

VOICE STATION COUPLERS

QCS TYPE

DESCRIPTION, INSTALLATION, MAINTENANCE & TESTS

	CONTENTS	PAGE
1.	GENERAL	317
2.	DESCRIPTION	318
	A. Physical Description QCS1A	318
	B. Physical Description QCS2B	319
	C. Functional Description	322
	Calling Procedure	322
	Answering an Incoming Call	322
3.	INSTALLATION AND CONNECTIONS	322
4.	MAINTENANCE	328
5.	TESTS	328

1. GENERAL

1.01 This section provides information required for installing and maintaining the Voice Station Coupler QCS1A and QCS2B. These couplers were previously coded QCT.

1.02 This section is revised to update information and include supplement and addendum.

1.03 The voice station coupler provides a means whereby customer provided telephone answering machines and alarm sending machines may be connected to the switched telecommunications network.

1.04 The voice station coupler is designed to provide the following:

- Isolation of customer equipment for the protection of the telephone plant and personnel.

- Detection of incoming ringing signals.
- Off-hook control which allows customer equipment to answer incoming calls automatically and to dial pulse for call originations.
- Exclude an associated telephone set.
- Two way transmission path.
- Internal ringing supply 65 to 95 volt, 60 Hz.
- Option to provide for 20 Hz ringing.
- Off-hook indicator to provide customer with voice station coupler status.
- "A" lead control for operation with key telephone equipment.
- Option to provide 24 V DC reserve battery by customer.
- Peak signal limiting, to protect the telephone network from high signal levels from the customer equipment.
- Disconnection under control of the central office if the customer's equipment fails to disconnect (QCS2B only).
- Limits voltage applied to customer equipment under line surge conditions to 30V peak.
- Provides test key for remote testing of the QCS2B unit only.

1.05 An associated telephone set may be operated in the conventional manner when the voice station coupler is not in operation.

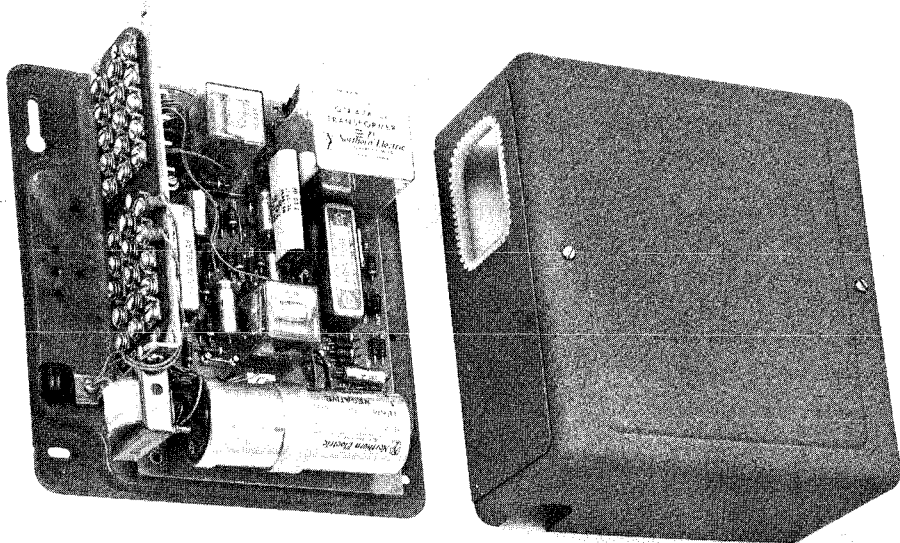


Fig. 1 — QCS1A Voice Station Coupler

1.06 An external transformer (type 2012B) is required to supply power for each station coupler.

1.07 ORDERING INFORMATION
Coupler Voice Station QCS2B
ASSOCIATED APPARATUS
Transformer 2012B

2. DESCRIPTION

2.01 The circuitry for the coupler is mounted on a single printed circuit board.

2.02 The major components of the voice station coupler consist of the ring detector, off-hook circuitry, peak signal limiter, ringing voltage transformer, rectifier and filter, remote disconnect circuitry and dial pulse repeating.

2.03 A functional schematic of these components is shown in Fig. 3.

A. Physical Description QCS1A

2.04 The voice station coupler QCS1A (Fig. 1) is a wall mounted unit measuring 6¾ inches wide, 6⅝ inches high and 3⅜ inches deep. The coupler weighs approximately 3 pounds and is enclosed in a metal apparatus box. Two key hole slots at the top and two screw holes at the bottom are provided on the base for mounting the unit on a wall or other vertical surface.

2.05 The terminal block which has 3 rows of 10 terminals is mounted on the left hand side of the apparatus box.

2.06 The top half of the block which has 15 terminals is for connecting the customer's equipment. See Table A for the designation of each lead at the interface. These terminals are accessible to the customer through an opening in the left hand side of the apparatus box cover.

