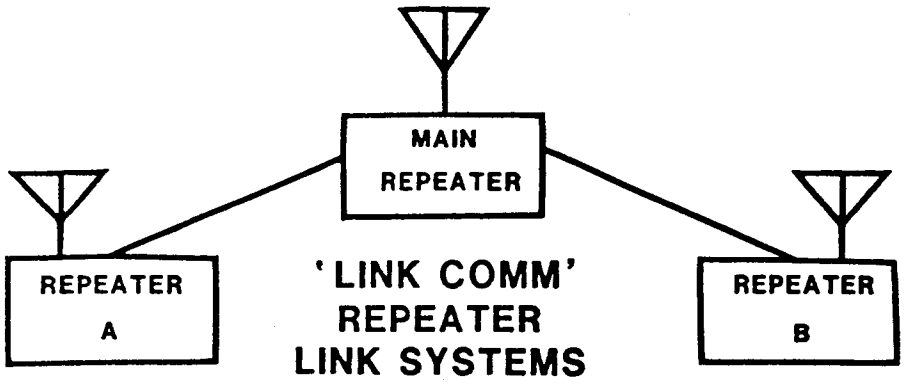
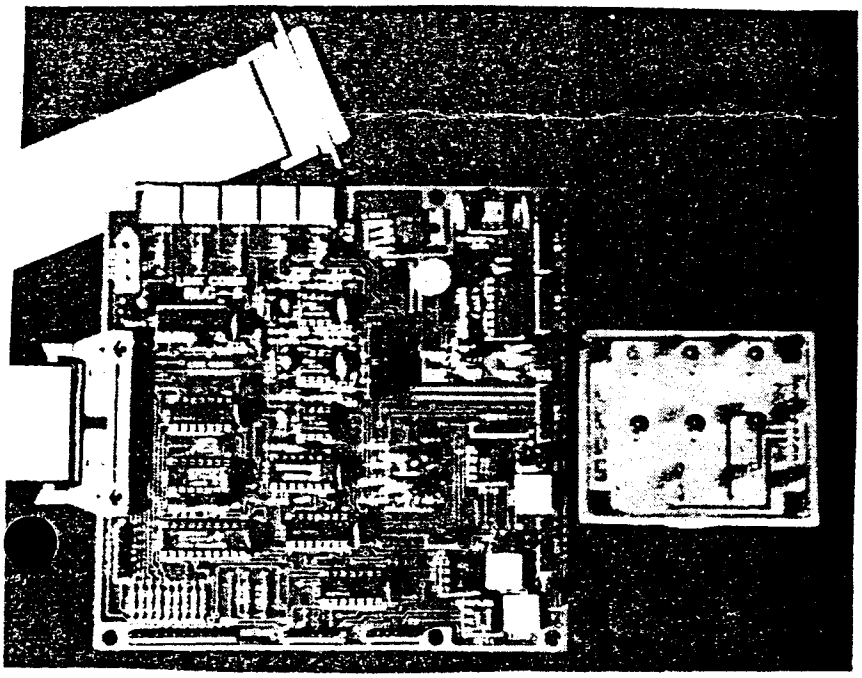



# 'LINK COMM' REPEATER LINK SYSTEMS



RLC - 5
REPEATER LINK CONTROLLER

- Central Hub Linking:
  Links talk to a Central Hub
- Repeater Chain Linking:
  Links talk to each other
- Switchable Audio Bus:
  Links can be divorced away from Main Repeaters Audio Bus
- All Source Audio Monitoring:
  Local audio monitoring port
- LED Display Panel .
  Monitors all Link functions
- COR circuitry on Board
  COR generation amp on board
- Direct Connection to the
  SCOM 5K Repeater Controller
- Adaptable to any DTMF control based Repeater Controller

-- RLC - 5 AND LED DISPLAY PANEL --

The RLC-5 Repeater Link Controller will allow ease in connection of 2 Simplex, or Duplex links to any repeater controller. The RLC-5 does all of the needed audio voting, switching, and PTT'ing of your links and requires only 3 latched output lines and 3 logical input lines for total link control. If your repeater group wants links, or your expensive controller doesn't handle your needed linking, then the RLC-5 will satisfy your linking needs. The RLC-5 handles two types of linking, Hub and Chain linking. The standard hub linking mode is where your repeater talks to Link 'A' or Link 'B', or both. Repeater Chain linking is where your repeater talks to Link 'A' or Link 'B', or both, and Link 'A' talks to Link 'B', along with Link 'B' talking to Link 'A'. If link activity is not wanted, the links can be divorced away from the repeater, or in the Repeater Chain Linking mode, the links can be disembarked away from the repeater without disturbing the Link 'A' - Link 'B' cross-tie.

| | |
|---|---|
| RLC - 5 REPEATER LINK CONTROLLER / LED BOARD | $ 99.95 |
| SHIPPING AND HANDLING CHARGE | $ 5.00 |
| COD CHARGE IF APPLICABLE | $ 5.00 |

LINK_COMM
306 So. 20TH
BOZEMAN. MT. 59715

**LINK COMM**
Repeater Link Systems
Circuit Board Layout Service

Copy, too.

Allan Overcast

306 So. 20TH
Bozeman, MT. 59715
(406) 587-4085

SYSTEM REQUIREMENTS:

LINK BOARD CONTROL:

3 LATCHED LOGIC OUTPUT LINES

* LINK ACTIVITY DETECT:

3 LOGIC INPUT LINES
( Not needed for normal board operation, only needed for link monitoring activity detect )

LOGIC OUTPUT LINE DEFINITIONS:

LOGIC OUTPUT LINE #1 ... LINK #1 TX ENABLE
LOGIC OUTPUT LINE #2 ... LINK #2 TX ENABLE
LOGIC OUTPUT LINE #3 ... LINK SYSTEM ENABLE

LOGIC INPUT LINE DEFINITIONS:

LOGIC INPUT LINE #1 .... LINK #1 RX ACTIVITY
LOGIC INPUT LINE #2 .... LINK #2 RX ACTIVITY
LOGIC INPUT LINE #3 .... MAIN RX ACTIVITY

PHYSICAL CHARACTERISTICS:

BOARD DIMENSIONS ..... 5.25" X 5.30"
CMOS DESIGN
9 LED DISPLAY PANEL
ON-BOARD COR SUPPORT
ON-BOARD AUDIO MONITORING

CONNECTOR DESCRIPTION:

MAIN RX PORT ..... COR,AUDIO,GROUND,POWER
MAIN TX PORT ..... PTT,AUDIO,GROUND
LINK PORTS:
COR,AUDIO IN,PTT,AUDIO OUT,GROUND
CONTROL RX ..... COR,AUDIO,GROUND,POWER

