DOUG HALL ELECTRONICS

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4RV/2 VOTER PRODUCT INFORMATION

4RV/2 Version 4.1.1
VLC Version 2.0
RLC Version 2.0

3/26/96

CONTENTS

INTRODUCTION

Doug Hall Electronics has been manufacturing voters since 1984. We produce the price performance leader in voting today. We continue to improve and add function to our product line to meet the increasing demand for a flexible voting system.

The DHE 4RV/2 Receiver Selector is a high performance signal-to-noise voter that can be used to enhance the performance of your radio system. Four independent circuits continuously monitor a signal-to-noise ratio, selecting the best signal's audio. Each voter channel can be disabled independently, allowing complete control of the systems input signals. The voter requires AUDIO and COR from each receiver site.

For *RF linking* Audio and COR, connect directly to the Voter card.

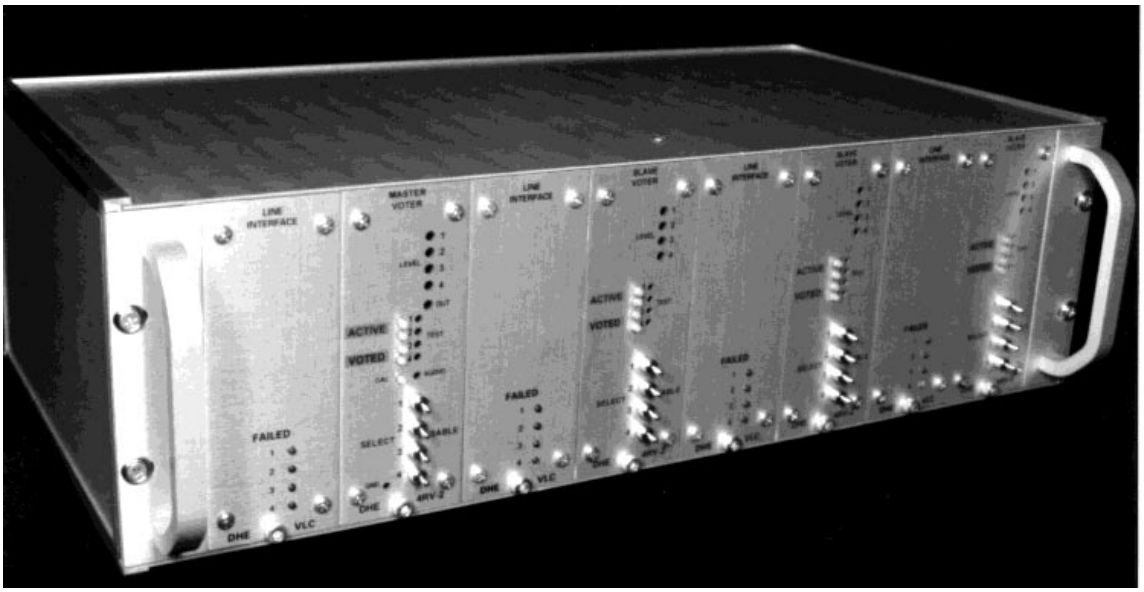
For *Microwave linking* with E+M signaling, connect to the Voter through Our 600 Ohm Line card (MLC).

For *Wire Leased line applications* we offer the Voter Line Card (VLC) that adapts the voter COR and audio inputs to 600 Ohm balanced input with COR detected by the lack of a 1950 Hz carrier. In this case, the receiver would be fitted with our Receiver Line Card (RLC). This then takes the audio and COR from the receiver and delivers a 600 Ohm line output. When there is a lack of COR, the RLC generates a 1950 Hz carrier on the line, to signal the VLC of the lack of COR. If the phone line were to fail, the VLC will time-out and disable that channel to prevent locking up the system.

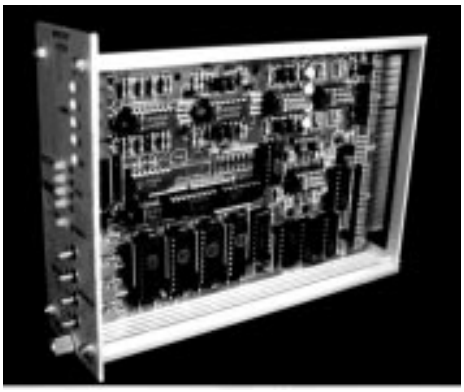
The voter system can expand as your needs grow. Each voter card has 4 input channels. By adding cards, you can expand in increments of 4 up to 32 channels.

