

INSTRUCTION MANUAL

Telephone Line
Remote Control

CU-10A Remote Control Unit

RA-10A Remote Control Adaptor

CU-10A

SPECIFICATIONS1) Electrical

- a) Input signal: -20 dbm (.06 volts rms
500 ohm line) for .5 watt
output at less than 5%
distortion.
- b) Input frequency response: ± 3 db from 300 to 3000 cps
- c) Output signal: Microphone amplifier 50 db
below 1 volt for 0 dbm
(1 milliwatt) into 500/600
ohm line
- d) Output frequency response: ± 3 db from 300 to 3000 cps
- e) Keying voltages; standard 100V DC at 10 ma across
10,000 ohms either line to
line or line to ground
- Keying voltages; special
function (optional)
100V DC at 10 ma and 30V
at 3 ma across 10,000 ohms
- f) Remote squelch option: Remote squelch only with
line to ground (simplex)
keying
- g) Input power: 117V AC 60 cycles, 60 watt

2) Mechanical

- a) Height: 7"
- b) Width: 13"
- c) Depth: 7-3/8"
- d) Weight: 16 lbs.

3) Tube Complement

- a) Receiver amplifier: 12AT7/6679 - Line amplifier
6AQ5 - Audio output
- b) Transmitter amplifier: 6BH6 - Microphone amplifier
12AT7/6679 - Output to line
amplifier
- c) Power Supply: 5Y3GT rectifier
Silicon plug-in rectifier
replaces 5Y3GT (optional)

CU-10A Specifications (Cont'd)

4) Microphone input:

Either low impedance for carbon (or transistorized) microphone or high impedance for crystal (or reluctance microphone. (Low/high impedance switch on rear of chassis).

INTRODUCTION

The Outercom CU-10A Telephone Remote Control is a versatile, high quality unit, which has been designed to be used with telephone lines permitting control of a transmitter from distant points. The use of this unit permits the antenna to be located in an area advantageous for greater coverage even though the location of the dispatcher may be in a relatively poor location.

The CU-10A is contained in an attractive, rugged, steel cabinet, that is readily accessible for periodic inspection and/or service. The speaker, receiver controls, indicating lights, and function switch are mounted on the front panel.

The CU-10A Telephone Remote Control unit is designed to work with the "RA-10A" Remote Control Adapter. The latter adapts the FM50-A or FM60-A communications units to telephone line control usage. The versatility of the CU-10A control unit permits it to be wired as a standard remote control unit (terminating in a 500/600 ohm line) or (where multiple units are to be used in parallel) as a bridging amplifier during standby. In this latter case the CU-10A has an impedance of 10,000 ohms while receiving signals, thereby permitting many units (up to 20) to be used in parallel without an impedance matching problem. When wired as a bridging amplifier, the CU-10A converts to a driving impedance of 500/600 ohms when transmitting.

The CU-10A's versatility also permits it to be used in other communications systems and when such is contemplated it is recommended that Outercom Electronics Engineering in Charlotte, N.C. be consulted for specific installation information.

The "telephone line" refers to a two wire, metallic pair of leads as normally supplied by the local telephone companies which are commonly called radio tie lines or abbreviated R.T.L. This consists of a pair of leads with DC continuity permitting control voltages to be super-imposed on the audio signal voltages. It is essential that this DC connection be provided as part of the service in order that remote functions such as relay switching may be accomplished. This R.T.L. or radio tie line may be as much as twenty miles in length depending on the signal attenuation characteristic (expressed in db) of the particular line. This information is normally available from the commercial service department of the local telephone company.

When the function switch is in the extreme left position, the CU-10A is "off". When it is in the center "standby" position, the unit is "on" and can be used as an intercom. In this position the Telephone Remote Control unit can be used to communicate with other CU-10A control units without the transmitter going on the air. In the extreme right position, the transmitter is keyed remotely when the press-to-talk switch on the microphone is depressed. The receiver volume control is at minimum volume in its extreme CCW position and the squelch control (when remote squelch control is used) is at tight squelch in the extreme CCW position. The amber light will be lit when the CU-10A is either in the intercom or

remote position. The red light will be lit only when the transmitter is on the air.

There are two chassis mounted controls, one sets the transmit audio level and the other control is used for hum balance when the CU-10A is connected for a bridging input. When the system is connected for 500/600 ohm input, this control is not needed and is automatically disconnected from the circuit.

