-20721 L10 hinge

assembly. The three units may also be ordered separately and assembled in the field (see 2.02 and 2.03).

Optional Units

When coupler is to be powered by telephone company, provide:

- Transformer, 2012B (one per coupler)

or

- Unit, Power, 19-Type (or equivalent dc supply) for multiple installations (see 3.09).

Associated Apparatus

- Battery, KS-6571 (or equivalent)—required for testing if coupler is powered by CPE
- Set, Test, KS-20721, List 15 (Fig. 5)—see 2.05
- Set, Test, Hand, 1013A (or equivalent)
- Tool, KS-19192, List 1 (not required on later model units which have slotted cover screws).⚡

DESIGN FEATURES

2.01 The KS-20721 station coupler provides the following features:

- DC isolation and high-voltage surge protection
- 20-Hz ringing detection
- Network control signaling (off-hook and disconnect)
- 2-way voice transmission
- Voice-controlled disconnect (RDY only)
- AC or DC powered.

2.02 The KS-20721, List 1 station coupler (Fig. 2) is the basic unit designed to be field equipped with a KS-20721, List 10 hinge assembly for mounting the optional circuit pack. The circuit pack is equipped with quick connect connectors for easy installation.

2.03 The KS-20721, List 2 station coupler (Fig. 3) consists of a KS-20721, List 1 station coupler with a KS-20721, List 10 hinge assembly and KS-20721, List 12 voice control, factory installed.

2.04 The List 12 voice control (Fig. 4) consists of a speech detector and a 13-second timer that is kept reset by pulses from the speech detector when voice signals are present on the telephone line. In the absence of speech signals, the timer will time out in approximately 13 seconds disconnecting the coupler from the line. However, the CO receiver off-hook tone generator, if applied to the line, will prevent operation of the List 12 voice control. An automatic volume limited (AVL) amplifier is part of the speech detector and provides a relatively constant -5 dBm speech level at 600 ohms to leads AVL and ground. The customer may use this AVL amplifier to drive a tape recorder, paging system, or other equipment. ⚡The List 12 voice control is provided only with PCA RDY to provide the features of the Y option (see Tables A and C).⚡

2.05 The KS-20721, List 15 test set plugs into the connector on the station coupler and is used with a 1013A hand test set (or equivalent) to test the operation of the coupler independent from the CPE (Fig. 5).

3. INSTALLATION—KS-20721, LISTS 1 AND 2 STATION COUPLERS (Refer to Tables A and B.)

3.01 The location and method of installing the KS-20721 station coupler shall be consistent with standard practices. The KS-20721 station coupler is designed for wall or shelf mounting, weighs 4 lbs, measures approximately 9 inches square by 3 inches deep, and has a metal base with plastic cover. (Cover screws require KS-19192, List 1 tool for early models, screwdriver for later models, and may be changed by the installer.)



Early models had special quarter turn fasteners; current models have conventional captive screws which fasten clockwise and release when turned counterclockwise. On the early models, turn fasteners clockwise only to open or close. (Fastener may break if turned counterclockwise.)