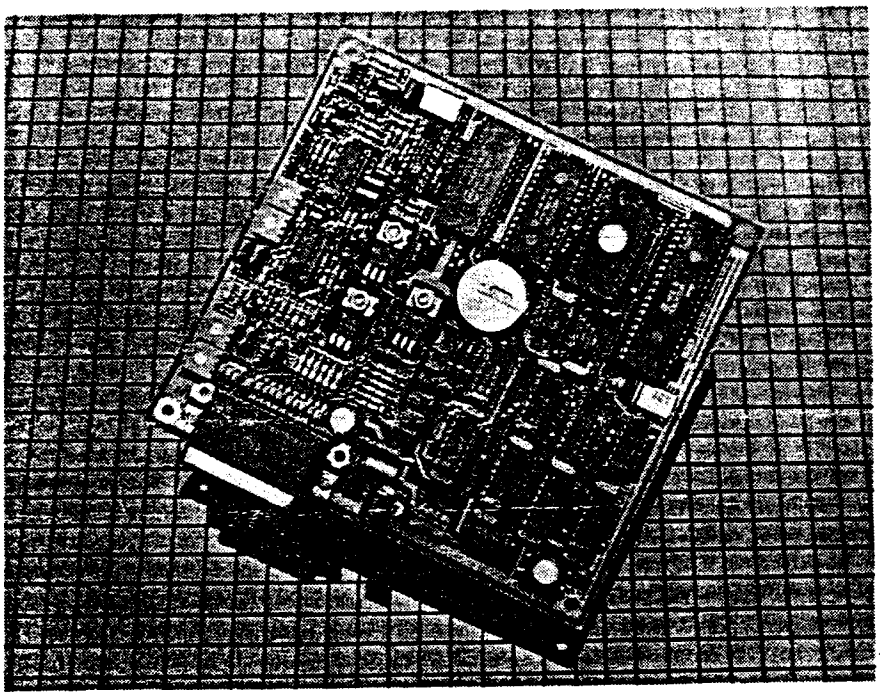
BOARD POWER REQUIREMENTS:

RLC-5 LINK BOARD ..... 160.5 mA, NO DISPLAY
..... 240.2 mA, FULL DISPLAY

REPEATER INTERFACE REQUIREMENTS:

S-COM 5K ..... DIRECT CONNECTION
DTMF CONTROL
OTHER ..... ACTIVE HIGH COR INPUT
ACTIVE LOW PTT OUTPUT
3 ACTIVE LOW LOGIC OUTPUT
3 ACTIVE HIGH LOGIC INPUT

New Product * New Product * New Product * New Product * New Product * New Product * New Product



## S-COM 5K REPEATER CONTROLLER

Never before has such powerful control capability been available in this small size and price range!

The S-COM 5K is **fully** remotely programmable via DTMF commands. Unlike other controllers, the 5K does away with the delays and reprogramming charges involved with custom ROMs; there are no jumpers or diodes to change; no trips to the repeater site! Data is retained in non-volatile memory, ensuring that no information is lost during power outages. You can create a library of user commands with S-COM's exclusive **MACRO** capability. And, the 5K supports both a repeater system and a separate control receiver.

The CMOS design draws little power, so it's perfect for emergency, portable, and solar-powered repeaters. Use 5Ks for main site control and control of remote receiver links.

For professional-sounding audio with full squelch tail and DTMF elimination, add the 5K-ADM Audio Delay Module. It connects to the 5K through a single ribbon cable, and is field-installable. The optional 5K cabinet provides mounting for both the controller and the Audio Delay Module.

---

No other repeater controller on the market gives you all these features for less than $200!

---

New Product * New Product * New Product * New Product * New Product * New Product * New Product

# S-COM 5K REPEATER CONTROLLER

## Specifications

### HARDWARE

| | |
|---|---|
| Microprocessor: | CMOS HD63B09 (MC6809-compatible) |
| Memory: | 8K bytes non-volatile CMOS RAM; 16K bytes CMOS EPROM |
| DTMF Decoder: | MT8870, full 16-digit, crystal-controlled |
| Receiver COR Input: | NPN transistor with pullup, switchable active hi/lo |
| Control Receiver COR: | NPN transistor with pullup, switchable active hi/lo |
| Transmitter PTT Output: | Open-drain power MOSFET, switchable active hi/lo |
| CTCSS Decoder Input: | NPN transistor with pullup, switchable active hi/lo |
| Rptr Receiver Audio: | 70mV to 2V rms in 2 ranges; level-adjust pot |
| Control Receiver Audio: | 70mV to 2V rms in 2 ranges; level-adjust pot |
| Transmitter Audio: | 100mV to 1V rms into 600 ohms; 200mV to 2V rms into 10K ohms; level-adjust pot |
| CW Generator: | Sine-wave synthesizer and shaper; level-adjust pot |
| Logic Inputs (3): | NPN transistor with pullup resistor |
| Logic Outputs (3): | Open-drain power MOSFET, 40V 100mA |
| Protective Circuits: | Tranzorb(TM) suppressor & ferrite bead on power input; Tranzorbs on all power MOSFETs; bypass capacitors on all external inputs and outputs |
| Power Requirement: | 12 to 15VDC at 60mA; on-board voltage regulators |
| Connectors: | DB25S input/output connector; 2.5mm DC power jack. All mating connectors supplied. ICs in machined-pin sockets. |
| PC Board: | G10FR glass epoxy, double-sided with plated-thru holes, solder masked, silkscreened legends |
| Size: | PC board measures 5-13/16" D x 6" W x 1/2" H without the mating DB25P attached |

### COMMANDS

| | |
|---|---|
| Access: | Carrier/PL/AND-PL/OR-PL/ANTI-PL/no access |
| Clock/Calendar: | Set clock/calendar; Read 12 hr., 24 hr., date |
| CW: | Disable/enable; Set frequency; Set speed |
| DTMF: | Disable/enable mute; Mute delay; Interdigit time |
| Identifier: | Initial & normal callsigns; Interval; ID Tail message; Force ID. ID'er is "polite" (IDs during breaks) |
| Logic Inputs: | Name macro(s) to execute on either/both transition(s) |
| Logic Outputs: | Force outputs to momentary or latched states |
| Macros: | Create; Append; Erase; List; Rename |
| Security: | Name passwords; Select privilege levels |
| Squelch/Repeater: | Courtesy message & timer; Dropout message & timer; Pre- and post-timeout messages & timer; Timeout reset; Activity monitor functions |
| Test Tone: | Create test tone of programmable frequency & duration |
| Transmitter: | Disable/enable transmitter; Key transmitter timed/untimed |
| Utilities: | miscellaneous helpful commands |

### ORDERING INFORMATION

| | |
|---|---|
| Price: | Wired & tested board, $195.00 plus $5.00 shipping; in stock |
| Options: | Rack cabinet (1-3/4" x 19"), $35; Audio Delay Module, $79.00; Extra manuals, $20.00 |
| Warranty: | 1 year on parts and workmanship |
| Documentation: | Custom 3-ring binder, detailed manual, large schematics |
| Terms: | VISA, MasterCard, cashier's check, M.O., cash C.O.D. Personal & club checks must clear before shipment. |

S-COM Industries - P. O. Box 1718 - Loveland, CO 80539 (303) 663-6000

# RLC - 5

## REPEATER LINK CONTROLLER

**Radio Connection Diagram:**


1 GND
2 COR
3 AUDIO IN
4 AUDIO OUT
5 PTT
6 +12 Volts

**(CN5)** Main RX uses: 1,2,3,6

**(CN6)** Main TX uses: 1,4,5,6

**(CN9)** Control RX uses:1,2,3,6

Links RX/TX use:
**(CN7)** Link 1: 1,2,3,4,5,6
**(CN8)** Link 2: 1,2,3,4,5,6

**Selection Diagram:**


1 RETURN
2 LINK #1 RX
3 LINK #2 RX
4 CONTROL RX
5 MAIN RX
6 MAIN TX

**CN11:**
AUDIO SOURCE SELECT

**Speaker/Volume Diagram:**


1 GND
2 SPEAKER HIGH
3 GND
4 VOLUME CONTROL HIGH (IN)
5 VOLUME CONTROL ADJ. (TAP)
6 VOLUME CONTROL LOW (GND)

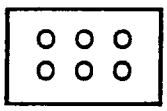
**CN10:**
SPEAKER OUTPUT ADJ.