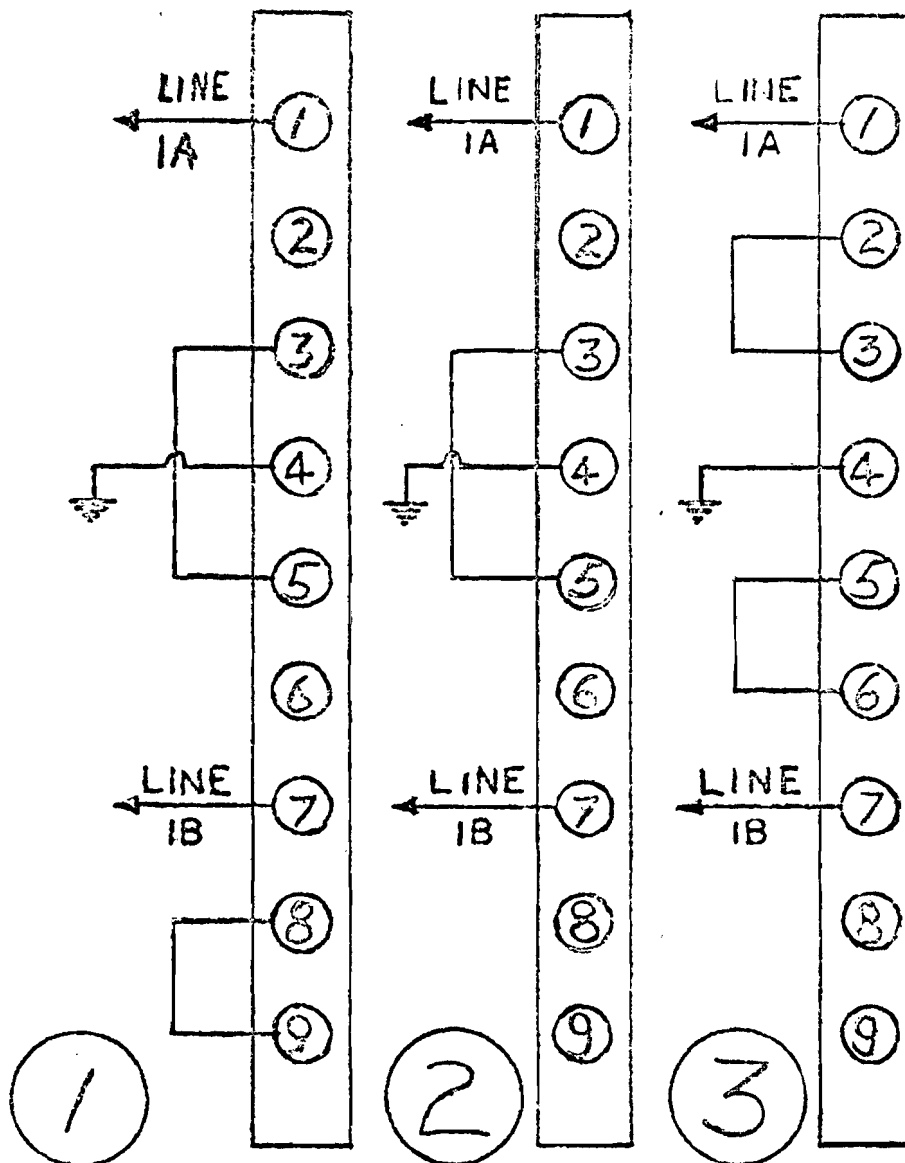
The fuse, Hi/Low impedance switch, and terminal board, TB101 are located on the rear skirt of the chassis. When the Hi/Low impedance switch is in the Low position, the necessary voltage for carbon or transistorized microphone operation is available at the microphone connector. In the Hi position this voltage is removed and the necessary high impedance is presented to the microphone input. The terminal board is accessible for telephone line connections and the various application jumper configurations.

The receiver amplifier consists of two tubes, one used as an input line amplifier and the other as an audio amplifier to drive the built-in speaker.

The transmitter section uses two tubes, one as a microphone pre-amplifier and the other as an output line amplifier.

INSTALLATION

The modern styling of the CU-10A cabinet lends itself to desk top operation and will not distract from the decor of the location. To place the unit in operation, first check to see if all the tubes are in place, then connect the remote telephone lines to terminals 1 and 7 on terminal board TB10A. The following diagram indicates the correct jumper connections for the various control functions.



- (1) Jumpers used for single unit control with remote squelch adjust.
- (2) Jumpers used for tone squelch over-ride.
- (3) Jumpers used for multiple unit control (bridging input).

Installation (Cont'd)

Connect the microphone plug to the microphone receptacle J101 and place the Hi/Low switch on the rear skirt in the proper position for the microphone being used. Place the power switch (3 position switch) in the left or "off" position and plug the line cord into an AC power receptacle. The CU-10A is now ready for use.

OPERATION

Place the receiver volume control in its mid-position; the squelch control in its mid-position; and the power switch in the STDBY position. In this position the receiver light will be lit and the CU-10A will function as an intercom between any other remote on the line, however, it also receives incoming calls.

Rotate the volume control knob until the desired volume is achieved. If the remote squelch function is used, rotate the squelch knob CCW until the receiver is squelched. If the remote squelch feature is not employed, the squelch must be adjusted on the RA-10A Remote Control Adapter. To talk to the other remote stations depress the press-to-talk switch on the microphone, and speak in a normal voice. The transmit indicator lamp will not light, indicating that the transmitter is not on the air.

To set up the audio level to be applied to the transmitter, place a 5K internal resistance DB meter across terminal 1 and 7 on TB101. Adjust the transmitter level control, located on the chassis, for a reading of .6 volts on the DB meter when speaking in a normal voice into the microphone.

When it is desirable to put the transmitter on the air, move the power switch to the operate position, now, when the press-to-talk switch is depressed, the red transmitter light will be lit indicating that the transmitter is on the air.

If the unit is connected for bridging input, the hum balance control located on the chassis, is in the circuit and is rotated to produce minimum hum or background noise in the speaker. In line to ground keying the DC control voltage is introduced into the system by applying the DC voltage between the center tap of the transformer T101 and ground. In this way there will be equal voltages in each conductor of the line, resulting in no difference of potential across the line.