2.07 The bottom half of the block which has 15 terminals is for connecting the telephone line and associated apparatus to the coupler. See Table B for lead designations.

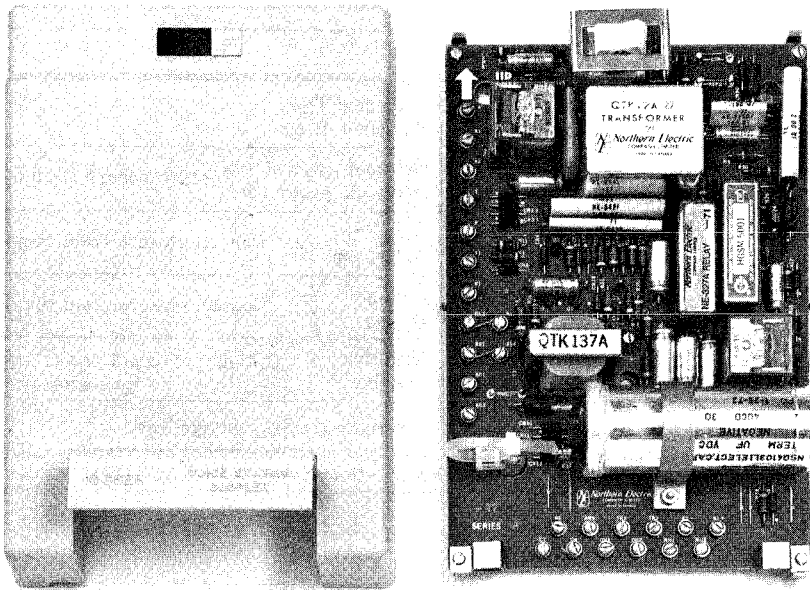


Fig. 2 — QCS2B Voice Station Coupler

B. Physical Description QCS2B

2.08 The coupler QCS2B (Fig. 2) is a wall mounted unit measuring 8 inches wide, 9 inches high and 2½ inches deep. The coupler weighs approximately 3 pounds and is enclosed in a plastic moulded box. Two key hole slots at the top and one key hole slot at the bottom are provided on the base for mounting the unit on a wall or other vertical surface.

2.09 The QCS2B couplers are similar to the QCS1A coupler in circuitry and compatible with the exception of the remote test key, located at the top of the couplers.

2.10 The test circuit consists of a non-locking test key. When the test key is operated it removes the transmission path from the customer

equipment and allows the verification of the ringing and on/off hook control circuitry.



ACCIDENTAL OR INTENTIONAL OPERATION OF THE "TEST" KEY DURING TRANSMISSION WILL INTERRUPT AND RELEASE THE LINE.

2.11 The interface terminal block for the connection of the customer provided equipment is located at the bottom of the coupler. The terminal designations for the customer are shown in Table A.

2.12 The terminal block for the connection of the telephone company equipment is located at the left side of the printed circuit board. The functional schematic is shown in Fig. 3 (Table B).

TABLE A

Terminal Number QCS1A Only	Terminal Designations QCS1A and QCS2B	Function
14 15	CT CR	Customer Tip Customer Ring
13 12	OH1 OH2	Off-hook control } Off-hook ground } Contact closure from customer
2 3	RU1 RU2	Ring } Indication } Contact closure from coupler
1 11	TR1 TR2	Coupler } Status } Contact closure from coupler
4 5	B2- B1+	Negative } Positive } Optional external power supplied by customer
25 22	RS ANS	Alternate ringing voltage lead. Optional customer control of transfer between auxiliary telephone set and CPE.
21 23 24	SPARE SPARE SPARE	

TABLE B

Terminal Number QCS1A Only	Terminal Designations QCS1A and QCS2B	Function
6 16	T R	Telephone line to CO, PBX or Key equipment
7 17	T1 R1	Connections to associated telephone set
8 18 28	A A1 A2	"A" Lead control contacts for associated key telephone equipment
19 29	AC1 AC2	18 volt AC power supply from external trans- former
26 27	RS1 RS2	Ringing input (60 Hz internal or 20 Hz external)
9 10 20 30	SPARE SPARE SPARE SPARE	