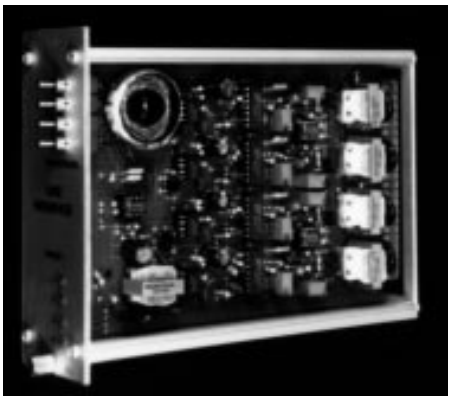
DHE can provide support for special applications and interfacing questions. We can also ship emergency loaner cards while factory repairs are made. The 19-inch rack mounted systems can be ordered in many different configurations. Contact us for your custom needs.

RACK SYSTEM



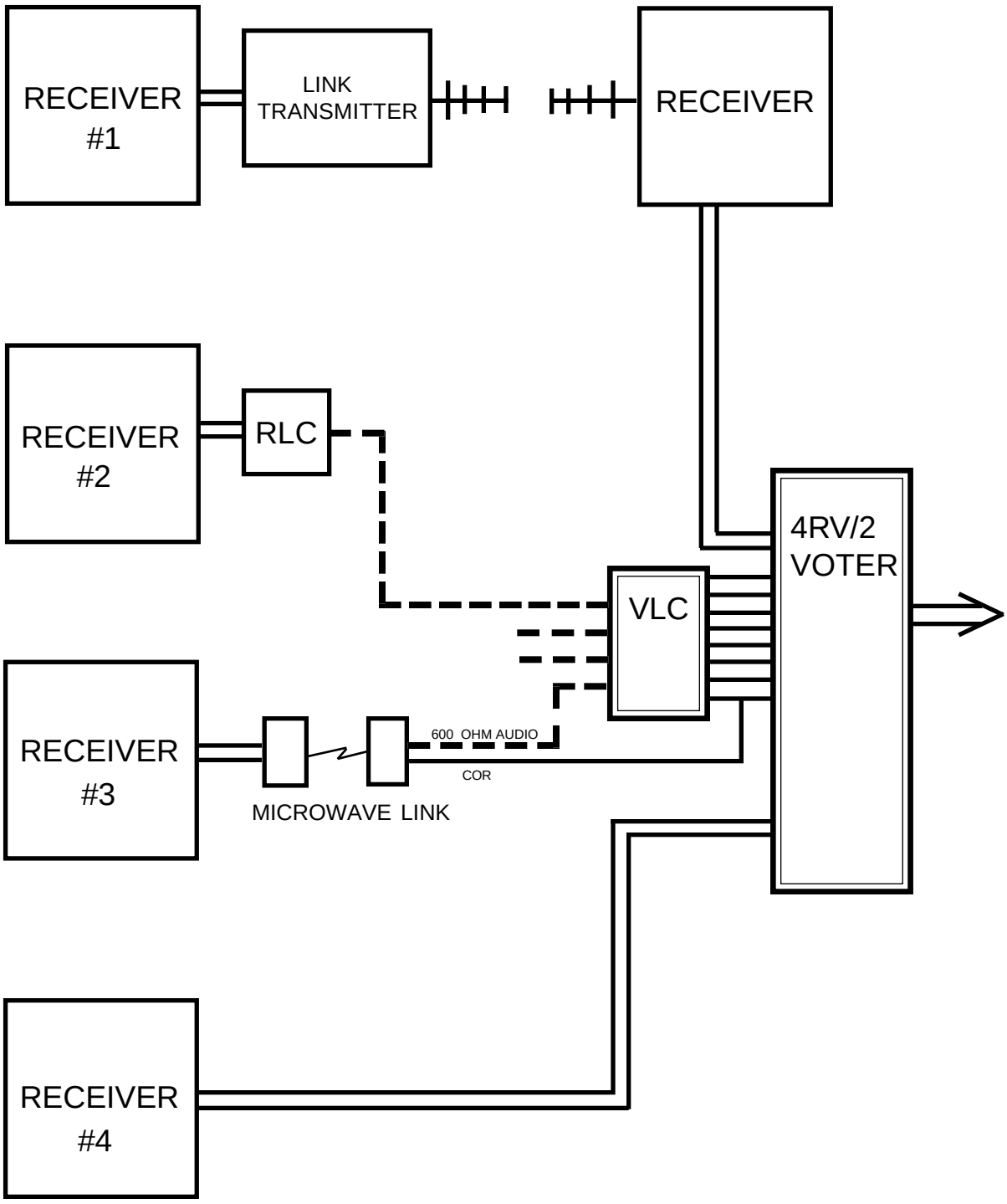
RACK SYSTEM
(SHOWN IN CUSTOM RACK)