3.02 A 15-pin connector (J1, Fig. 1) is located on the base of the unit to connect the transmission

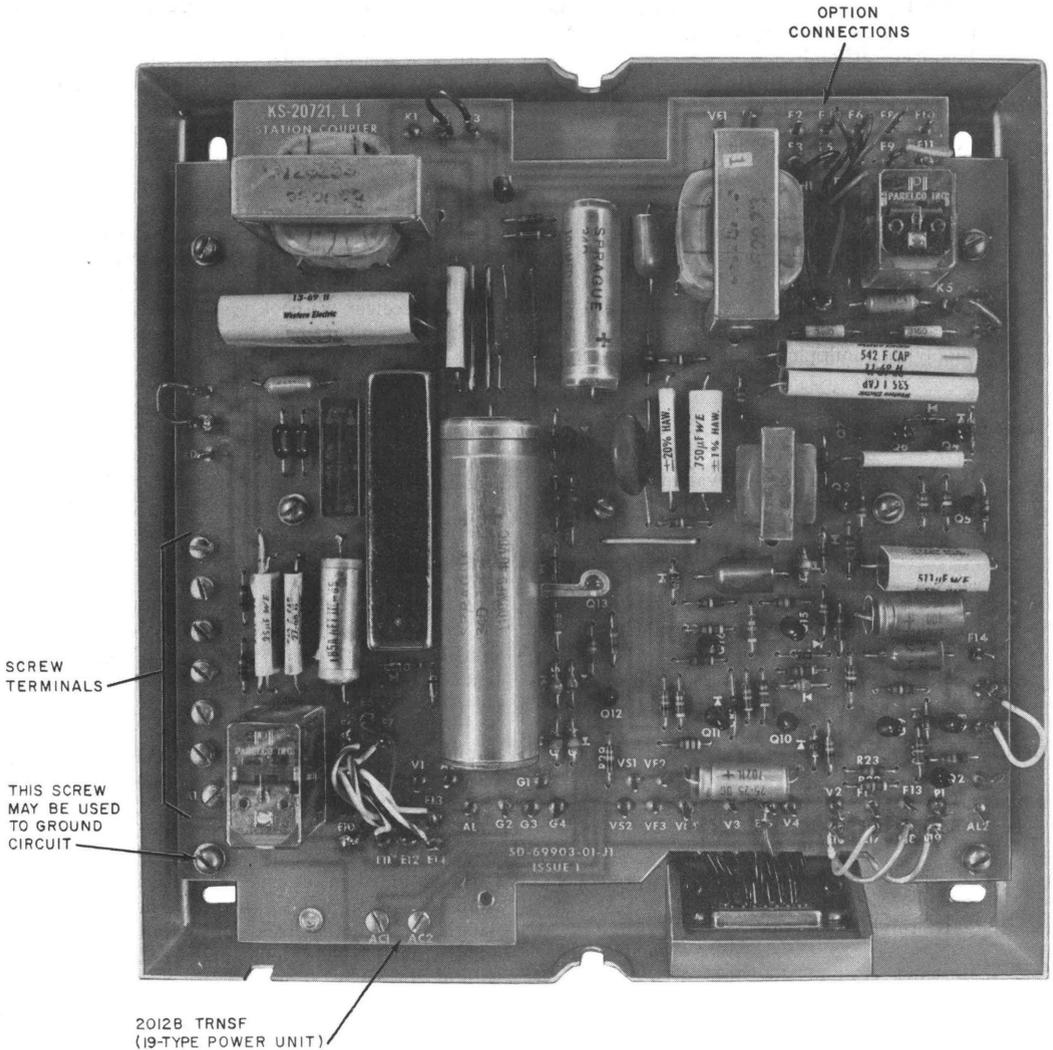


Fig. 2—KS-20721, List 1 Station Coupler, Cover Removed

path and control leads to the CPE by means of a CP cable equipped with an ITT-Cannon Electric or Cinch Mfg. Co. No. DA-19603-403 plug with Hood No. DA-51225-1. Screw terminals on the left side of the printed circuit board (Fig. 2) provide connections to the CO line, telephone set, and 2012B power transformer (or power supply). Flexible

jumper leads with connectors provide for installation options.

3.03 The station coupler should be located in a place mutually agreeable to the customer and telephone company, readily accessible for maintenance, and convenient for customer connection.