TELEPHONE COMPANY TERMINALS

CUSTOMER PROVIDED EQUIPMENT TERMINALS

C.O. K.T.E. OR P.B.X. LINE

ASSOCIATED TELEPHONE SET

OPTIONAL 20 HZ RINGING

KEY TELEPHONE EQUIPMENT

2012B

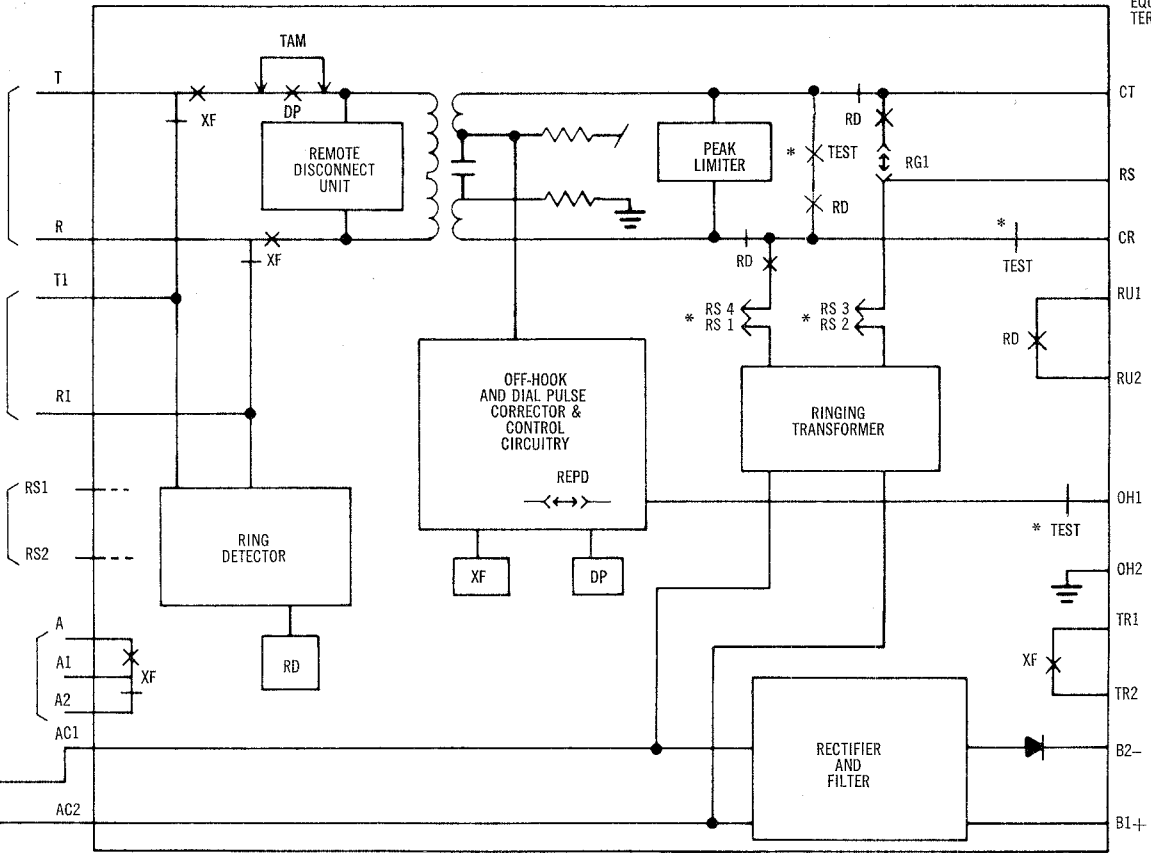


Fig. 3 — Functional Schematic of Voice Station Coupler

* QCS 2B UNIT ONLY

SECTION 463-233-900CA

C. Functional Description

2.13 Calling Procedure: To initiate a call, the customer's equipment provides a closure between the CT & CR leads. This provides a circuit for the XF relay to operate which disconnects the auxiliary terminals T1 and R1 from T and R, thereby disabling the associated telephone set. The XF relay contacts short circuits leads TR1 and TR2 and A and A1 which are used to provide other functions of the coupler. (Option K) Customer dials on CT and CR leads. (Option L) Customer dials on OH1 and OH2 leads. Either option will operate the DP relay in the control circuit, providing a closure to the central office. The L relay (remote disconnect circuit) operates from central office battery to provide a hold circuit for the XF relay (QCS2B only). The DP relay follows the pulses of the dial and merely repeats the dial pulses over its contacts out on the telephone line.

2.14 Answering an Incoming Call: The ring detector is activated (Fig. 3) when 20 Hz ringing is present on the line indicating an incoming call. The RD relay, part of the ring detector operates and releases in response to the ringing cycle (i.e., 2 seconds operated — 4 seconds released): The operation of relay RD causes a contact closure between terminals RU1 and RU2. It also causes 20 Hz or 60 Hz ringing voltage from the ringing transformer to be applied between terminals CR and CT or between terminals CR and RS, depending on whether or not the RG1 strap is in place (Option G).

Note: QCS1A Coupler introduces a 400 millisecond delay in the start of the ringing supply to customer equipment.

The customer's equipment should detect one of these ringing indications and must either terminate CT and CR with a resistive termination of 600 ohms or less (Option K) or the customer's equipment must also terminate OH1 and OH2 with a resistive termination of less than 100 Ω (Option L) to trip the ringing and answer the call.