4RV/2 AND **VLC** RACK
MODULES

SYSTEM BLOCK DIAGRAM



COR / AUDIO

TWISTED PAIR / PHONE LINE

SYSTEM DESCRIPTION

The Voting system shown on the left illustrates some of the possible ways the Voter can be connected to the receivers.

Receiver #1 is shown to be a remote receiver, linked back to the voting site with RF links. This is the most common connection. The link receiver is attached directly to the voter as if it were a local receiver. Typically unsquelched "volume high" for audio and a ground active COR are used. The Link receiver should appear to the voter as if the remote receiver was directly attached.

Receiver #2 is shown with a telephone leased line connection. This should be ordered from your local Phone Company as a high quality, stable, equalized line. The receiver audio and COR lines connect to the RLC (Receiver Line Card). This provides a 600 Ohm balanced driver to directly attach to your leased line. The COR from the receiver can be positive or negative going, the RLC has a threshold adjustment and polarity jumpering to mate with almost anything. When the COR is inactive, the RLC puts a 1950 (other frequencies available at extra cost) carrier on the line to tell the VLC (Voter Line Card) that there is no activity or COR. When the COR goes active, the RLC first removes the 1950 carrier and then gates the receiver audio onto the phone line. The VLC Can handle up to 4 receivers / telephone lines. The VLC handles the audio transition and COR detection to be fed to the 4RV (Four Channel Receiver Voter).

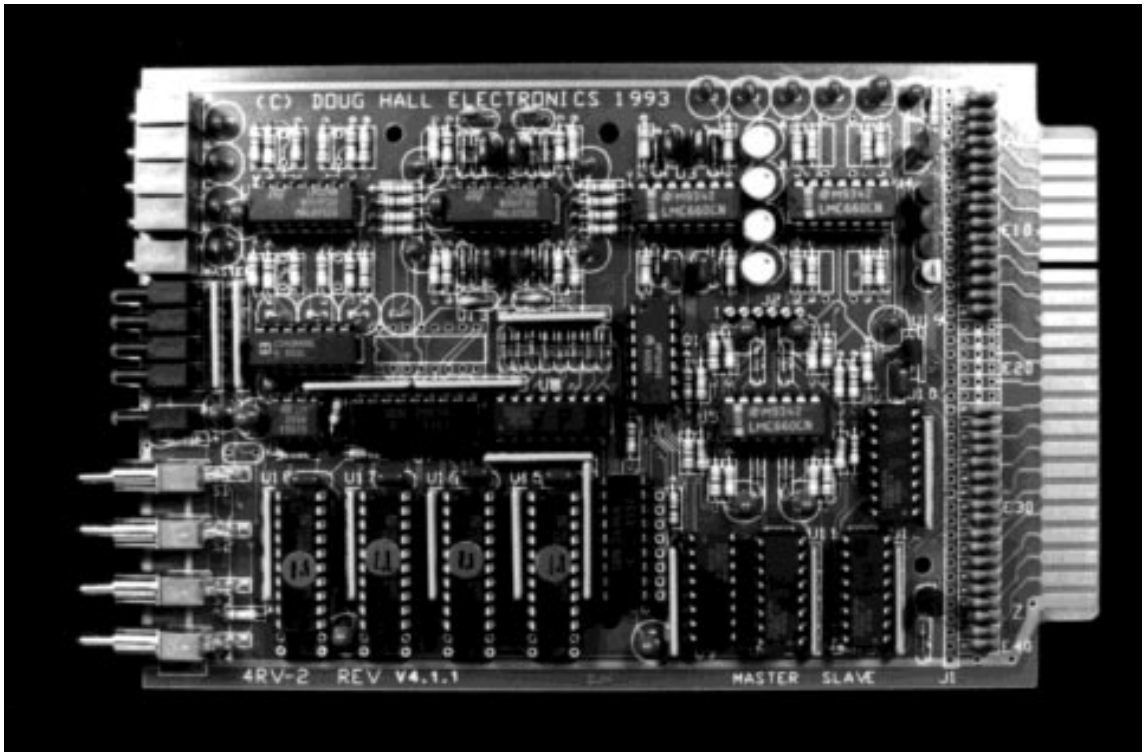
Receiver #3 is shown with a microwave link. Some microwave systems can provide the COR contact closure with its internal E+M signaling as shown in this diagram. Some may require the RLC at the receiver to use the microwave as a phone line. We also make the MLC (Microwave Line Card) which is the same as the VLC, but doesn't have the tone detection or notching circuits. The MLC uses the E+M signalling for the COR input.