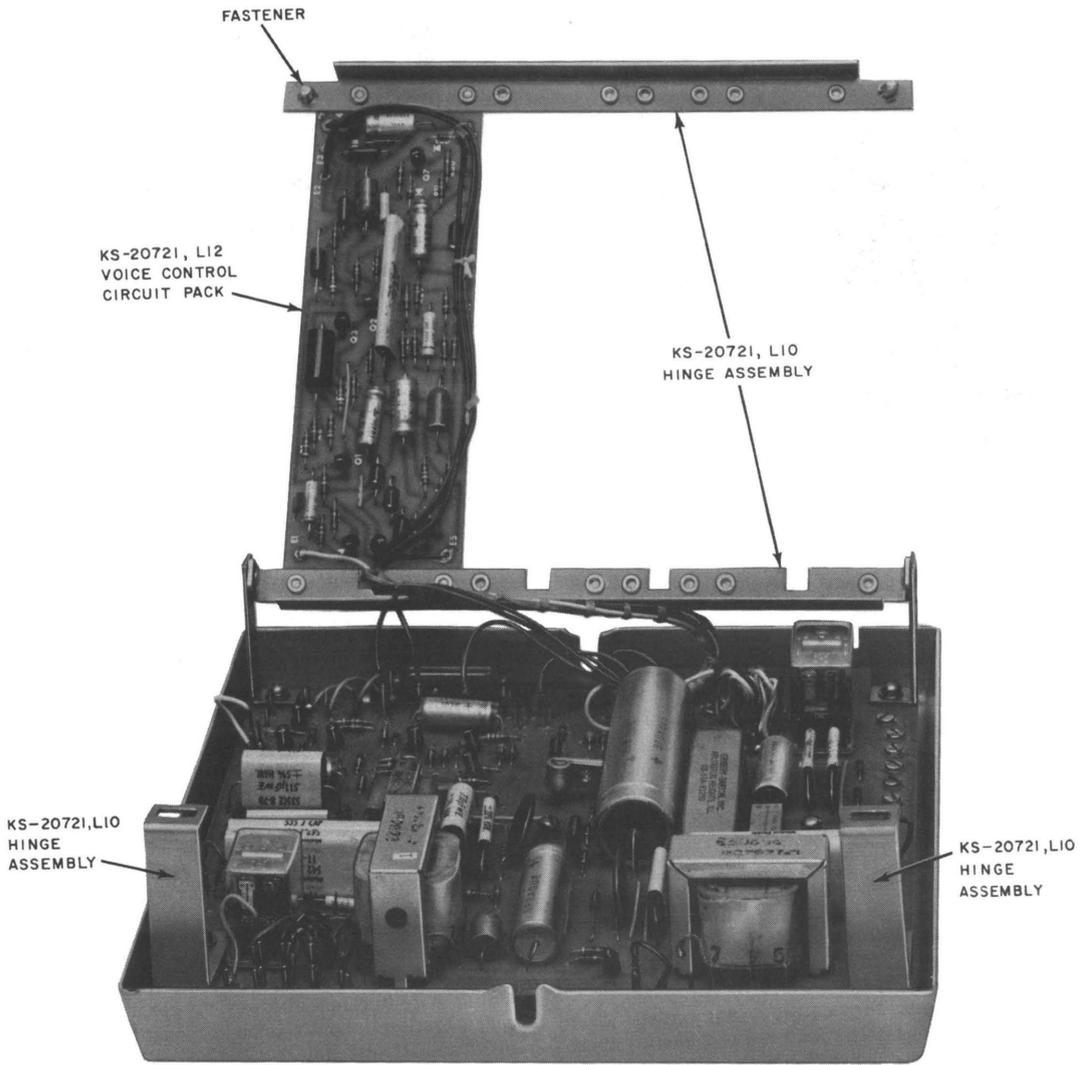


Fig. 3—KS-20721, List 2 Station Coupler

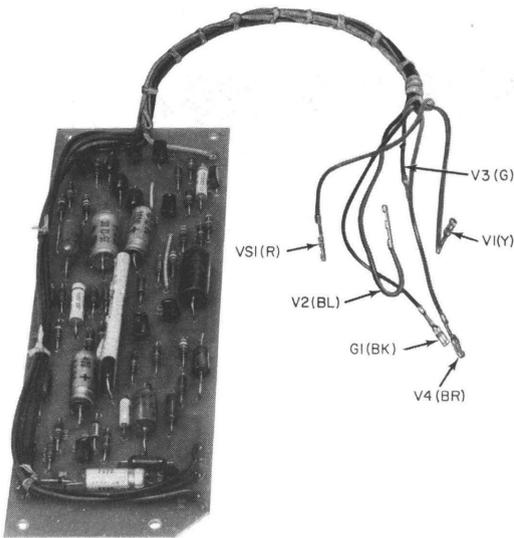


Fig. 4—KS-20721, List 12 Voice Control

◆ When a telephone set is associated with the coupler, locate coupler within 5 feet of telephone set, if practicable. ◆ When mounting coupler with screws, do not overtighten and bend base. Mount the unit close to a 115V ac convenience outlet not under control of a wall switch when power is provided by a 2012B transformer or 19-type power unit.



Complete all installation work before connecting the power supply or connecting the CPE.

3.04 ◆ **Options:** Provide the wiring options given in Table A. The features provided by these options are explained in Table C. **These are the only options that are to be provided.** Wire the options by moving the flexible jumpers with connectors to the terminals in Table B. Unused leads should be stored on the terminals given in Table B. For PCA RDY, if the KS-20721 List 12 is to be field installed, proceed with the circuit pack installation given below. ◆

3.05 **Circuit Pack Installation:** For PCA RDY installations where the KS-20721, List 2 is

not used, the List 12 must be added to the List 1 as follows:

- (1) Remove the cover from the station coupler using the KS-19192, List 1 tool or screwdriver.
- (2) Attach KS-20721, List 10 hinge assembly to the four corner screws mounting the List 1 board. Refer to Fig. 3.
- (3) The installer can mount the circuit pack on the internal mounting frame formed by the hinge assembly. Place board in correct position on frame (refer to Fig. 3 or cover label) and secure with four corner mounting screws furnished with circuit pack.
- (4) Connect the flexible jumper leads on List 1 board to provide the required options called for in Table A by using the connecting information given in Table B (see 3.04).
- (5) Provide option Y by plugging the connecting leads from the List 12 board into corresponding terminals on List 1 board per Table B and Fig. 4. Dress leads to avoid interference with boards and cover and secure leads with cable clamp provided.
- (6) Close hinge assembly and fasten the two top corner fasteners; replace cover.

Connections

3.06 ◆ If an associated telephone company telephone set(s) is supplied, connect the telephone set mounting cord directly to station coupler; otherwise, interconnect set and station coupler using D station wire. Secure telephone set mounting cord or D station wire to clamp at lower left corner of station coupler. All telephone sets on line must be connected to T1 and R1 of coupler.



If there is no telephone set on the line, use a ringer simulator (to prevent line testing open). Use an AA-1A ringer simulator. If not available, an EIC ringer installed and silenced as described in Section 501-251-100 may be used.