If the customer's equipment places a 600 ohm or less termination between terminals CT and CR during the ringing silent interval, the "Ring Trip Circuit" will operate the "Off-Hook Control" which will operate relay XF.

A termination of 100 ohms or less placed across terminals OH1 and OH2 causes the Off-Hook Circuitry to operate, (during the ringing or silent interval) which operates the relay XF. The contacts of the XF relay will transfer the line from the associated telephone set to the voice station coupler and close the loop to trip ringing. The XF relay contacts also signal the associated key equipment, if provided, over terminals A, A1 or A2 and the customer's equipment over terminals TR1 and TR2. When (Option D) is specified the coupler will not operate to customer equipment seizure during the ringing interval. The coupler will recognize such condition only in the silent interval.

The calling party is now connected through to the customer equipment by the CT and CR terminals.

When the call is completed the customer's equipment will remove the termination on CT and CR or on OH1 and OH2 leads. This causes the Off-Hook Control Circuitry to release relay XF which disconnects the coupler from the line.

2.15 The Peak Signal Limiter limits the voice signals from the customer equipment to +3 dBm (measured across terminals CT and CR).

2.16 The voice station coupler is powered by the Rectifier and Filter which operates from a 2012B transformer.

2.17 The Remote Disconnect Unit monitors the loop current during a call. If the loop current is disconnected for more than 3 seconds the Remote Disconnect Unit will disconnect the coupler (QCS2B only) even though the customer's equipment is applying an Off-Hook termination to terminals CT and CR or OH1 and OH2. The circuit will restore to normal when the termination is removed from the CT-CR or OH1-OH2 leads.

3. INSTALLATION AND CONNECTIONS

3.01 The voice station coupler may be used with various types of central office lines, key telephone systems, and PBX lines that provide access to the switched network.



ALL INSTALLATION CONNECTIONS AND TESTS MUST BE PERFORMED PRIOR TO THE CUSTOMER MAKING ANY CONNECTIONS TO THE COUPLER.

3.02 The installation of the coupler should comply with general practices to ensure an orderly station arrangement.

3.03 The coupler is provided only to protect and isolate Telephone Company facilities from C.P.E. They should not provide supervision features not required to maintain isolation and protection. Telephone Company facilities should normally terminate on the "in" side of a coupler and the customer's equipment should normally terminate on the "out" side. Telco couplers should appear in the circuit at the immediate point of interconnection so that trouble sectionalization is possible.



DO NOT INSTALL NEAR HAZARDOUS LOCATIONS, MOISTURE, OR EXCESSIVE HEAT.

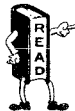
3.04 The coupler must be mounted vertically on a surface not subject to vibration. Provide space at the left of the coupler (QCS1A) for the customer to have access to the terminal strip. If a backboard is required the KS5796L7 backboard is recommended.

3.05 Locate the coupler within 5 feet of the associated telephone set.

3.06 Locate the coupler approximately 6 feet from the 105-125V 50-60 Hz electrical outlet, provided by the customer.

3.07 Install the coupler on the wall or backboard as follows:

- (1) Carefully remove cover of the coupler.
- (2) Position the coupler base pan vertically against the wall with the key hole slots narrow end at the top.



THE MERCURY RELAY IN THE COUPLER WILL ONLY FUNCTION PROPERLY MOUNTED IN THE UP-RIGHT POSITION.

- (3) Secure the base with 4 screws. SEE TABLE C FOR FASTENERS.

3.08 Location of the QCS1A voice station coupler terminals are shown in Fig. 4.

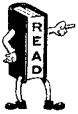
3.09 Connect the 0 and 1 button key type telephone sets and call directors with a voice station coupler as shown in Fig. 5.

3.10 On key systems where 6 button key type telephones are used and it is not practical to run a separate cable for the voice station coupler, install a 565 HQF key telephone set and connect as shown in Fig. 6.

3.11 There are various option strapping arrangements within the voice station coupler (See Table D). These straps are soldered between terminals on the circuit board.

TABLE C
FASTENERS FOR MOUNTING COUPLER

Hardwood	Softwood	Masonry	Plaster	Hollow Tiles
$\frac{3}{4}$ " No. 8 Woodscrew	1" No. 8 Woodscrew	1" No. 8 Woodscrew No. 10 Plastic Anchor.	2" No. 8 Woodscrew No. 10 Plastic Anchor.	$\frac{1}{8}$ x 4" Toggle Bolts



THE OPTIONS WILL BE SPECIFIED ON THE SERVICE ORDER. THERE MUST BE A MINIMUM OF THREE OR A MAXIMUM OF FOUR OPTIONS. IF NOT, REFER SERVICE ORDER TO SUPERVISOR WHO WILL CONTACT THE MARKETING DEPARTMENT.