For coded squelch telephone line over-ride, kit #53076 is required. The over-ride switch will be located either on the front panel or on the microphone. This switch will enable the operator to over-ride the QT squelch system.

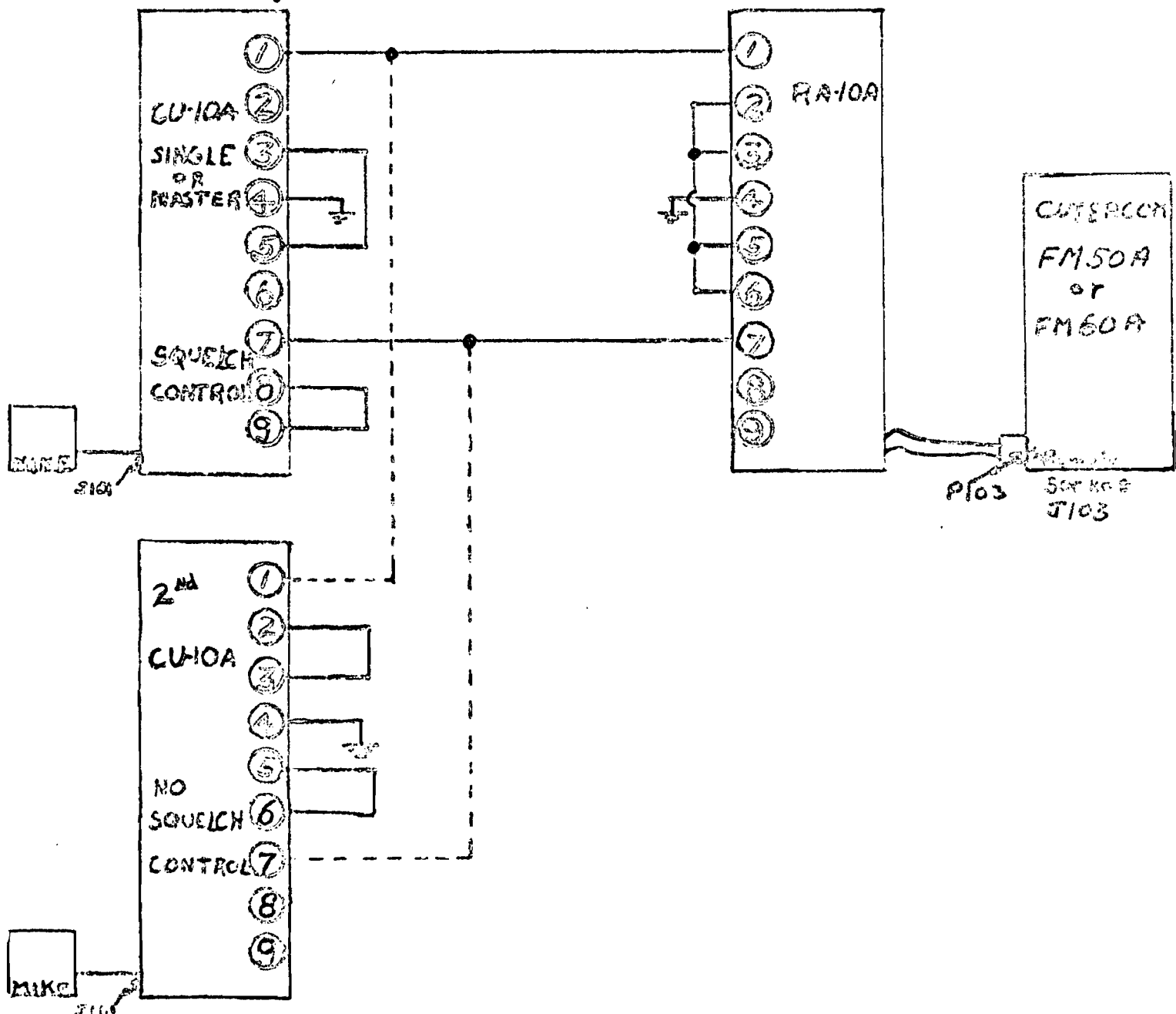
If a carbon or transistorized microphone is used, the Hi/Low impedance switch is placed in the Low impedance position. This will introduce the voltage necessary for the microphone operation and present the proper input impedance to the microphone. When a

Operation (Cont'd)

crystal or reluctance microphone is used the Hi/Low switch is placed in the Hi position. This will remove the voltage from the microphone input and insert a high impedance load for the microphone.

For a second remote control function, such as tone squelch over-ride, or receiver second frequency, kit #53076 is required. This kit contains the required components to put a differential voltage on the remote lines. The voltage is either 30 or 100 volts DC.

The system connections are shown below:



MAINTENANCE

The CU-10A is designed for continuous duty and should normally require little attention beyond the replacement of tubes.

Weak or defective vacuum tubes are the most common cause of degradation in sensitivity, faulty performance or failure of operation of the remote control unit.

The CU-10A is designed conservatively to prolong the life of the tubes, but due to normal use, tubes wear out. The advanced design of the CU-10A is such that considerable weakening can take place before tube replacement is necessary and need not be replaced until it is actually causing a degradation in the performance of the CU-10A. If a tube tester is not available a simple check would be to substitute a "good" tube, one at a time, until the defective tube is found by the improvement or restoration of the performance of the unit.