3.07 Connect the CO line to screw terminals T and R. Finger-tighten all unused terminal screws. ◆

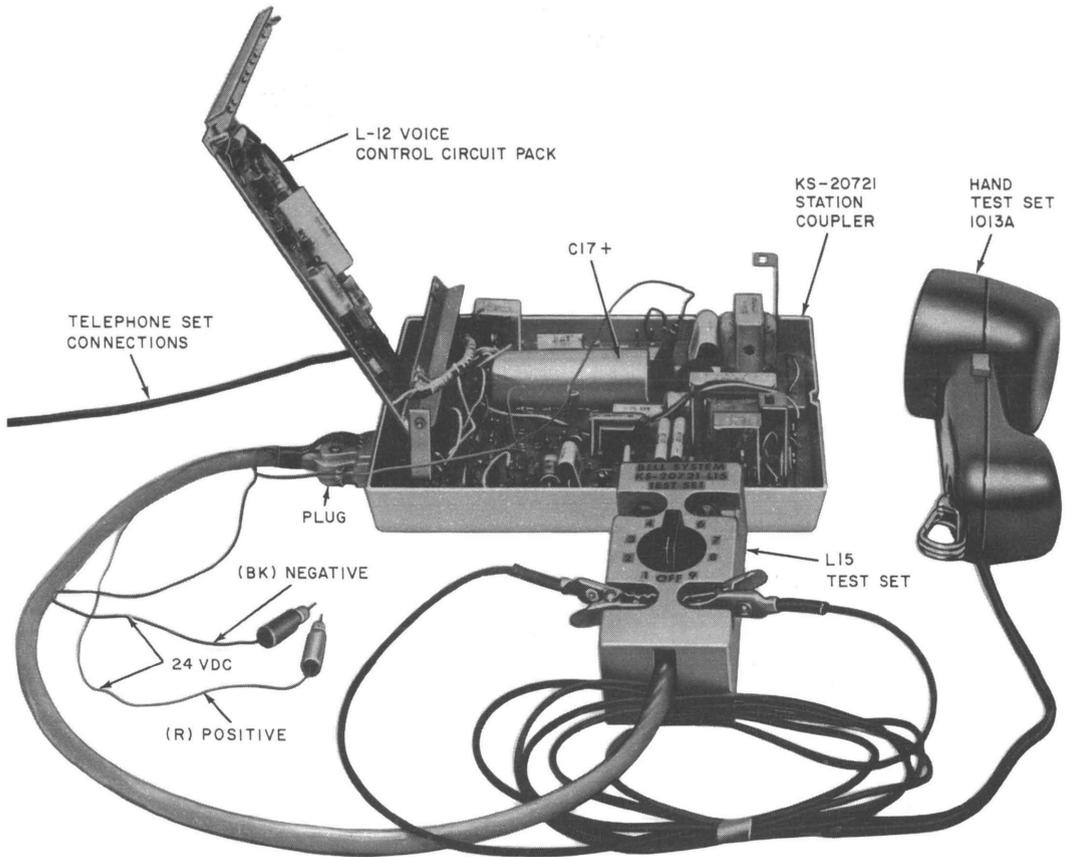


Fig. 5—KS-20721, List 2 Station Coupler With KS-20721, List 15 Test Set and 1013A Hand Test Set

TABLE A

OPTION TABLE
(SEE NOTE)

PROTECTIVE CONNECTING ARRANGEMENT	TYPICAL CUSTOMER PROVIDED EQUIPMENT	KS-20721 STATION COUPLER LIST NUMBERS	REQUIRED WIRING OPTIONS*
RDMZR	Answering Set	List 1	Q,R,Z
RDY	Answering Set	List 2†	Q,R,Y,Z

Note: Do not provide options other than those shown required.

* Features described in Table C.

† List 2 consists of Lists 1, 10, and 12.

♦ TABLE B ♦

WIRING OPTIONS FOR FIELD INSTALLATION

	OPTION LEADS COLOR	FROM TERMINAL ON L1†	TO TERMINAL ON L1 BOARD			
			OPTIONS			
			Q‡	R	Z‡	Y
LEADS ON L1	G	N			N	
	BL	K1				
	S	K4				
	O	F10				
	BR	F6				
	V	F4				
	BK	F5		F1		
	Y	P2	P2			
	S*	F8			F8	
	BL*	F7			F7	
	W	M				
LEADS ON L12	R					VS1
	BK					G1
	Y					V1
	BL					V2
	G					V3
	BR					V4

* These leads originate from J1 connector.

† Verify that leads are stored on these terminals when not in use.

‡ Options Q and Z are factory-wired.

Power

3.08 Power for the coupler may be supplied either by the telephone company or the customer. If power is supplied by the telephone company, either a 2012B transformer or suitable dc supply (19-type or equivalent) may be used.