Receiver #4 is a local receiver at the voting site. It is connected the same as the Link receiver shown with Receiver #1.

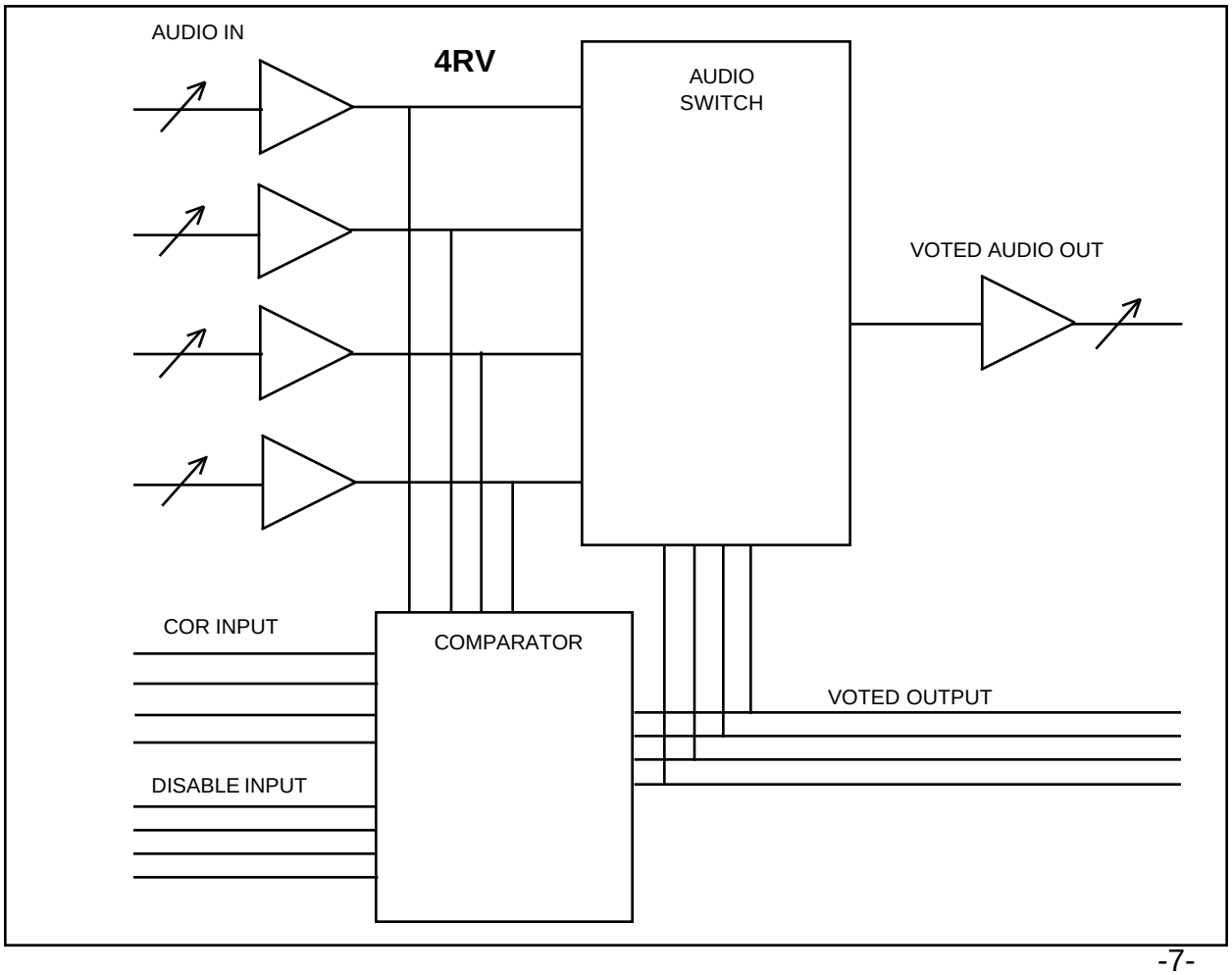
The VLC or MLC can coexist with direct attached receivers. The VLC also has a notch filter that connects after the Voter to reduce the short 1950 tone burst when the COR drops. If our mother board is used, it makes all the connections between the 4RV and VLC. The system shown would require one DHE-R-DMP-01 (4 channel Telephone Line Rack system with 1 RLC) which includes the Rack, Mother Board, Power Supply, VLC, 4RV and 1 RLC. This can be expanded later with a DHE-E-DS expansion set in increments of 4 channels. Up to 16 channels of voting can be in one rack, but the power supply will then need to be external.