**PL Tone Activity Access:**


1 GND
2 PL ACTIVE INPUT
3 MAIN RX AUDIO
4 N/C
5 N/C
6 +12 Volts

**CN3:**
PL ACTIVITY ACCESS

**COR SELECTION:**




**J7** **MAIN RECEIVER COR JUMPER SELECT**
**J6** **LINK #1 RECEIVER COR JUMPER SELECT**
**J5** **LINK #2 RECEIVER COR JUMPER SELECT**

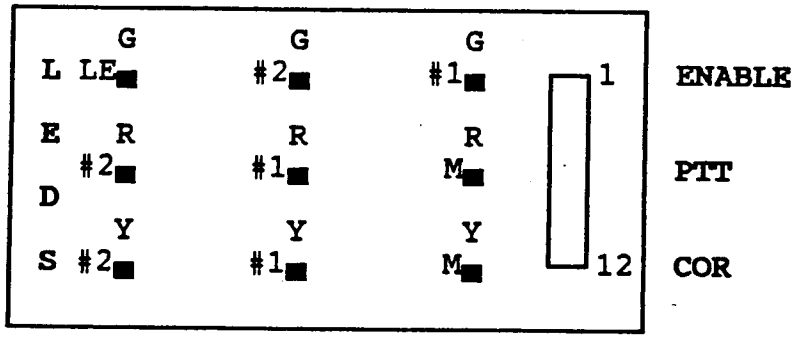
(See COR adjust section for jumper info.)

## Introduction:

The RLC - 5 was designed for the S-COM 5K repeater controller to expand the already powerful repeater controller into a versatile, and complete repeater/link controller. The Basic operations of the controller include full duplexing of links, link talk-thru (Link A talks to B), and central hub linking. All COR circuits are included on board and no external support circuitry is required. Throught the adjustment cycle, refrence is made to "Main" receiver or "Main" transmitter. The word "Main" is used to tell the end system user that we are refering to the repeater, not the links. If any confusion is encountered when installing the RLC-5, refer to the schematic section being discussed. A certain knowledge in repeater operation is needed, but not required when installing this board.

## LED DISPLAY PANEL:

PIN 1 GND
PIN 2 D1
PIN 3 D2
PIN 4 D3
PIN 5 D4
PIN 6 D5
PIN 7 D6
PIN 8 D7
PIN 9 D8
PIN 10 D9
PIN 12 +5




## DEFINITIONS:

### ENABLE:

| | | | |
|---|---|---|---|
| LE: | LINK ENABLE | OUT #3 | D3 |
| #1: | ENABLE PTT LINK #1 | OUT #1 | D1 |
| #2: | ENABLE PTT LINK #2 | OUT #2 | D2 |

### PTT:

| | | |
|---|---|---|
| M : | PTT MAIN REPEATER | D4 |
| #1: | PTT LINK #1 | D9 |
| #2: | PTT LINK #2 | D8 |

### COR:

| | | | |
|---|---|---|---|
| M : | MAIN RECEIVER COR | IN #3 | D5 |
| #1: | LINK #1 COR | IN #1 | D6 |
| #2: | LINK #2 COR | IN #2 | D7 |

### COLORS:

| | |
|---|---|
| PTT: | RED |
| COR: | YELLOW |
| ENABLE: | GREEN |

**REPEATER CONTROLLER SETTINGS:**

When connecting the RLC-5 link controller to your existing repeater controller the following settings need to be used for proper repeater/link operation.

**- MAIN RECEIVER COR SELECT:**

Set the main receivers COR select, on the repeater system controller, for an active high voltage when the receiver becomes active. The RLC-5 controller will deliever a logical active (+5 volts) to signal the repeater of current system activity. When the activity on the RLC-5 goes away it will deliever to the system repeater controller a logical inactive (0 volts) to signal loss of COR signal.

**- MAIN REPEATER PTT SELECT:**

Set your main repeater transmitting PTT select for an active low when transmitting. The most standard configuration used for transmitting PTT is to present the transmitter with a low (ground) signal to key the system into transmit. The RLC-5 does not process the transmit the signal at all, but the LED display panel needs an active low to light its activity display.

**- PL - TONE ACTIVITY SIGNAL:**

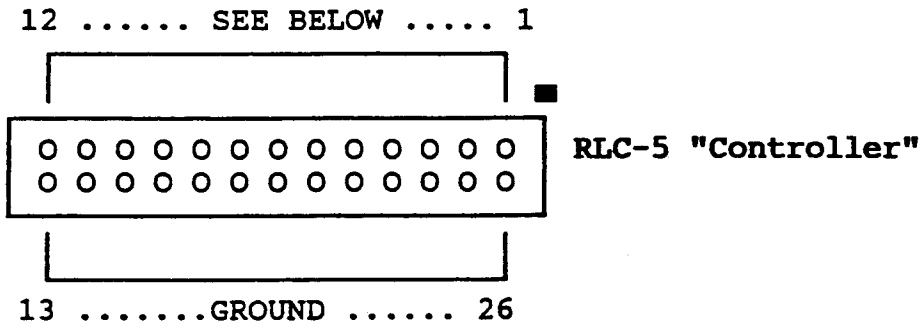
If your repeater requires a PL tone for system access, the the links will need to detect that PL also for transmit enable/disable. For main repeater detection, set your PL detect line for an active high (+5 volts). When the PL signal is no longer present, your external PL decoder must present the controller with an active low (ground) signal. The RLC-5 uses the PL activity signal to gate main receiver COR from causing the links to transmit, only if jumper 3 is in the active mode. See PL link select jumper for more information.

## NON-SCOM USERS
## CONTROLLER CONNECTIONS

**REPEATER CONTROL SIGNALS:**

| | | |
|---|---|---|
| COR Input | **ACTIVE HIGH** | **+5 Volts** |
| Time Out Timer | **(minimum COR)** | **100 mS** |
| PTT OUT | **ACTIVE LOW** | **OPEN TO GROUND** |

**RLC-5 CONNECTIONS:**




**PIN ASSIGNMENT:**

| | | |
|---|---|---|
| 1 | LOGIC INPUT #1 | LINK #1 COR |
| 2 | LOGIC INPUT #2 | LINK #2 COR |
| 3 | LOGIC INPUT #3 | MAIN RX COR |
| 4 | PL ACTIVITY IN | ACTIVE HIGH, GND LOW |
| 5 | CONTROL RX COR | CONTROLLER SPECIFIC |
| 6 | MAIN RX COR | ACTIVE HIGH |
| 7 | LOGIC OUTPUT #1 | ACTIVE LOW |
| 8 | LOGIC OUTPUT #2 | ACTIVE LOW |
| 9 | LOGIC OUTPUT #3 | ACTIVE LOW |
| 10 | PTT MAIN TX OUT | ACTIVE LOW |
| 11 | MAIN TX AUDIO OUT | CONTROLLER SPECIFIC |
| 12 | CONTROL RX AUDIO | AUDIO IN |
| 13 | MAIN RX AUDIO IN | RLC-5 AUDIO OUT |
| 14-26 | GROUND | SIGNAL ISOLATION |

This is the output configuration used by the RLC-5. The 3 logical input lines are used only to detect activity on the three receivers. Follow these pin configurations and the controller will adapt to your system with ease.