- 3.12 Connect the 2012B transformer to AC1 and AC2 terminals as shown in Fig. 5.
- 3.13 Perform the operational tests shown in Part 5.
- 3.14 Place the cover on the voice station coupler.
- 3.15 Inform the customer of the following:

- (a) The maximum permissible signal power output from the customer's equipment must not exceed -8 dBm. The output level of the customer equipment is the power measured at the customers interface into a 600 ohm resistive load.
- (b) The customer can furnish a reserve power supply of -18V to -26V DC connected to terminals B1- and B2+. This will provide power for outgoing calls only. No ringing voltage will be provided with this option. The customer should detect incoming calls using the contact closure between RD1 and RD2.
- (c) The customer interface connections are made on terminal strips located as follows:

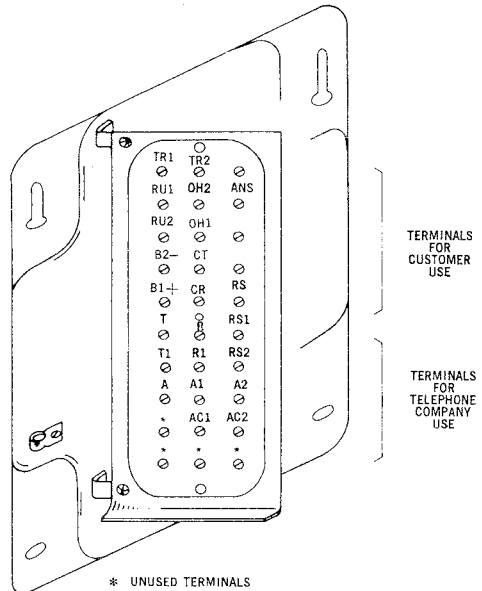
- QCS1A to the top left hand side opening of the coupler cover.

- QCS2B under a protective "flip-up" cover at the bottom of the coupler.

3.16 Options for the QCS Couplers are shown in Table D.



THE CUSTOMER SHOULD BE ADVISED TO REMOVE THE TRANSFORMER FROM THE OUTLET WHILE CONNECTING HIS EQUIPMENT.



NOTE: FOR CLARITY THE CIRCUIT BOARD IS NOT SHOWN IN THIS FIGURE

Fig. 4 — Location of QCS1 Voice Station Coupler Terminals

TABLE D

Option	Description	QCS1A Action	QCS2B Action
A	Dialing required.	Remove "TAM" strap.	Remove "TAM" strap.
B	Ringling signal on "CR" and "RS" leads only.	Remove "RG1" strap.	Remove "RG1" strap.
C	Dialing on "OH1" and "OH2" leads with off hook control on CT and CR leads.	Remove "REPD" and "CTR" straps.	Remove "REPD" and "CTR" straps.
D	Ring indication by closure of contact on "RU1" and "RU2" leads. SEE NOTE.	Disconnect the transformer red leads from "RS1" and "RS2" terminals and connect them on spare terminals 20 and 30, unless Option J and B or G are specified.	Remove straps between "RS1" and "RS4", "RS2" and "RS3" unless Option J and B or G are specified.
E	20 Hz ringing (Special Assembly).	Provide Option D. Terminate 20 Hz ringing on Terminals "RS1" and "RS2".	Provide Option D. Terminate 20 Hz ringing on terminals "RS3" and "RS4".
F	Dialing not required.	Remove "TAM" strap.	
* G	Ringling on "CT" and "CR" and/or on CR and RS leads.	Factory wired "RG1" strap and red transformer lead connected to the "RS1" and "RS2" terminals.	Factory wired "RG1" strap. The "RS1" and "RS4", "RS2" and "RS3" are strapped.
H	Delete		
* J	60 Hz ringing (standard).	Leave transformer leads on "RS1" and "RS2".	Leave strap between "RS1" and "RS4", "RS2" and "RS3".
K	Off hook or dialing and off hook on CT and CR leads.	Remove "CTR" and "REPD" straps. Place strap between OH1 and OH2 terminals.	Remove "REPD" strap.
L	Off hook or dialing and off hook on OH1 and OH2 leads.		Remove "CTR" strap.

* Options furnished with unit.

Note: DO NOT CONNECT THE RS1 AND RS2 LEADS TOGETHER AS THIS WOULD SHORT CIRCUIT THE OUTPUT OF THE RINGING TRANSFORMER. DO NOT DISCONNECT THE WIRE WRAPPED OR SOLDERED LEADS AT THE REAR OF THE RS1 AND RS2 TERMINALS.

Examples — A typical 2 wire telephone answering and recording machine requires options F, G, J and K.

A typical 2 wire alarm sending device requires options A, D and K.