Regular inspections of the CU-10A will keep the unit operating at peak performance and increase its longevity. The frequency of such inspections will depend upon the installation of the unit and surrounding conditions. Use a soft brush or a light dry air blast to clean dust and dirt from the CU-10A. Clean the contacts of the relays with a burnishing tool, or heavy paper passed between the contacts, being careful not to bend the contact springs. If the "RECEIVE" light does not light when the power switch is placed in the "STDBY" position, check for a blown line fuse. If the fuse is not blown and the line cord, plug, and power source receptacle have been checked, remove the unit from the cabinet and inspect for visual signs of trouble.

Visual evidence of trouble is usually a burned or darkened resistor, which if found, is likely caused by excessive current due to a short circuited capacitor or tube element at the load side of the resistor. Refer to Parts List and Schematic for values of components and replace defective ones. If visual inspection of parts and check on tubes fail to disclose the cause of the malfunction, the tube socket voltages and resistances should be measured and checked against Table 1. More than a 15% departure from the values in the table will generally indicate the circuit at fault.

REPLACEMENT PARTS LIST

<u>Symbol No.</u>	<u>Description</u>	<u>Part No.</u>
C101	Capacitor, Electrolytic 24 mfd 25V.	K23932-4
C102	Capacitor, Disc. Ceramic .01 mfd +80 -20% 600V.	K23034-19
C103	Capacitor, Mylar .22 mfd ±10% 125V.	K23927-3
C104	Capacitor, disc. Ceramic .02 mfd +80 -20% 500V.	M23034-27
C105	Capacitor, Mylar .47 mfd ±10% 400V.	K23927-5
C106	Capacitor, Mylar .47 mfd ±10% 400V.	K23927-5
C107	Capacitor, Electrolytic 40-40-40-40	K15504-72
C107A)		
C107B)	Capacitor, 40 mfd 450V.	K15504-72
C107C)		
C107D	Capacitor, 40 mfd 25V.	K15504-72
C108	Capacitor, Disc. Ceramic .01 mfd +80 -20% 600V.	M23034-19
C109	Capacitor, Disc. Ceramic .002 mfd GMV 1000V.	M23034-43
C110	Capacitor, Disc. Ceramic .01 mfd +80 -20% 600V.	M23034-19
C111	Capacitor, Disc. ceramic .01 mfd +80 -20% 600V.	M23034-19
C112	Capacitor, Disc. Ceramic .01 mfd +80 -20% 600V.	M23034-19
C113	Capacitor, Electrolytic 10 mfd 150V.	K23073-75
C114	Capacitor, Disc. Ceramic .02 mfd +80 -20% 500V.	M23034-27
C115	Capacitor, Mylar .047 mfd ±10% 125V.	K23927-2
C116	Capacitor, Mylar .047 mfd ±10% 125V.	K23927-2
F101	Fuse, 2 amps, type 2AGC	K15928-7
K101	Relay	H10407-1
L101	Choke, Filter 6 Hy	K38939-1
R101	Resistor, Fixed 270Ω 1/2 w. ±10%	K19309-35
R102	Resistor, Variable ±30% 1/2 w. 500K	K26218-10
R103	Resistor, Fixed ±10% 1/2 w. 100K	K19309-97
R104	Resistor, Fixed ±10% 1/2 w. 1K	K19309-49
R105	Resistor, Fixed ±10% 1/2 w. 470K	K19309-113
R106	Resistor, Fixed ±10% 1/2 w. 470K	K19309-113
R107	Resistor, Fixed ±10% 1/2 w. 27K	K19309-83
R108	Resistor, Variable ±20% 10K	K15368-10
R109	Resistor, Fixed ±10% 1/2 w. 100K	K19309-97
R110	Resistor, Fixed ±10% 1/2 w. 47K	K19309-89
R111	Resistor, Fixed ±10% 1/2 w. 4.7K	K19309-65
R112	Resistor, Fixed ±10% 1/2 w. 4.7K	K19309-65
R113	Resistor, Fixed 820Ω ±10% 1/2 w.	K19309-119
R114	Resistor, Fixed ±10% 1/2 w. 820K	K19309-119
R115	Resistor, Fixed ±10% 1/2 w. 100K	K19309-97
R116	Resistor, Variable ±30% 1/2 w. 500K	K26218-10
R117	Resistor, Fixed ±10% 1/2 w. 470K	K19309-113
R118	Resistor, Fixed 1 w. ±10% 330Ω	K19310-37
R119	Resistor, Fixed ±10% 1/2 w. 47K	K19309-89
R120	Resistor, Fixed ±10% 1/2 w. 10K	K19309-73
R121	Resistor, Fixed 7 w. ±10% 8.2K	K19304-1
R122	Resistor, Fixed 2 w. ±10% 22K	K19304-50
R123	Resistor, Fixed 2 w. ±10% 27K	K19304-52
R124	Resistor, Variable ±20% 1/2 w. 20K	K26218-11

Replacement Parts List (Cont'd)