3.09 A 2012B transformer must not be used to supply more than one coupler. A suitable dc supply (19-type or equivalent) can supply a maximum of 25 PCA RDMZR or 21 RDY connected to the dc signal output. The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor to provide current limiting. The power supply may be connected with either polarity to the AC1 and

AC2 terminals. ♦ The internal, full-wave bridge rectifier will apply the correct voltage polarity to the station coupler. **Do not ground either terminal of the power supply.** (Due to noise considerations, a power supply used in this application is an exception to the grounding instructions in Section 167-440-201.) Power supply current drain of the KS-20721, List 1 station coupler in the PCA RDMZR is .060 ampere operating current, .012 ampere standby current, and 1 ampere initial surge current. Adding the List 12 voice control to the List 1 coupler increases the operating current to .070 ampere total.♦

3.10 Line noise pickup, cross-talk, etc, may occur between units connected to a common power supply. When this occurs, it may be cleared by

TABLE C
WIRING OPTION FEATURES

OPTION	FEATURE
Q	Provides for direct control of line relay PR for DC pulse repeating.
R	Connects RU relay to ring detector.
Z	Connects transmission circuit to tip side of telephone line. Used with option R to provide an isolated contact closure to customer over leads RU1 and RU2.
Y	Adds List 12 circuit to provide voice controlled disconnect supervision and volume limited output to CP equipment.

grounding the housing of each station coupler. The circuit board mounting screw *below* terminal A1 may be used for grounding the circuit.

3.11 When power is supplied by a 2012B transformer (or 19-type power unit), a current limited, positive dc voltage source is provided to the customer on lead B1 (ground return on lead B2) furnishing a charging current of 2.5 milliamperes which may be used to keep a CP rechargeable battery (18V, 150 to 500mA) charged during normal operation to provide power when commercial power fails. If the customer furnishes power, 21 \pm 5 volts dc must be connected to leads B1 and B2 through plug (P1).

3.12 After installation is completed, perform tests given in Part 5 to check for proper operation before CPE is connected.

4. OPERATION

General

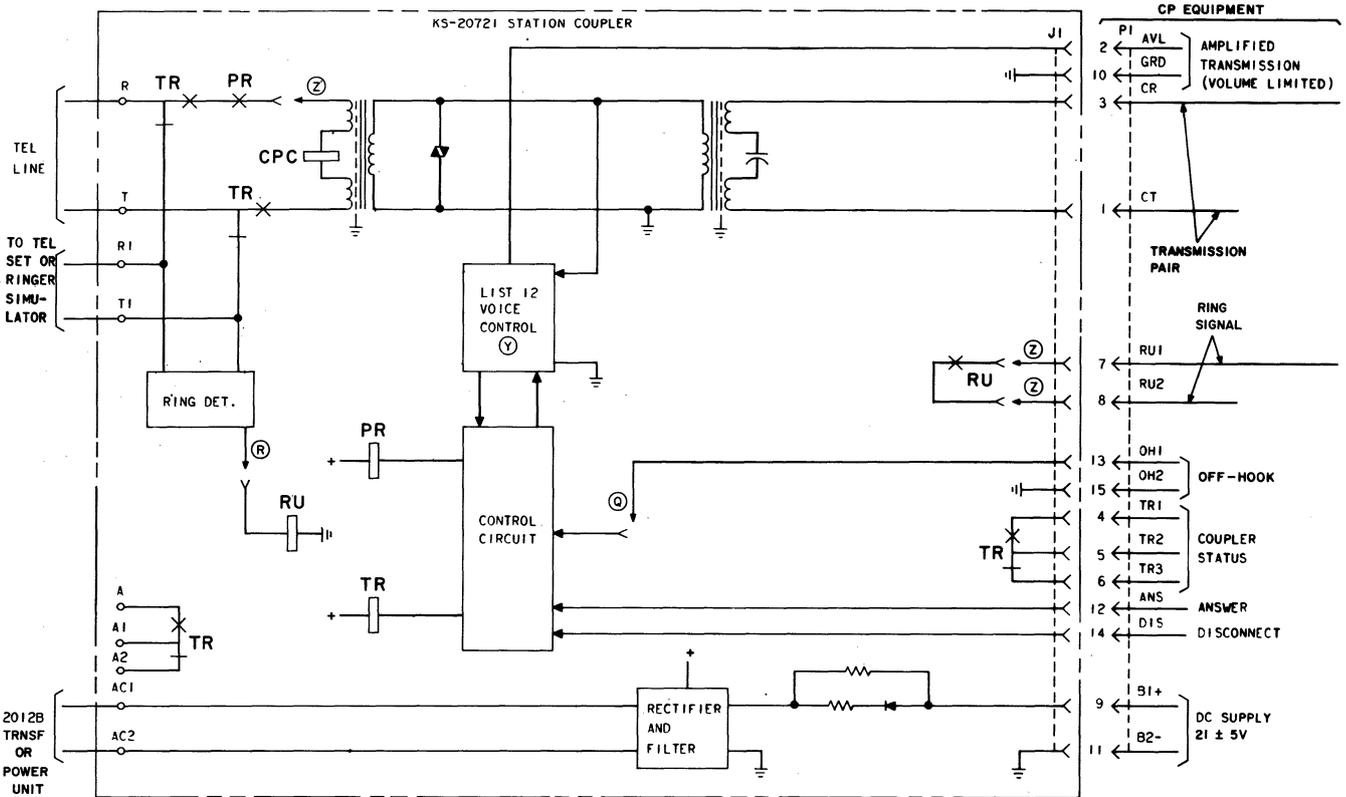
4.01 The KS-20721, List 1 station coupler (Fig. 6) consists of a 20-Hz ringing signal detector operating ringup (RU) relay, a supervisory control circuit operating line transfer (TR) relay, dial pulsing (PR) relay, CPC relay, a transmission circuit consisting of two transformers in tandem, a peak voltage limiter, and a power supply rectifier and filter circuit.