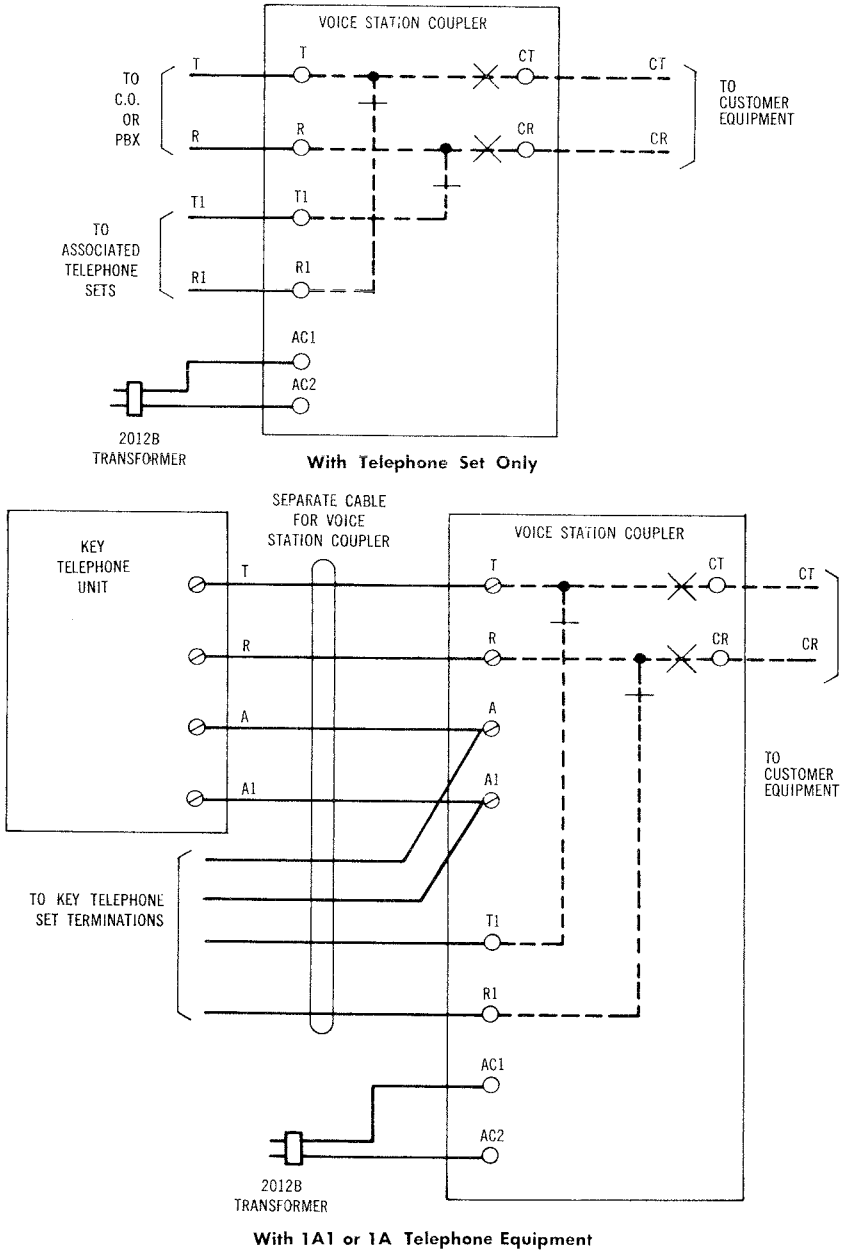


Fig. 5 - "Voice Station Coupler" Electrical Schematic

(Associated Recording or Alarm Sending Equipment is provided by the Customer)