<u>Symbol No.</u>	<u>Description</u>	<u>Part No.</u>
S101	Switch Toggle (off-stby-operate) (DP- 3 Pos.)	K26675-1
S102	Switch Slide Modified (DPDT) (HI-IMP.=CAR)	K26619-1
T101	Transformer, Output	K5103-1
T102	Transformer, Power	M38938-1
T103	Transformer, Audio Output	K26647-1
IL01	Neon Pilot Light	K40922-2
IL02	Neon Pilot Light	K40922-1
V101	Tube, Electron 12AT7	K16267-1
V102	Tube, Electron 6BH6	K16299-1
V103	Tube, Electron 12AT7	K16267-1
V104	Tube, Electron 6AQ5	K16387-1
V105	Tube, Electron 5Y3GT/G	K16252-1

RA-10A

INTRODUCTION

The Outercom RA-10A Base Station Remote Control Adapter, companion of the CU-10A Telephone Remote Control unit is required to convert the Outercom FM50-A or FM60-A communications unit for telephone line remote control. The remote control adaptor performs the control functions of keying the transmitter, switching the receiver audio and the transmitter as required, and provides facilities for remote squelch as well as a second remote control function.

The unique use of a zener diode insures automatic electrical separation of the squelch and keying circuits, and provides positive switching relay operation, thereby increasing the reliability of the remote control function.

There are two internal controls that are used to adjust the audio levels to and from the communications unit. When remote squelch is not used, a squelch control must be installed on the RA-10A such as is done where remote coded squelch over-ride is employed. The chassis of the RA-10A is punched to receive this control when required.

INSTALLATION

The base plate of the RA-10A is normally fastened to any convenient surface near the communications unit and can be mounted in any position. The Remote Control Adapter chassis is held to the base plate with four mounting screws, and a protective cover encloses the adaptor chassis but leaves the terminal board exposed for easy access.

To connect the RA-10A to the Outercom communications unit, plug the cable from the remote control adaptor into the remote socket on the communications unit and place the local/remote switch on remote. The socket and switch are located on the rear skirt of the communications chassis. Connect the remote lines to terminals 1 and 7 on TB101. Make sure that terminal 4 of TB101 is connected to a good ground.

The audio level to the transmitter from the remote lines is adjusted with the line to transmitter control, to produce the normal deviation. The receiver audio is adjusted with the receiver to line control, to produce .6 volts on a DB meter having an internal resistance of at least 5000 ohms, connected across terminals 1 and 7 on TB101.

When the base station is operated remotely the microphone should be removed from the communications unit and connected to the CU-10A control unit. If it is desired that both local and remote operation be provided simultaneously, the remote/local switch on the rear of the chassis should be in the local position. Under these conditions the squelch control will be activated on the front panel of the communications unit. For local

Installation (Cont'd)

and remote operation it is necessary that the microphone connected to the FM50-A or FM60-A communications unit be so wired that the microphone element be disconnected when the push-to-talk switch is not pressed. Early microphones in the field have the switch contacts built in but are not wired, therefore, it will be necessary to make this change. Microphones shipped from approximately December 1, 1961 on have the switch contacts wired in and no field modification is required.

REPLACEMENT PARTS LIST

<u>Symbol No.</u>	<u>Description</u>	<u>Part No.</u>
C101	Capacitor Metalized Paper 1 mfd 200V.	K23035-7
C104	Capacitor Disc Ceramic .02 mfd +80% -20% 500V.	K23024-27 K22211-1
CR101	Diode, Zener	
K101	Relay	F40406-1
R102	Resistor, Var. 500Ω ±10%	K25368-9
R103	Resistor, Var. 20Ω ±10% 2 w.	K15372-4
R104	Resistor, Fixed 33Ω ±10% 5 w.	K19336-2
R105	Resistor, Fixed 3.3Ω ±10% 5 w.	K19336-3
R106	Resistor, Fixed 470Ω ±10% 1/2 w.	K19309-41
T101	Transformer, Matching	K51027-1

TONE SQUELCH OVER-RIDE KIT

RA-10A

If tone squelch over-ride is required, the components necessary for this feature are included in kit #53076. Relay K201, potentiometer R201 and resistor R202 are connected as shown in the schematic #53075. Local squelch control is necessary when a second remote control function is desired. The jumper configuration is shown below for this condition.

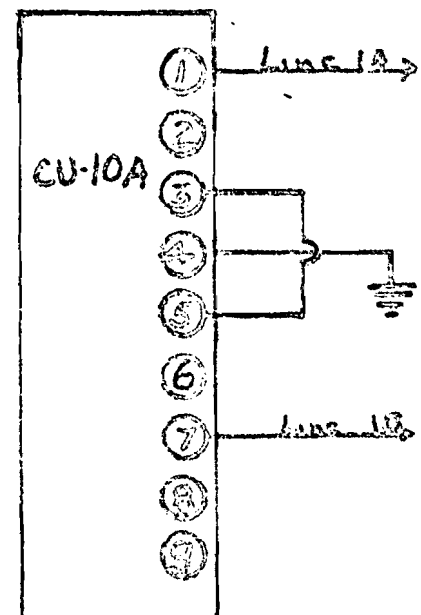
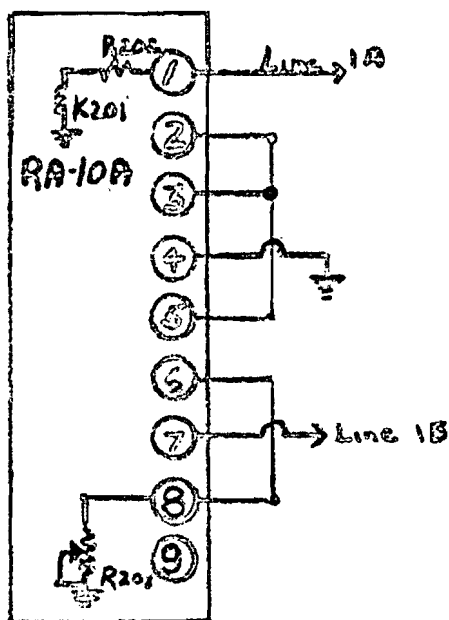
Relay K101 (the basic unit transfer relay) is parallel with R202 (8.2K ohm resistor). Relay K201 is connected in series with relay K101.