## - PROGRAMMING OPTIONS

### S-COM 5K REPEATER CONTROLLERS

When using the S-COM 5K controller in conjunction with the RLC-5 some knowledge of the 5K's macro programming is useful. I will include some short macro's that will cause the RLC-5 to operate. There is no way to include all possible programming styles for the board operation, but we will do our best.

### NON S-COM 5K REPEATER CONTROLLERS:

Because the RLC-5 was designed only to require 3 logical outputs to operate, any interfacing can be accomplished to controllers that meet this requirement. Logical inputs are also handy if separate courtesy beeps are desired. We will refer to three output commands used to control the RLC-5. These commands, in there command structure, are different than the S-COM commands, but the command "idea" is the same with all controllers. Refer to '**' for proper output commands.

**SYSTEM REQUIREMENTS:**

LINK BOARD CONTROL:

3 LATCHED LOGIC OUTPUT LINES

* LINK ACTIVITY DETECT:

3 LOGIC INPUT LINES
( Not needed for normal board operation, only needed for link monitoring activity detect )

**LOGIC OUTPUT LINE DEFINITIONS:**

LOGIC OUTPUT LINE #1 ... LINK #1 TX ENABLE
LOGIC OUTPUT LINE #2 ... LINK #2 TX ENABLE
LOGIC OUTPUT LINE #3 ... LINK SYSTEM DISABLE

**LOGIC INPUT LINE DEFINITIONS:**

LOGIC INPUT LINE #1 .... LINK #1 RX ACTIVITY
LOGIC INPUT LINE #2 .... LINK #2 RX ACTIVITY
LOGIC INPUT LINE #3 .... MAIN RX ACTIVITY

**NOTE:**

**OUTPUT LINE LOGIC LEVELS:**

| | | |
|---|---|---|
| OUTPUT LINE #1 | POSITIVE LOGIC | -P- 70 1 * (ON)<br>-P- 71 1 * (OFF) |
| OUTPUT LINE #2 | POSITIVE LOGIC | -P- 70 2 * (ON)<br>-P- 71 2 * (OFF) |
| OUTPUT LINE #3 | **NEGATIVE LOGIC** | -P- 70 3 * (OFF)<br>-P- 71 3 * (ON) |

The output lines will be refrenced to throught the manual and understanding of these lines is needed. To enable your links to transmit, turn on output lines #1 and #2. To enable your links to be received on the link board turn off output line #3, the link disable line. Normally, in a positive logic system, of means 0 volts, while on means positive voltage. Output line #3 is opposite; to enable the links you turn off your output line #3 and to enable the links you turn on your output line #3.

**COR Definitions:**

Throught the discussion of the RLC-5 we will make refrence to the term "COR". The term "COR" refrences itself to the receiver activity signal that indicates, to external hardware, when the receiver is active. The RLC-5 requires a COR signal that goes from inactive(ground) to active(+5 volts). There are COR buffering circuits present on the RLC-5 and can act as the needed interfacing between your receiver, and the controller.

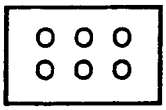
**COR Requirements:**

The RLC-5 will accept and style of external COR to operate. First you need to determine the "sense" or the way your receiver delivers a voltage when activity is present. If your receiver delivers a high voltage(12 volts or less) to a lower voltage (2 volts different than your high voltage), then your sense is + to - . If your receiver delivers a low voltage (0 volts to 10 volts) to a high voltage(12 volts or less), then your sense is - to + .

JUMPERS:

**J7 (MAIN RECEIVER)**
**J6 (LINK #1 RECEIVER)**
**J5 (LINK #2 RECEIVER)**

JUMPERS




If your COR sense is + to - select jumpers 1,2
If your COR sense is - to + select jumpers 2,3

Once you have determined your receiver sense then select your jumper pairs with respect to your receivers COR sense. The actual COR adjusting will be quite simple and fast. With your LED display panel plugged in, look at the YELLOW LED's to see if your receivers COR is adjusted propperly. With all receivers squelched, or not connected, all YELLOW indicators should be dark. Upon un-squelching any of your receivers the YELLOW LED should light. If this is not the case, the you need to adjust the three COR adjustments on board.

**COR ADJUSTMENT:**

ADJUSTMENTS:

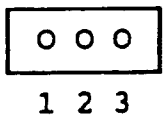
**VR6 (MAIN RECEIVER COR ADJUST)**
**VR7 (LINK #1 RECEIVER COR ADJUST)**
**VR8 (LINK #2 RECEIVER COR ADJUST)**

When you adjust the COR transition levels, the receivers need to initially be in the squelched position. Preceed on to the main receiver level adjustment **VR6**. Unsquelch the main receiver and adjust the level pot until the yellow LED lights. Now squelch the receiver and the LED should unlight. Do this for all three receivers. COR adjustments for link #1 is **VR7**, and COR adjustment for link #2 is **VR8**. If a receiver is not connected to a link port then adjust the COR level until the LED does not light indicating lack of activity. Once these levels are adjusted then no further adjustment is necessary.

**PL Link select jumper:**

Jumper 3 will allow the RLC-5 to control the access to the whole system via. and external PL tone decoder. In the 1,2 position, the PL decode signal is bypassed and a single active will be passed to the circuit thus bypassing the activity of the PL decoder. This position is used when no PL decoder is used, or if access to the link system does not depend on the state of the PL decoder. When you place the jumper in the 2,3 position, access to the link board, main receiver, link #1, and link #2 are totally dependent on the state of the external PL decoder. The controller must see +5 volts when the PL decoder is active, and a virtual ground when the decoder is inactive. The use of this function is to control the links activity when a PL'ed repeater goes active. If your main repeater system requires a PL tone to be present, and the link system is enabled in the TX enable mode on any of the links, and a non-PL'ed station comes on frequency, then the links would go active, but the repeater would stay inactive. This is a bad situation because of possible link interference to linked repeater systems. This feature is normally bypassed and usually will not be used.

Jumper 3 (J3)

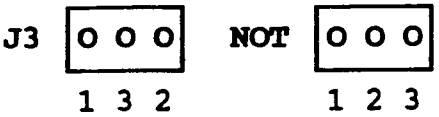



Repeater PL decoder bypassed: Select Jumpers 2,3
Repeater PL decoder used: Select Jumpers 1,2

**NOTE:**

On some of the circuit boards J3's pin numbers are not marked. J3's numbering reads the same as J1 and J2's numbering. See diagram above for correct pin reading layout. Also note on the Main Logic Section diagram that J3 is also wrong.

The correct pin layout on the schematic is :




Please make a note of this.

## Central Hub Linking:

### THEORY OF OPERATION:

Central hub linking is a mode in which the main receiver can talk to link #1, or link #2, or both systems. The links can talk only to the main repeater and are isolated from each link. This mode is useful when the user wants isolation between the two links.