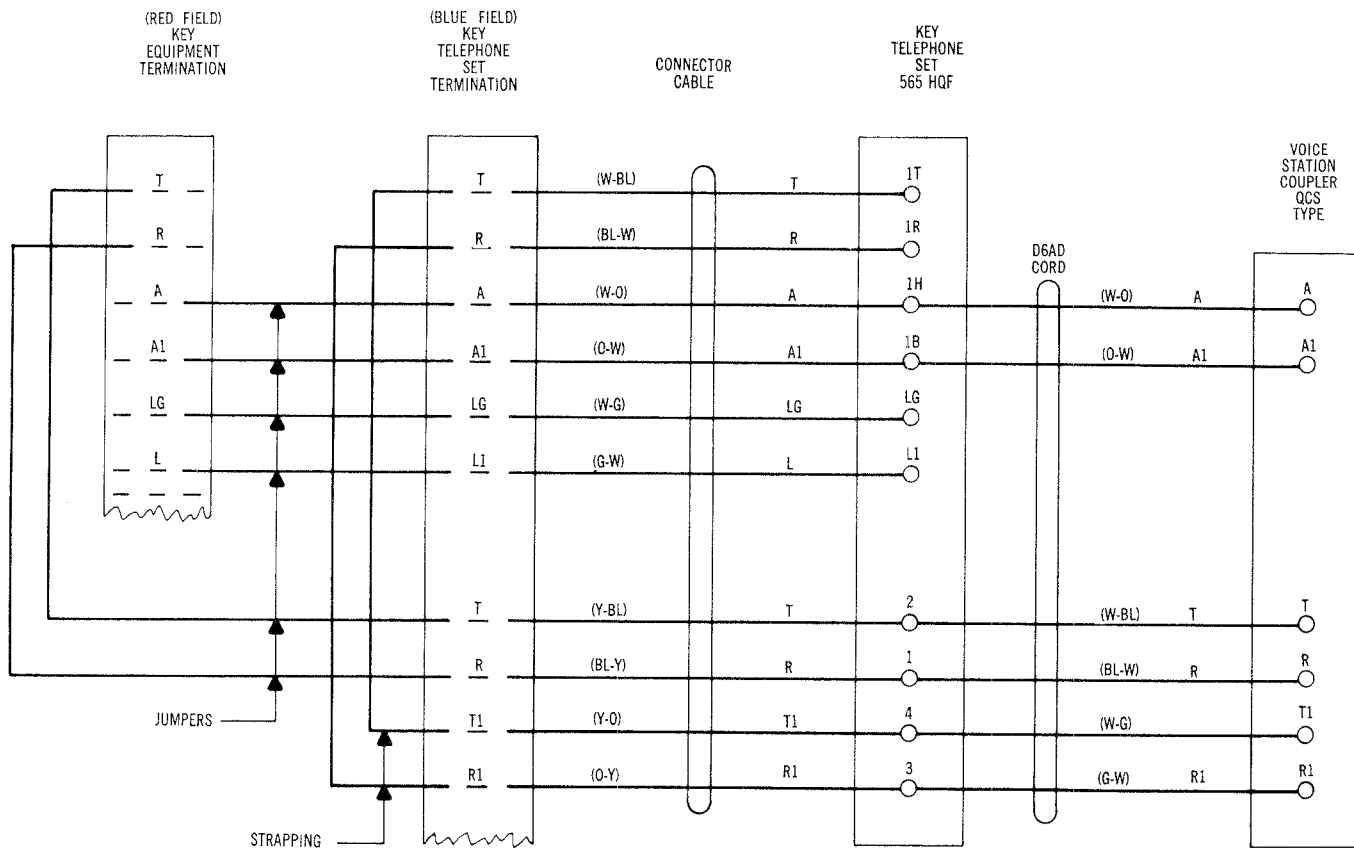


Fig. 6 - Voice Station Coupler
Connections with 1A1 or 1A2 Key Telephone Systems.

4. MAINTENANCE

4.01 All repair forces should be familiar with the tariff provisions which generally provide for a "Maintenance Service Charge" for each customer-requested visit to a voice station coupler that is terminated with a FOK (found OK) condition. When the customer requests such a repair visit and it is subsequently determined that the trouble is *NOT* in the telephone company equipment, the employee should advise the customer there will be a Maintenance Service Charge, and notify the Test Centre to originate Form 5855.

4.02 Maintenance of the coupler on the customer's premises should be limited to visual inspection of wiring and connections, local tests, testing with test centre and replacing a defective unit.



UNDER NO CIRCUMSTANCES SHOULD THE REPAIR EMPLOYEE ATTEMPT ANY TESTS OR MAINTENANCE ON CUSTOMER EQUIPMENT.

5. TESTS

5.01 The following tests are required to ensure the proper installation of the voice station coupler and to determine the operating condition of the unit during a maintenance visit.

- Ringing indication tests
- Off-hook control tests

5.02 The following test equipment is required for the tests.

- 1011 type hand test set
- 81A type test set or equivalent (Buzzer)
- Standard installation or maintenance tools.



THE TELEPHONE EMPLOYEE SHOULD NOT NORMALLY CONNECT OR DISCONNECT THE CUSTOMER'S INTERFACE LEADS. HOWEVER, WITH THE CUSTOMER'S APPROVAL THIS MAY BE DONE IN ORDER TO TEST OR REPLACE A DEFECTIVE UNIT.

CAUTION: THE POWER MUST BE DISCONNECTED FROM THE CUSTOMER'S PROVIDED EQUIPMENT BEFORE THE TERMINALS OR INTERFACE LEADS ARE CONTACTED.



IF THE COUPLER IS INCORRECTLY WIRED BY THE CUSTOMER, DISCONNECT THE INTERFACE LEADS, VERIFY THE OPTIONS WITH TABLE D AND INFORM THE CUSTOMER AND THE TEST CENTRE.

Off-Hook Control and Dialing Tests (See Note)

5.03 *Option C and L* — Dialing "OH1" and "OH2" leads.