In two function keying K201 will be energized when the 33 volt control signal from the CU-10A is introduced into the system, and K101 will be energized when the 100 volt control signal from the CU-10A is applied to the system. With this method of operation, the second control relay will be energized without keying the transmitter.

CU-10A

In the CU-10A resistors R201, R202 and switch 201 are connected as shown in schematic #53103, the jumper configuration is shown below. Switch S201 is mounted in the hole that is under the front panel vertical nameplate, behind the Hammarlund trademark. The nameplate supplied with kit 53076 indicates the normal and alternate positions; alternate being Tone Squelch over-ride.

When the Normal/Alternate switch is in the normal position, the lower voltage control signal is prevented from being introduced to the remote telephone lines. In the alternate position, the lower voltage control signal is permitted to enter the remote line and energize K201 in the RA-10A.



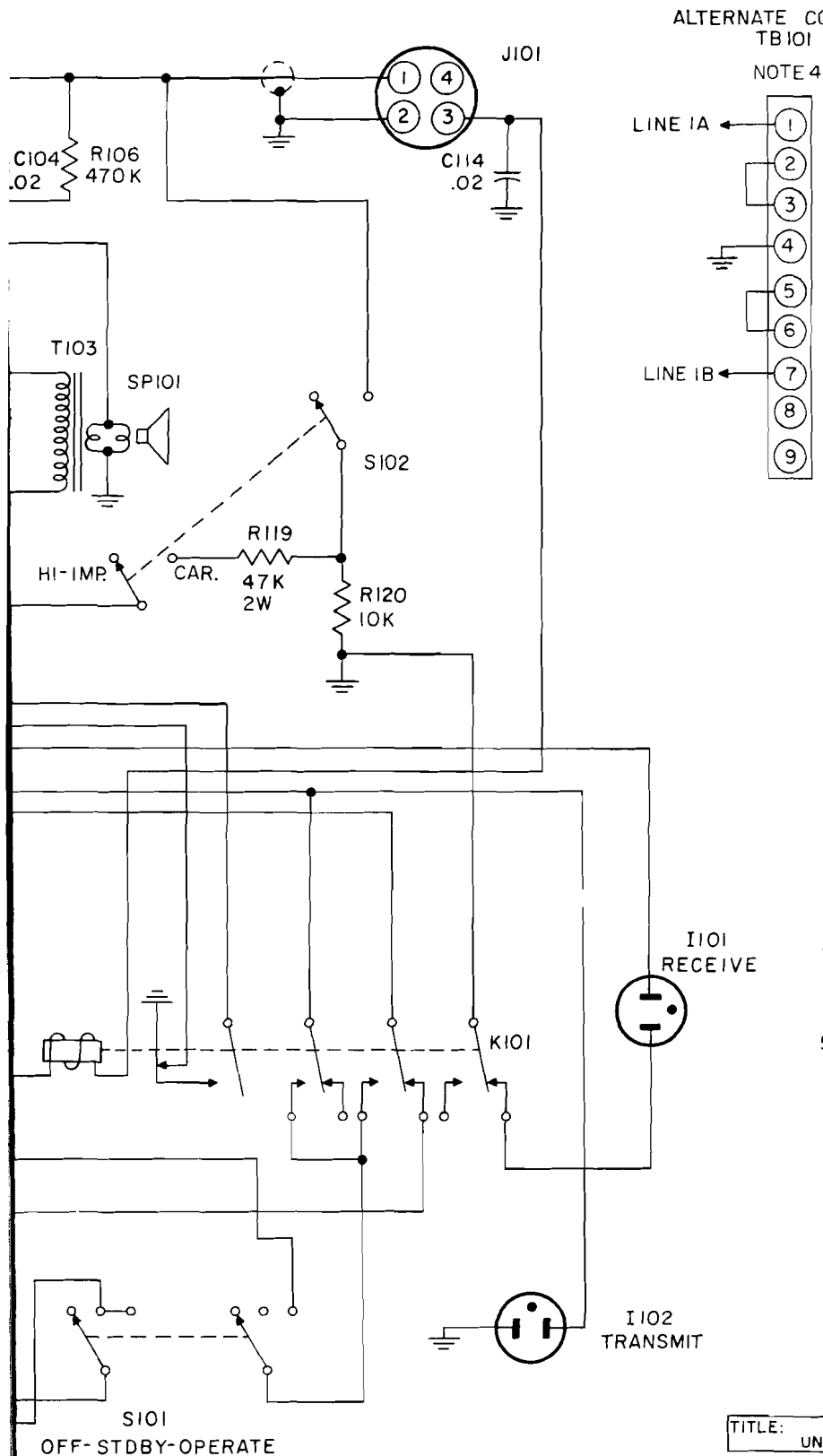
REPLACEMENT PARTS LIST

RA-10A

<u>Symbol No.</u>	<u>Description</u>	<u>Part No.</u>
K201	Relay	K140412-3
R201	Resistor, Var. 20K 1/2 w. $\pm 20\%$	K26218-11
R202	Resistor, Fixed 8.2K 2 w. $\pm 10\%$	K19304-40