4.02 When 20-Hz ringing is detected by the ring detector circuit, relay RU will operate for

approximately 1 second during each 2-second ringing cycle closing leads RU1 and RU2 to indicate ringing to the CPE. The ring detector circuit also causes PR relay to operate and hold for about 4 seconds. The CPE may answer the call by:

- (a) Closing leads OH1 and OH2, or
- (b) Closing lead ANS to lead B1+ momentarily (at least 1 second).

Performing (a) causes TR relay to operate, seizing the line, since PR relay was already operated by the ring detector. Performing (b) causes PR relay to stay operated and causes TR relay to operate. Telephone line current operates CPC relay which causes PR and TR relays to stay operated after lead ANS is disconnected from lead B1+. Either of the two actions listed above will cause the coupler to terminate the telephone line and answer the incoming call. Two-way transmission is provided immediately upon line seizure; leads TR2 and TR3 are opened, and leads TR1 and TR2 are closed indicating line seizure. When the ANS lead is closed to B1+ to answer the call, leads OH1 and OH2 must not be connected. Line current must be present at all times for operation of the connecting arrangement. If line current is interrupted momentarily, inadvertently or otherwise, after using the ANS and B1+ leads to establish line seizure, a disconnect signal will be given to the CPE via the status leads (TR1, TR2, TR3).



- NOTES:
1. CIRCLED LETTERS (Z), (R), ETC DENOTE WIRING OPTIONS
 2. PI IS CUSTOMER PROVIDED PLUG.

Fig. 6 → KS-20721 Station Coupler, Internal Wiring Options ←

Disconnect Incoming Call

- 4.03** The coupler will remain connected to the telephone line until:
- (a) The CPE opens the closure between leads OH1 and OH2.
 - (b) The CPE closes lead DIS to lead B2—
 - (c) List 12 voice control causes disconnect when speech is absent for approximately 13 seconds.
 - (d) The CO times out following calling party disconnect and momentarily opens the line toward the coupler (the CPE must have answered using ANS and B1+ and there must be no closure between OH1 and OH2).

Any of the actions described cause TR and PR relays to release, disconnecting the coupler from the line.



The open signal described in (d) above is not given by every CO. If the customer requires disconnect, he must order PCA RDY.

List 15 Test Set

- 4.04** The List 15 test set (Fig. 5 and 7) used with the 1013A hand test set (or equivalent) and a connecting cable terminated in a plug for connection to the station coupler permits checking of the coupler independent of the CPE.

- 4.05** When detailed circuit description and operation information is required, refer to CD- and SD-69903-01.

5. MAINTENANCE

- 5.01** When trouble is reported, verify that:

- Customer connector plug is secure in coupler.
- Power is being supplied to station coupler either by telephone company or CPE.
- Leads to CO line and telephone set are secure.
- CO pair and telephone set are good.
- Wiring options and coupler connections are correct. (Refer to Table B and Fig. 8.)

- 5.02** After performing steps in 5.01, if trouble still exists, perform the following test.

5.03 Apparatus Required:

- List 15 test set
- 1013A (or equivalent) hand test set
- KS-6571 (or equivalent) battery (if coupler is powered by CPE).