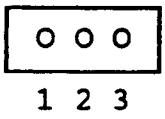
### EXAMPLE:

One example is when an autopatch is placed in half-duplex mode and is connected to link #1. A link to another repeater also in half-duplex mode and is connected to link #2. You want isolation between the two systems so that if link #2 brought up your half-duplex autopatch, interferences would not result. In half-duplex mode usually a transceivers is used and thus the receiver is only active when the transmitter is inactive. If the link were to activate the autopatch, the autopatch would become active and transmit link #2 thus keeping link #2's receiver from controlling the autopatch and autopatch interference on link #2's channel would result.

## Mode selection:

To select the central hub operation mode you must select the following jumpers.

**JUMPER 1, JUMPER 2, JUMPER 4**




JUMPER BLOCK

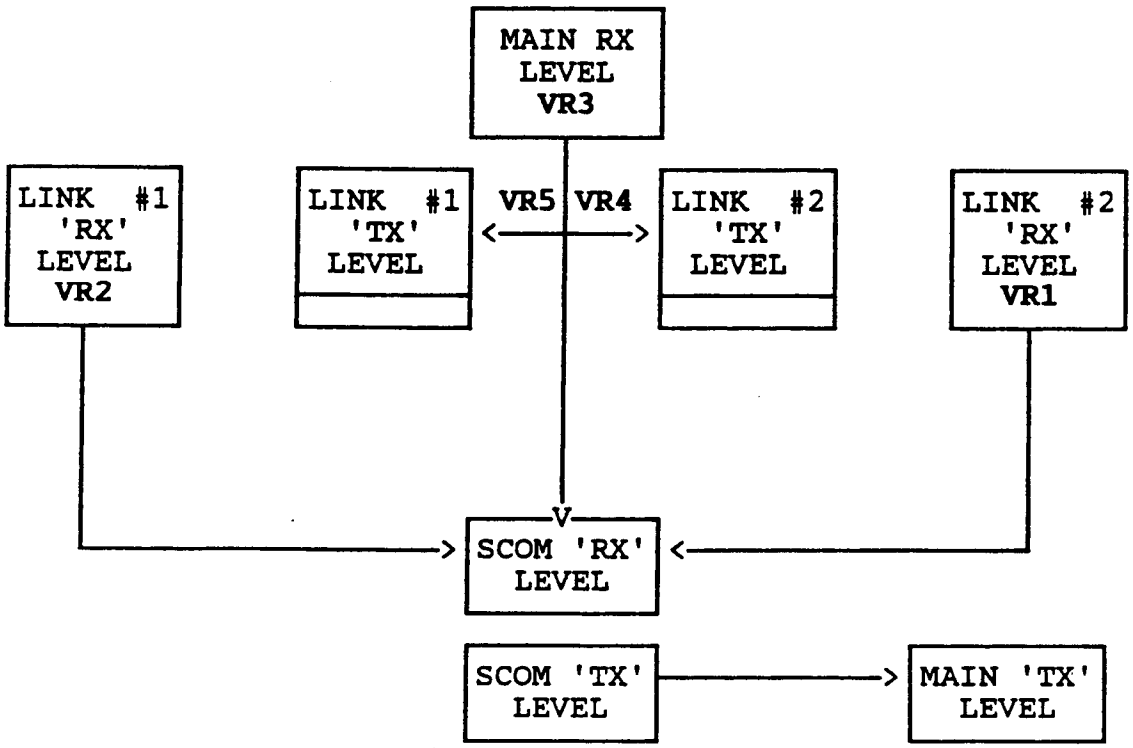
Place all Jumpers in the 2,3 position.

**Adjustment in the Hub Mode:**

**OUTPUT LINE DEFINITIONS:**

| | |
|---|---|
| **OUT #1** | **TX ENABLE LINK #1** |
| **OUT #2** | **TX ENABLE LINK #2** |
| **OUT #3** | **LINK SYSTEM ENABLE** |

With the jumpers in the 2,3 position, turn off OUT #3 with -P- 71 3 * to enable the links on the RLC-5. Turn off both link transmit enable -P- 71 1 * and -P- 71 2 *. Adjust the RLC-5's VR3, the main receivers input level to about 1/2 level. Then adjust the S-COM 5K's 'RX' level to about 1/2 level. Now present a known signal level, like a DTMF touch tone on your main receiver. Using a deviation meter set your deviation on the main transmitter to about 4 Khz. max. Use the 'TX' pot, on the S-COMN controller to achieve a correct level. You may have to play with these three level adjustments in the consecutive order to balance the input level. Now present the same signal to link #1's receiver. Adjustment for link #1 is marked VR2. You may need to increase the S-COM 5K's 'RX' level to balance out link #1. If you change this level you must re-adjust your main receiver level to offset the increase in deviation. The same input adjustment for link #2 pertains to that of link #1.



To adjust your link transmitters turn on link #1 TX enable with -P- 70 1 *. Now put your deviation meter on link #1's transmitter. Present the same DTMF tone to your main receiver and adjust your deviation on link #1 using the adjustment on the RLC-5 marked VR5. This is the only adjustment for link #1's level. Proceed on to link #2 by disabling link #1's TX enable with -P- 71 1 *. Enable link #2's TX enable with -P- 70 2 *. Link #2's level adjustment is with VR4.

These are the only adjustments that are needed to the RLC-5 for proper operation. For small code macro examples see the programming section of the manual.

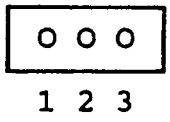
**Thru-put Chain Linking:**

Chain linking is the term used when repeaters are linked to each other via another in-line repeater. This linking is accomplished by selecting Mode 2 on the RLC-5. When Mode 2 is selected link #1 will be able to cause transmit on link #2, and link #2 will cause transmit on link #1. This can occur at the same time, or separately. The audio, in this mode is in the voted manner which means that the priority level induced on the RLC-5 is active. Link #1 has higher priority over link #2 along with the main receiver carrying highest priority over both link receivers. There are several operation parameters that need to be overviewed.

**Mode selection:**

To select the thru-put chain liking operation mode you must select the following jumpers.

**JUMPER 1, JUMPER 2, JUMPER 4**




JUMPER BLOCK

Place all Jumpers in the 1,2 position.

**Adjustment in cross tie mode:**

The adjustment in this mode is kind of tedious, but will operate correctly if done in the proper levels. With the jumpers in the 1,2 position, turn off OUT #3 with -P- 71 3 * to enable the links on the RLC-5. Turn off both link transmit enable -P- 71 1 * and -P- 71 2 *. Now present a known signal level, like a DTMF touch tone on your main receiver. Using a deviation meter set your deviation on the main transmitter to about 4 Khz. max. Adjustment of the board is in a systematic order. Adjust the RLC-5's VR3, the main receivers input level to about 1/2 level. Then adjust the S-COM 5K's 'RX' level to about 1/2 level. Proceed on to the 'TX' pot to achieve a correct level. You may have to play with these three level adjustments in the consecutive order to balance the input level.

**LINK ADJUSTMENT:**

Now we go to the links. Disable the links from the controller -P- 70 3 * and enable both TX enable for talk-thru configuration, -P- 70 1 * and -P- 70 2 *. Present a known signal to the link #1's receiver and monitor link #2's deviation. Adjust VR4 for a deviation of about 4 Khz. Now go to link #2 with the input signal and adjust link #1's deviation with VR 5. Once the levels are adjusted in this mode **DO NOT ADJUST VR 4, or VR5 AGAIN.**

The cross tie levels are now adjusted, now enable the main repeater to the link system -P- 71 3 *. Go back to link #1 and input a known signal and adjust the input level adjust, VR 2 monitoring link #2's deviation. Use only this adjustment for link #1 to link #2's level. Go back to link #2 and do the same adjustment monitoring link #1's deviation and adjusting VR1. Now input a signal on the main receiver and monitor link #1's deviation, adjusting VR 3 to the proper deviation level.