- (1) Connect the 81A test set across terminals TR1 and TR2.
- (2) Connect the 1011 test set to terminals OH1 and OH2 and switch to TALK, the 81A test set should indicate a short circuit between terminals TR1 and TR2 and also check for a short circuit between terminals A and A1.
- (3) Retaining the short circuit between terminals OH1 and OH2, connect the 1011 test set across terminals CT and CR. Dial tone should be heard.
- (4) Remove short circuit from terminals OH1 and OH2. Connect 1011 test set to terminals OH1 and OH2 and dial test number.
- (5) Retaining the short circuit between terminals OH1 and OH2, connect the 1011 test set across CT and CR and verify if the test number was reached. Remove short circuit and 1011 test set.

Note: When Option F is used, omit the dialing test.

5.04 Option K — Dialing on CT and CR leads.

- (1) Connect the 1011 test set to terminals CR and CT with the set switch to MONITOR.
- (2) Switch the 1011 test set to TALK, the voice station connection should go “Off-Hook” and dial tone should be heard.
- (3) With the 1011 test set connected as in (Step 2) above, using the 81A test set check that there is a short circuit between terminals TR1 and TR2 and also between A and A1.
- (4) Dial the milliwatt supply to verify transmission.

Ringling Indication Tests**5.05 Option B** — Ringing Applied over Terminals CR and RS

- (1) Connect the 1011 test set to terminals CR and RS with the test set switched to monitor.
- (2) Call the local test desk and have a call placed to the station coupler.
- (3) When the test desk calls, the associated telephone should ring and 60 Hz ringing should be heard through the 1011 test set receiver.
- (4) If ringing can be heard connect the 1011 test set in the monitoring position across CT and CR terminals, nothing should be heard in the receiver. (Option “K”) Switch the 1011 test set to talk. (Option “L”) Short circuit terminals OH1 and OH2 and switch the 1011 test set to talk. The coupler should cut through to the test centre. Talk to the tester to verify the transmission through the coupler.
- (5) If ringing cannot be heard through the 1011 test set check that the ringing transformer leads are connected to terminals RS1 and RS2 or strap placed across RS1-RS4 and

RS2-RS3. Check that the 2012B transformer is plugged into a 117V electrical outlet.

5.06 Option D — The Customer Receives Ringing Indication as a Contact Closure Between Terminals RU1 and RU2.

- (1) Connect the 81A type test set with the switch in the C position across RU1 and RU2, the test set should not buzz.
- (2) Call the local test desk and have a call placed to the station coupler.
- (3) When the test desk calls, the associated telephone set should ring and the 81A test set should buzz during the ringing interval indicating that the ringing detector is working.

5.07 Option G — Ringing Applied Over Terminals CT and CR

- (1) Connect the 1011 test set to terminals CT and CR with the set switched to MONITOR.
- (2) Call the local test desk and have a call placed to the station coupler.
- (3) When the test desk calls, the associated telephone should ring and 60 Hz ringing should be heard through the 1011 test set receiver.
- (4) If ringing can be heard through the 1011 test set, (Option “K”) switch the 1011 test set to talk during the ringing cycle. (Option “L”) Short circuit terminals OH1 and OH2 during the ringing cycle. The ringing should be tripped and the coupler should cut through to the test centre. Talk to the tester to verify transmission through the coupler.
- (5) If ringing cannot be heard through the 1011 test set check that the strap RG1 is in place and that the ringing transformer leads are connected to terminals RS1 and RS2. Check that the 2012B transformer is plugged into a 117V electrical outlet.

SECTION 463-233-900CA

5.08 Options E, and J — These options will be tested automatically when performing tests on the assigned options.

Test Application (QCS2B Unit Only)

5.09 In addition to the option tests previously specified in Part 5 the following test should be performed to verify proper function at time of installation. Also, the same test can be used independently by the customer, or in conjunction with the test centre to sectionalize trouble with customer equipment.

For the test to be satisfactory the coupler must be:

- Connected to the telephone line.
- 2012B transformer must be plugged into the AC receptacle.
- Option straps must be in accordance with the customer requirements.

Test Procedures

5.10 (1) Arrange to have the auxiliary telephone on-hook and the test switch (QCS2B)

depressed for a period of approximately 45 seconds.

(2) Originate a call to the coupler. A brief burst of ring tone followed by a similar condition to an answer from a silent termination should be observed. Listen for 15 seconds to insure the ring trip circuitry operation and finally the off-hook condition.

(3) Place a second call to the coupler to verify the on-hook control circuitry operation. A similar sequence to that in (2) should be observed.

(4) The functions tested are in sequence, the operation of the ringing detector and the off/on-hook control circuitry.

(5) Should the above operating sequence not occur as indicated, a trouble in the coupler is indicated.

(6) After a normal test, release of the test switch will restore the circuit to normal operation immediately.