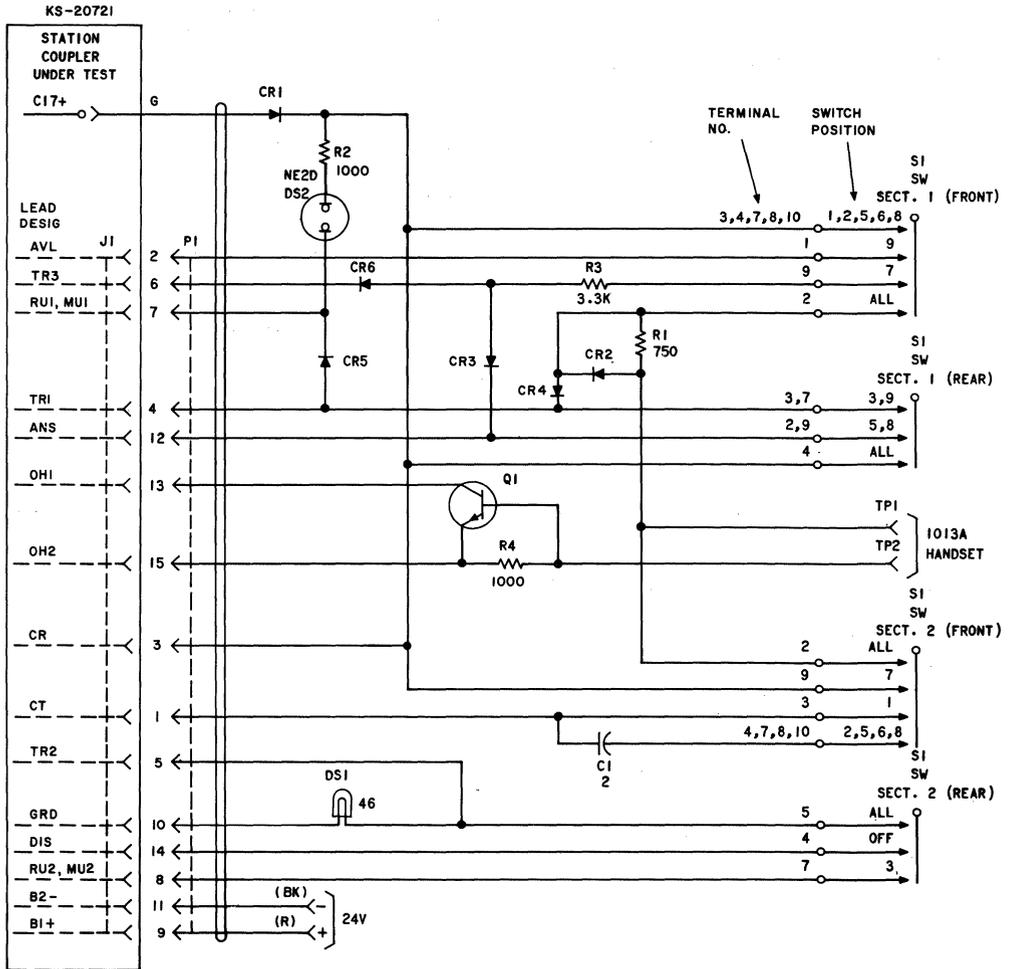


Fig. 7—KS-20721, List 15 Test Set Schematic

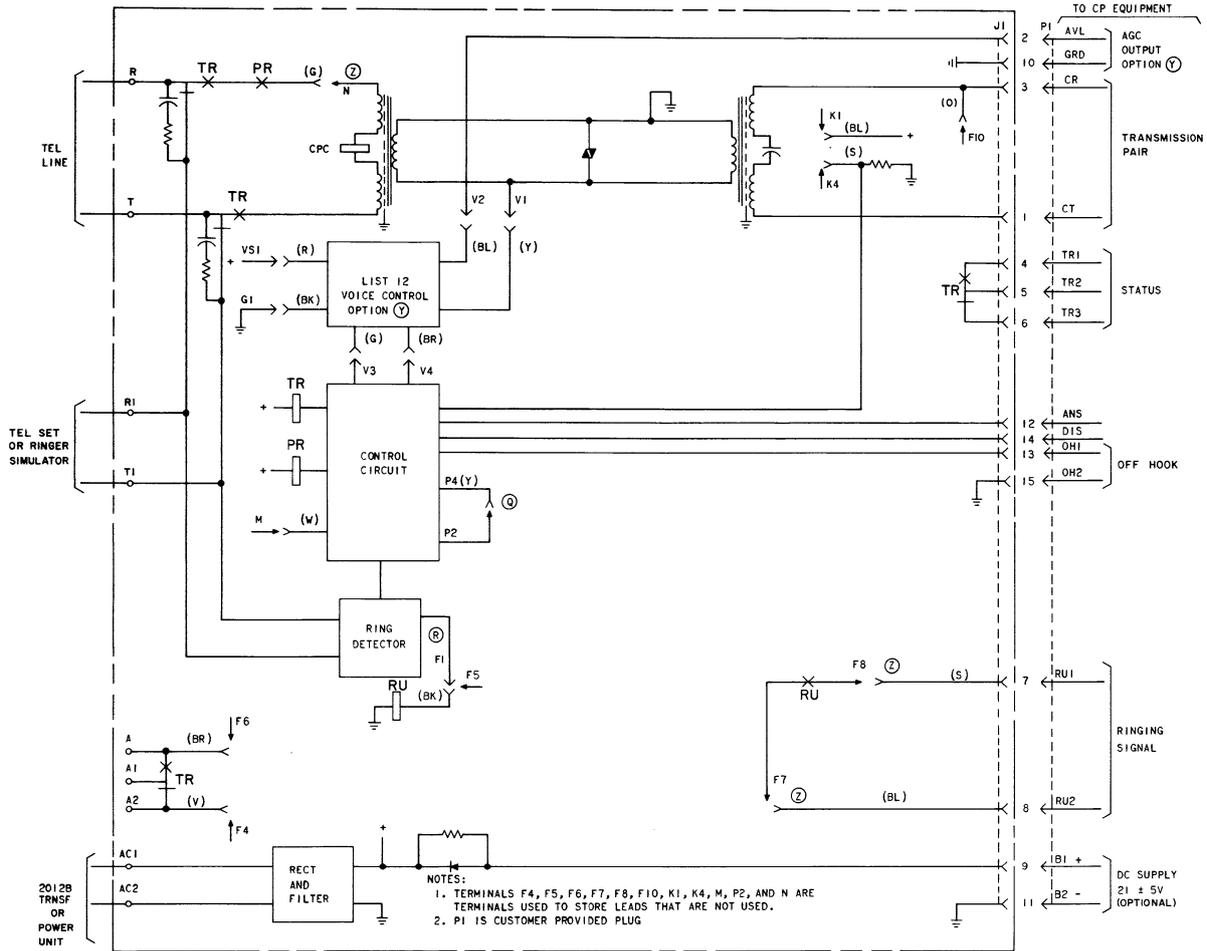


Fig. 8—KS-20721 Station Coupler, Simplified Schematic

5.04 *Preparation:*

Make all tests with CPE disconnected.

STEP	ACTION	VERIFICATION
1	Remove cover of station coupler using KS-19192, List 1 tool or screwdriver.	
2	Rotate selector switch on List 15 test set to OFF.	
3	Connect a 1013A (or equivalent) hand test set to terminals provided on test set (Fig. 5).	
4a	If coupler is normally powered by CPE— Use a 24V (KS-6571 or equivalent) battery and connect the pin-tipped red lead from the test set to +24V and black lead to -24V.	
5	Connect test set plug to receptacle on station coupler.	White lamp extinguished. Red lamp extinguished.

5.05 *Tests—RDMZR and RDY*

STEP	ACTION	VERIFICATION
6	Connect alligator clip on wire coming from the test set plug to the positive (+) terminal of capacitor C17 in the station coupler (Fig. 5).	
7	Operate switch on hand test set to MON.	
8	Rotate selector switch of test set to position 2.	
9	Operate switch on hand test set to TALK.	White lamp lighted. Dial tone heard in hand test set receiver in approximately one second.
10	Using the hand test set, dial the local test desk and request the testman to call back; proceed with Step 11 immediately.	
11	Operate switch on hand test set to MON.	White lamp extinguished.
12	Rotate selector switch of test set to position 3.	

STEP	ACTION	VERIFICATION
13	Testman returns call.	White lamp flashes in unison with ringing cycle.
14	Rotate selector switch of test set to position 5 to answer call.	White lamp lighted.
15	Operate test set switch to TALK position.	
16b	If testing PCA RDMZR— Rotate selector switch of test set to position 6.	
17b	Request testman to release the line and immediately operate switch on hand test set to MON.	
18b	Wait for disconnect.	White lamp extinguished within 1 minute (indicates disconnect).
	<i>When the coupler is connected to a SXS office, a loop current interruption may occur almost immediately after the calling party disconnects. The hand test set must be set to MON very quickly to catch the open indication and extinguish the white lamp. Not all central offices give an open indication upon disconnect. This should be considered before a coupler is replaced as defective.</i>	