This now completes the link I/O adjustments. To adjust the main repeater level go to the S-COM 5K's RX adjustment to obtain a suitable TX deviation. You may have to go through this process several times to balance out the thru-put deviation to match the voted audio's deviation.

**Sub-Modes:**

1) Main repeater hooked to the link.
** -P- 70 1 * OUT #1 on, Link #1 TX enable.
** -P- 70 2 * OUT #2 on, Link #2 TX enable.
** -P- 71 3 * OUT #3 off, Main repeater link enabled.

When the main receiver becomes active it PTT both Link #1, and Link #2. When it goes inactive link #1 RX carries priority and can PTT link #2, or link #2 can PTT link #1. If tied into the full duplex mode, link #1 will PTT link #2 and link #1's audio will be present on the links.

2) Main repeater divorced away from the link system.
** -P- 70 1 * OUT #1 on, Link #1 TX enable.
** -P- 70 2 * OUT #2 on, Link #2 TX enable.
** -P- 70 3 * Out #3 on, Main repeater link disabled.

When the main repeater needs to have the links inactive, at least on the main repeater, then this sub-mode is selected. This mode is useful if a repeater net is active and the activity on the links are distracting. When selected, the main repeater acts like a standard repeater without and links operational. The link backbone is still active. There is no audio voting done, link #1's audio is directly routed to link #2, and likewise for link #2. The repeater can operate normal and the links can operate normal, without any interferences.

3) Main repeater divorced links broken.
** -P- 71 1 * OUT #1 off, Link #1 TX disabled.
** -P- 71 2 * OUT #2 off, Link #2 TX disabled.
** -P- 70 3 * OUT #3 on, Main repeater link disabled.

This mode is rarely used but is available. The main repeater can be divorced away from the link system and the talk-thru system is broken. Only the main repeater will operate in this mode.

4) Main repeater in receive only, links broken.
** -P- 71 1 * OUT #1 off, Link #1 TX disabled.
** -P- 71 2 * OUT #2 off, Link #2 TX disabled.
** -P- 71 3 * OUT #3 off, Main repeater link enabled.

This mode is useful if a problem occurs on the link system and all you want to do is monitor the link activity. The links can not talk to each other, they can just be monitored by the main repeater.

5) Main repeater can talk out individual link, links broken.

```
     Link #1 TX enable, Link #2 RX only
**   -P- 70 1 * OUT #1 on, Link #1 TX enabled.
**   -P- 71 2 * OUT #2 off, Link #2 TX disabled.
**   -P- 71 3 * OUT #3 off, Main repeater link enabled.

     Link #1 RX only, Link #2 TX enable
**   -P- 71 1 * OUT #1 off, Link #1 TX disabled.
**   -P- 70 2 * OUT #2 on, Link #2 TX enabled.
**   -P- 71 3 * OUT #3 off, Main repeater link enabled.
```

This mode is useful when you only want your signal to go one direction, either out link #1 or out link #2. The main repeater will still monitor both receivers.

This concludes the several mode operations that are capable of the RLC-5. Because of the requirements of your main repeater controller, there are more ways than were presented here for controlling the board.

**PROGRAMING IDEAS FOR THE RLC-5:**

Enable links to be active on the link controller

```
**    - P - 71 3   * ' TURNS OUT #3 OFF

      - P - 32 14 * ' TAGS A SINGLE BEEP BEFORE MAIN TX DROP

**    - P - 71 1   * ' TURNS OUT #1 OFF, LINK #1 TX ENABLE

**    - P - 71 2   * ' TURNS OUT #2 OFF, LINK #2 TX ENABLE
```

This is the enable command macro for the links. When in MODE 1, the RLC-5 is in receive only form. When in MODE 2, the RLC-5 is in the broken cross tie configuration.

Enable link #1 to TX providing that the links are enabled to operate on the link controller, see previous macro.

```
**    - P - 70 1   *   ' TURNS ON OUT #1 TO ENABLE LINK TX

      - P - 15 ## ## * ' SENDS A CW ID TO SHOW USER THAT THE
                         LINKS ARE ON. THE ## IS A CODE FROM
                         THE CW TABLE AND CAN BE ANY LENGTH.

      - P - 34 33 * ' APPENDS THE DROP OUT MESSAGE TO SAY 'X'
```

Macro that turns on Link #1 and tells the user of the happening. The drop out addition is used to signal the operators that the link is in transmit. If the link is normally in TX then get rid of the last command. Normally in MODE 1 you run the system in RX only, thus the drop out message is useful. In MODE 2, normally you have both TX enables on, but if in this mode it is good to signal the user of the broken tie thru.

Turn off link #1 TX enable.

```
**    - P - 71 1 * ' TURNS OFF OUT #1

      - P - 15 24 15 15 * ' TELL THE USER "OFF"

      - P - 34 14 * ' CHANGE DROPOUT MESSAGE TO A SINGLE BEEP
```

Macro that turns off Link #1 TX enable and appends the drop out message. If the link is normally on, and shutting it off is not normal the append something else to the dropout message. Normally a MODE 1 operation.

Take both links off of the board.

```
**    - P - 70 3 * ' TURN ON OUT #3 THUS SHUTTING OFF LINKS

      - P - 15 21 24 * ' SEND "LO" FOR LINK OFF TO USER

      - P - 34 21 * ' APPEND THE DROPOUT MESSAGE WITH A "L"
```

Macro to take off the links from the board. It is wise to append your dropout message with something "out of the ordinary" to signal all users that the links are off. The two links TX enable is kept the same as earlier, but is not active until OUT #3 is turned back on. If you want to reset the states of the two links when a main link shut off command is given just add the commands - P - 71 1 * and - P - 71 2 *. This shuts off both of the link TX enables. If you want different beeps when the links become active refer to your section on logic inputs. If Input #1 becomes active, then inactive, like a standard receiver, send a courtesy beep just for that line. This mode of operation is often called being divorced away from the link system.

```
      - P - 26 06 (MACRO NAME) *

** (MACRO NAME) **

      - P - 15 14 * ' SENDS A SINGLE BEEP, LINK #1 INACTIVE

OR....

      - P - 26 08 (MACRO NAME) *

** (MACRO NAME) **

      - P - 15 18 * ' SENDS A DOUBLE BEEP, LINK #2 INACTIVE

OR....

      - P - 26 10 (MACRO NAME) *

** (MACRO NAME) **

      ** NOTHING MAYBE WHEN THE MAIN RX IS ACTIVE **
```

Mode 1 special configurations:

A bulletin needs to be announced to as many listeners as possible. Turn on both TX enables and you will go out both repeater systems simultaneously. The code for this operation is:

```
**    -P- 71 3 * ; 'Turn OUT #3 off, Enables links
**    -P- 70 1 * ; 'Turn OUT #1 on, Enables link #1 TX
**    -P- 70 2 * ; 'Turn OUT #2 on, Enables link #2 TX
```

Repeater 'A' on Link #1 fails and its squelch is open. Your repeater does not want to hear the noise all the time so you decide to disable the link system until Repeater 'A' is fixed. Using the RLC-5 you can have the controller re-enable the link system when Repeater 'A's squelch goes inactive:

```
**    -P- 70 3 * ; 'Disable the Link System
      -P- 26 06 1000 * ; 'Calls macro 1000 on a high to low
                          drop on link #1's COR signal
      -P- 34 21 * ; 'Appends the dropout message with an 'L'

      -P- 20 1000, -P- 15 75 95 75 95 75 95 * ; ' Make a
```

Macro 1000 and have it send a message of beeps to alert the users of the update.

```
      -P- 29 1000, -P- 71 3 -P- 2606 * ; ' Appended the macro
```

1000 to also re-enable the links on the RLC-5 along with cancelling the command to call macro 1000 on a high to low transition on link #1.