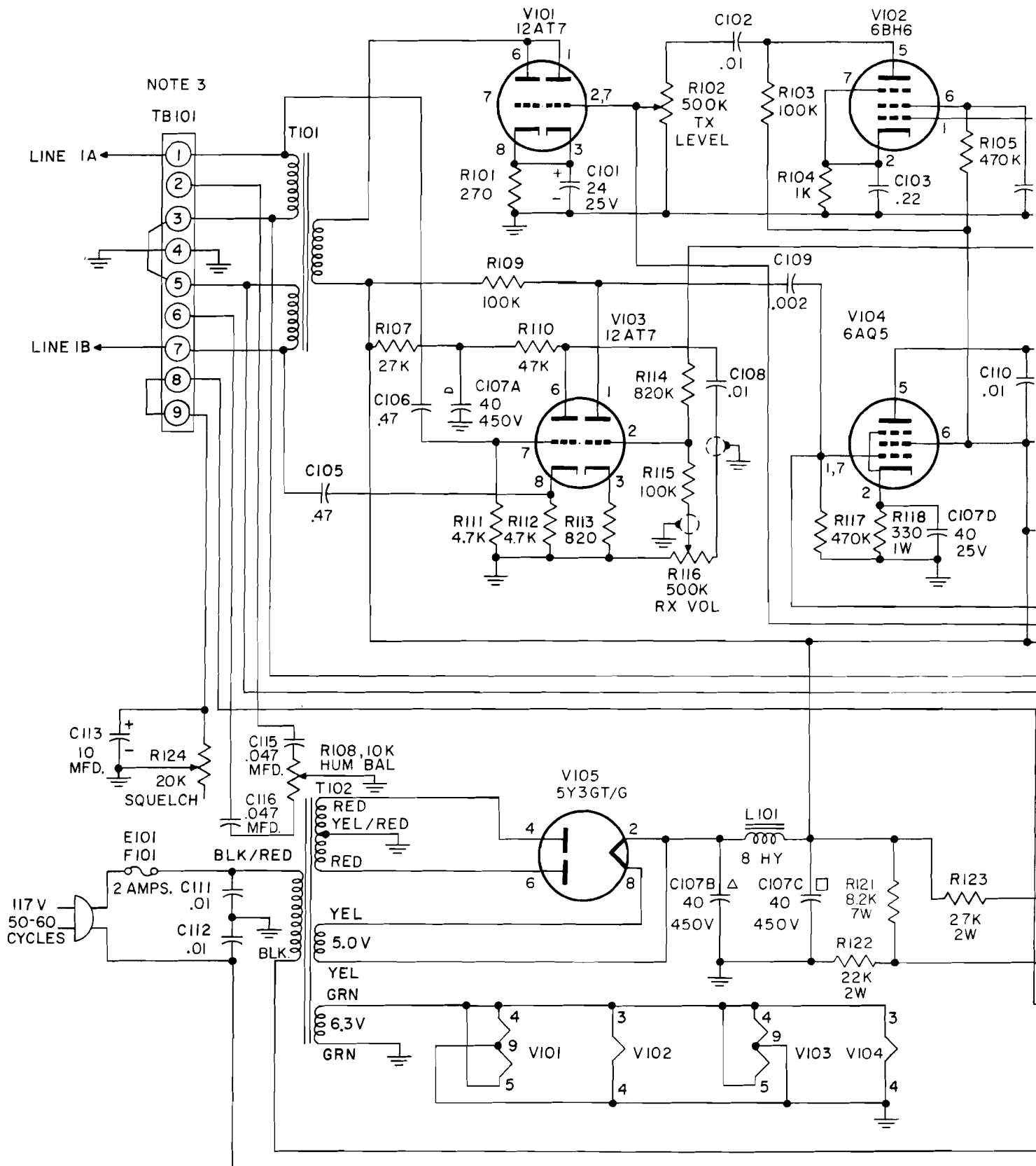
CU-10A

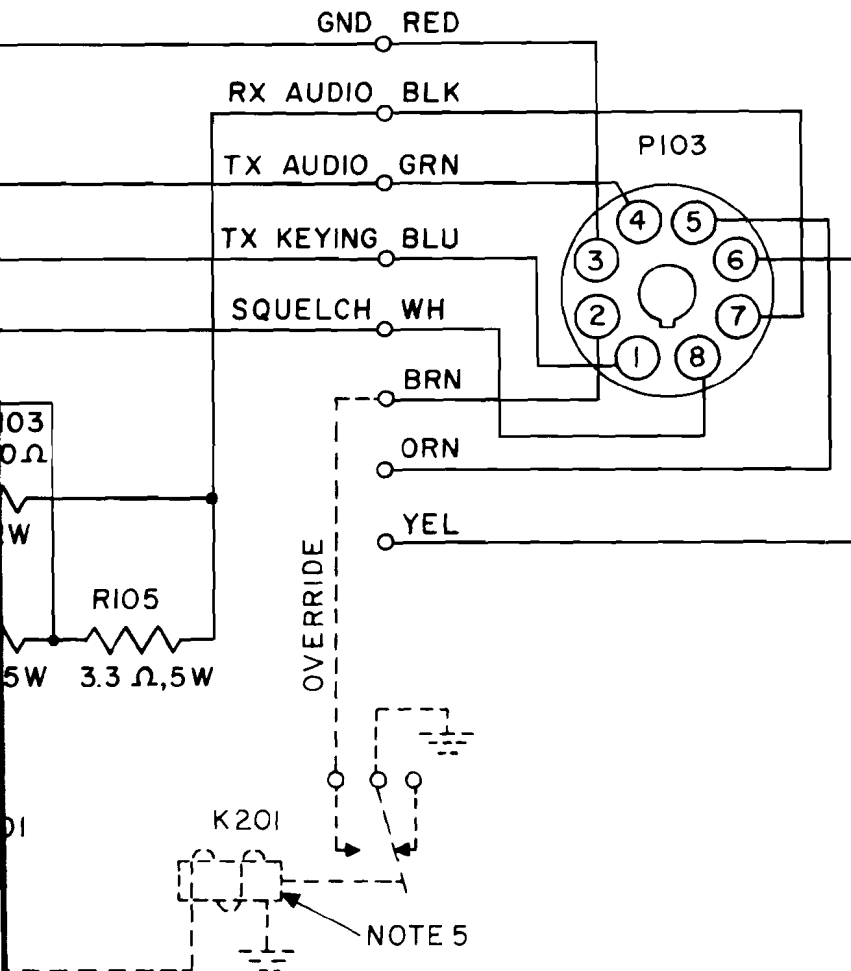
R201	Resistor, Fixed 22K 1/2 w. $\pm 10\%$	K19309-81
R202	Resistor, Fixed 47K 2 w. $\pm 10\%$	K19304-58
S201	Switch, toggle (SP-DT)	K52018-1
	Plate Marking	M53117-3

NOTE:

1. ALL RESISTORS ARE 1/2 WATT $\pm 10\%$ TOLERANCE, UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. JUMPERS USED FOR SINGLE UNIT CONTROL WITH REMOTE SQUELCH ADJUST.
4. JUMPERS USED FOR MULTIPLE UNIT CONTROL (BRIDGING INPUT).
5. TERMINAL 4 TB101 MUST BE GROUNDED.
6. THIS SCHEMATIC WAS ISSUED FOR INSTRUCTION BOOK REPRODUCTION ONLY, BECAUSE OF A MANUFACTURING CHANGE AND PERTAINS TO UNITS BELOW SERIAL NO. 300. THIS DRAWING IS BASICALLY IDENTICAL TO DWG 53103-1 REV. 4 EXCEPT FOR THE EXTERNAL SYSTEMS CONNECTIONS OF TB101 & NOTE 5

TITLE:	SCHEMATIC DIAGRAM (CU-10A)	No. 53255	T
	UNITS WITH SERIAL NO'S BELOW 300		





RESISTORS ARE 1/2 W $\pm 10\%$ UNLESS OTHERWISE SPECIFIED.

SWITCH FOR REMOTE SQUELCH OPERATION.

FOR SQUELCH CONTROL ADD R201
CONNECT 5 & 6 TO 6 & 8.

PINS 6 & 7 OF TB101 CONNECT TO TELEPHONE LINE.
PINS 6 & 7 MUST BE CONNECTED TO A GOOD EXTERNAL GROUND.

SWITCH IS USED FOR TONE SQUELCH OVERRIDE. LOCAL
CONTROL REQUIRED (SEE NOTE 3).

TITLE: SCHEMATIC DIAGRAM (REMOTE CONTROL ADAPTER)

NO. 53057-1

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ADDENDUM INFORMATION - CU10A AND RA10A
INSTRUCTION MANUAL

Page 5 of the above referenced manual shows the connections for the multiple remote control of a base station. The diagram on this page is incorrect in that it indicates squelch control at the single or master unit may be used. When using a standard CU10A it will be necessary to delete the squelch function from the master CU10A and wire in a squelch control at the RA10A adapter between terminals 6 of TB101 and ground. Referencing schematic diagram #53057-1 the squelch control should be wired in as indicated in dotted lines and incorporate the connections called for in notes. The squelch control at the master CU10A may be disabled by breaking the jumper between 8 and 9 of its TB101.

For those installations where squelch control of the base station at the master remote of a multiple remote system is required, a bulletin is being prepared showing the modification required. This fundamentally will convert the system to "line-to-ground keying," with the keying voltage on one line to ground and the squelch control on the other line to ground.

NOTE: If the system shown on page 5 of the Instruction Manual is attempted, the master unit will control the base station, however, the slave unit will have its control voltage shorted out by the squelch control of the master unit, its transmit light will not light and the main station will not go on the air. In addition, hum at the slave unit may also result.

A bulletin is also being prepared for multiple remote control using Q-T over-ride.