19c	If testing PCA RDY— Request the testman to disable his transmitter while retaining talk battery on the line.	
20c	Operate switch on hand test set to MON, wait 20 seconds, then operate switch to TALK.	White lamp remains lighted.
21c	Rotate selector switch of test set to position 6 and talk for at least 10 seconds and request testman to remain silent for 20 seconds, then disconnect by operating hand test set switch to MON.	
22c	After talking, immediately operate switch on hand test set to MON and wait for disconnect.	White lamp extinguished in approximately 13 seconds after talking ends.
23	Rotate selector switch of test set to position 7.	White lamp remains extinguished. (If white lamp lights, verify that switch on hand test set is in MON position. Rotate selector switch of test set back to position 6, wait for lamp to extinguish, then rotate back to position 7 and proceed with test.)

STEP	ACTION	VERIFICATION
24	Rotate selector switch of test set to position 8.	White lamp lighted. Dial tone heard in hand test set receiver. (If there is an abnormal delay before proceeding to the next step, some offices may return a dial tone time-out indication. If this happens, rotate selector switch to OFF, then back to position 8; dial tone will return; proceed with test.)
25c	If testing PCA RDY— Rotate selector switch of test set to position 9. (The 13-second time-out starts at this time and may cause disconnect. If this happens, rotate selector switch to position 8, then back to 9, and proceed with test.)	White lamp remains lighted. Dial tone level is increased.
26b	If testing PCA RDMZR— Rotate selector switch of test set to position 9.	White lamp remains lighted. Dial tone silenced.
27	Rotate selector switch of test set back to position 8.	White lamp remains lighted.
28	Rotate selector switch of test set to OFF.	White lamp extinguished.
29	Disconnect test set from station connector and reconnect CPE.	
5.06	If coupler does not meet the above tests, replace coupler and/or circuit pack.	
5.07	If the tests are satisfactory, remove all test connections, restore circuit to normal, and follow local reporting procedures for CP trouble.	