These were a couple of examples on how you, as a control operator, can use the RLC-5 for most of your link applications.

Special applications for Mode 2 are covered in the text. All of Mode 1's application programs will also operate correctly in Mode 2. The operations will differ, but the programming structure is the same.

This concludes the manual of operations for the RLC-5. Any programming changes made to your controller to control the RLC-5 should be jotted down for future reference.

PHYSICAL CHARACTERISTICS:

BOARD DIMENSIONS ..... 5.25" X 5.30"
CMOS DESIGN
9 LED DISPLAY PANEL
ON-BOARD COR SUPPORT
ON-BOARD AUDIO MONITORING

CONNECTOR DESCRIPTION:

MAIN RX PORT ..... COR,AUDIO,GROUND,POWER
MAIN TX PORT ..... PTT,AUDIO,GROUND
LINK PORTS:
COR,AUDIO IN,PTT,AUDIO OUT,GROUND
CONTROL RX ..... COR,AUDIO,GROUND,POWER

BOARD POWER REQUIREMENTS:

RLC-5 LINK BOARD ..... 160.5 mA, NO DISPLAY
..... 240.2 mA, FULL DISPLAY

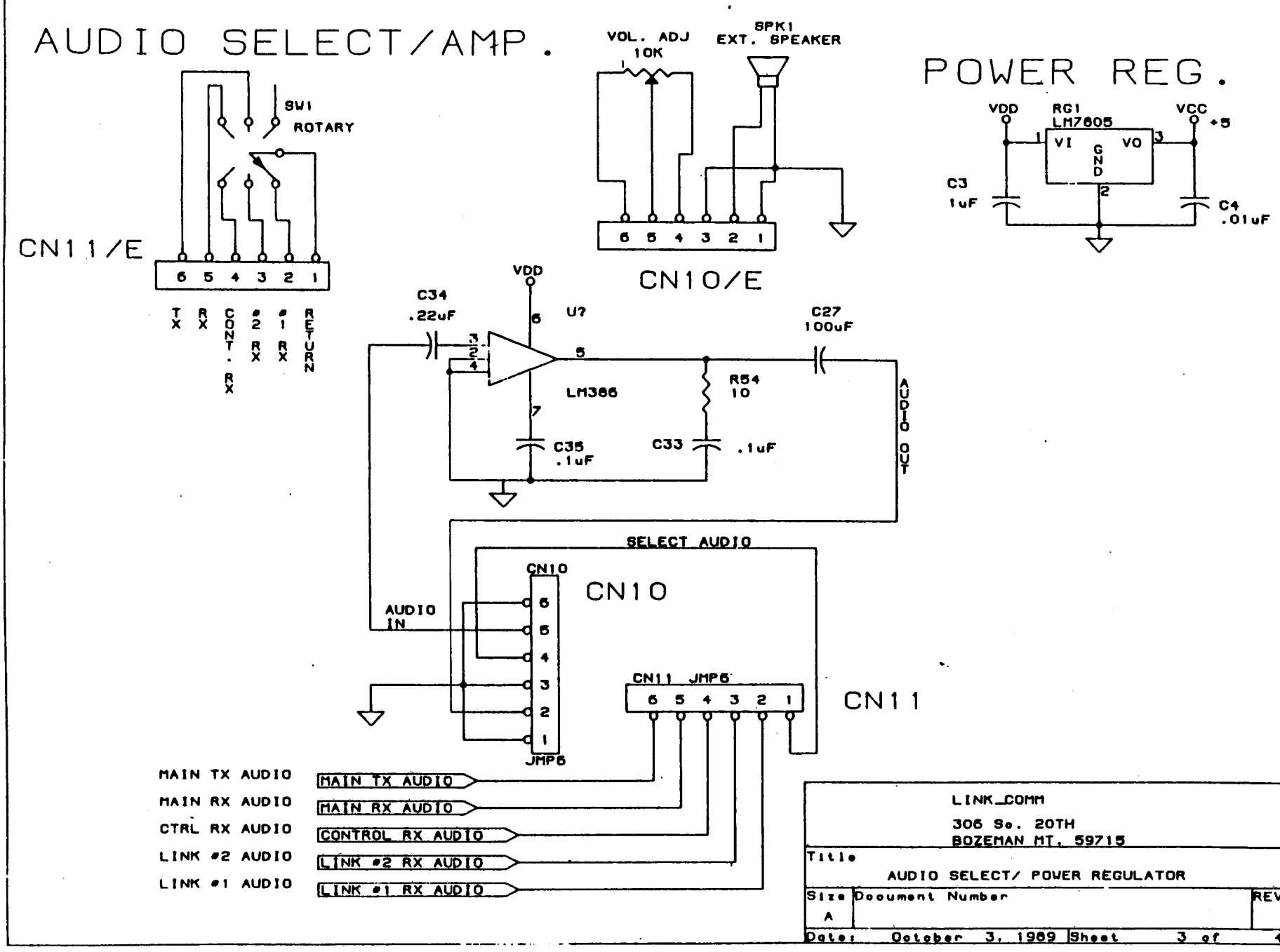
REPEATER INTERFACE REQUIREMENTS:

S-COM 5K ..... DIRECT CONNECTION
OTHER ..... DTMF CONTROL
ACTIVE HIGH COR INPUT
ACTIVE LOW PTT OUTPUT
3 ACTIVE LOW LOGIC OUTPUT
3 ACTIVE HIGH LOGIC INPUT

73's

Allan Overcast KF7FW
Owner, LINK_COMM

# AUDIO SELECT/AMP.

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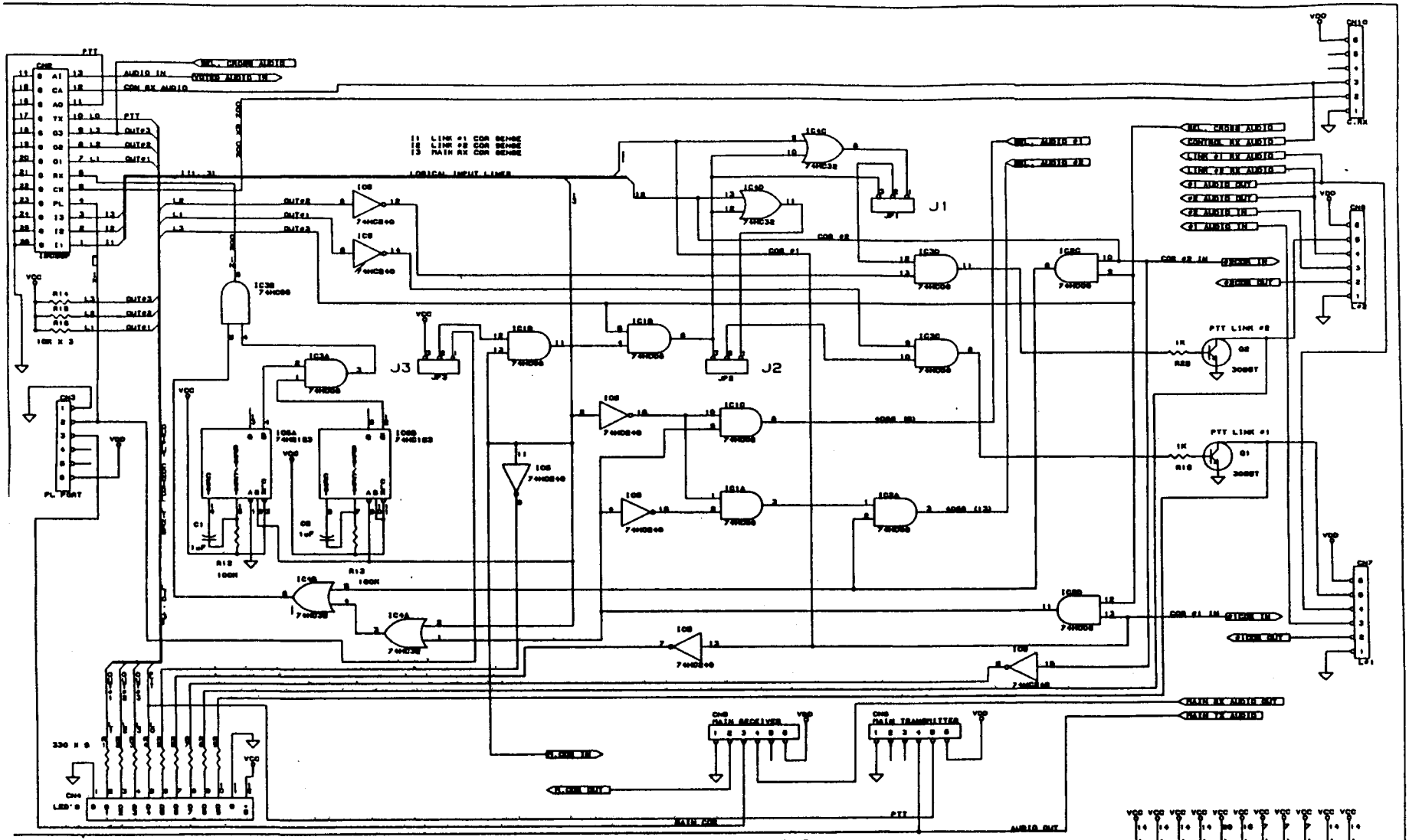
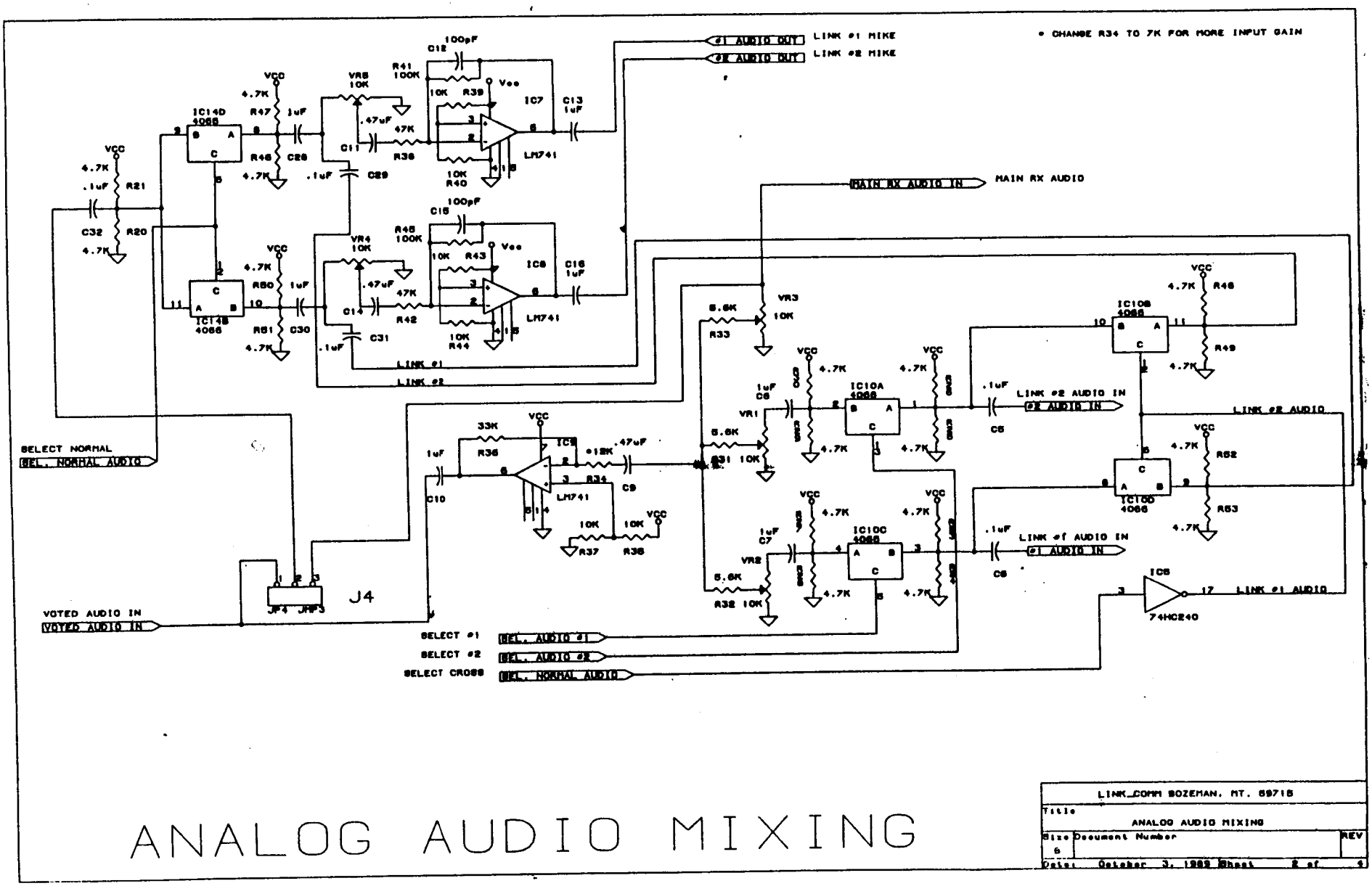
| | LINK_COMM<br>306 So. 20TH<br>BOZEMAN MT. 59715 |
| Title | AUDIO SELECT/ POWER REGULATOR |
| Size A | Document Number / REV |
| Date: October 3, 1989 | Sheet 3 of 4 |



# MAIN LOGIC SECTION

SUB SECTIONS:

- ANALOG AUDIO MIXING
- AUDIO MONITORING/SWITCHING
- POWER REGULATING
- COR CONFIGURATION




# ANALOG AUDIO MIXING