The output of the voter looks like one receiver with audio and COR.

4RV/2



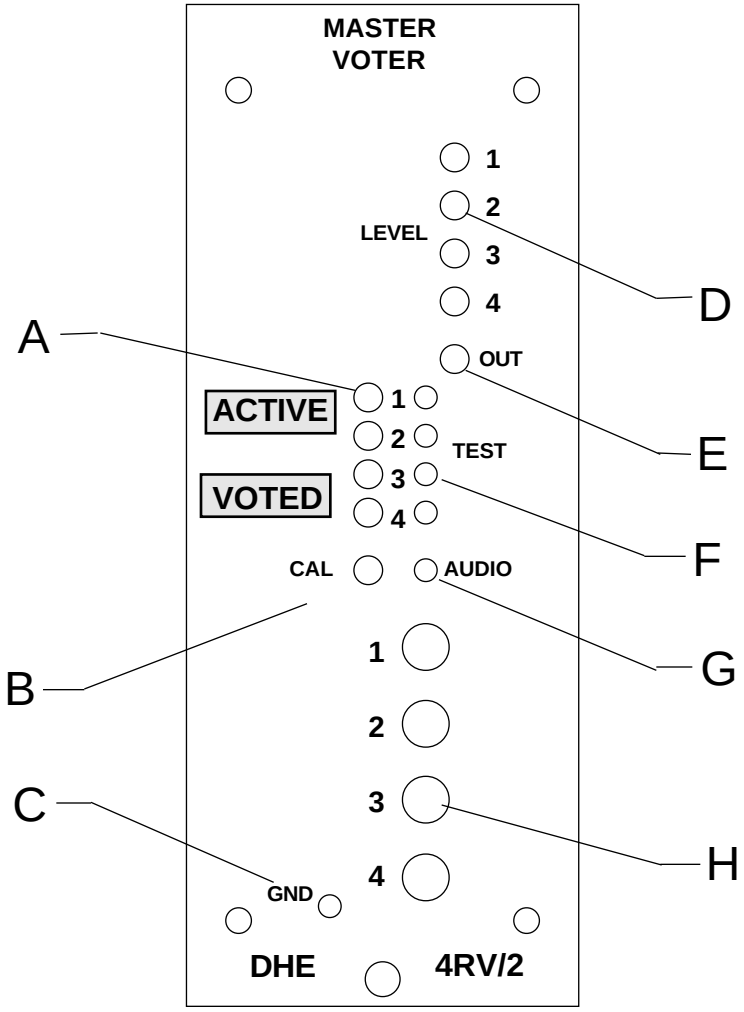
4 CHANNEL VOTER BLOCK DIAGRAM



4RV/2 VOTER SPECIFICATIONS

Voting Method:	Signal-to-Noise.
Hysteresis:	Approximately 10% Factory set. See options section.
Capacity:	Four channels expandable to 32, 4 channels per card.
Voting Criteria:	Approximately 2db difference in signal-to-noise. (measured with low input noise levels)
Voting Time:	Continuous, fast voting - no delay or sampling, Four independent circuits working simultaneously.
Calibration:	Built-in audio level calibrator. Test points provided.
Indicators:	5 LED's (4 on slave cards.) 4 Bicolor Voted (green) and Receiving / Active (red)
Audio in:	100mv - 10v p-p into approximately 10K input impedance.
COR:	Ground is the active state (unsquelched) 12v sourced opto-isolated input with > ~2mA to ground active.
Mixer:	Audio mixer input available for external input.
Output Section:	
Audio:	1v p-p adjustable with a master level pot into approximately a 5K load.
Distortion:	< 0.6% at rated output.
Frequency Response:	±1dB 100-20,000 Hz (4RV/2 only)
PTT:	Ground is the active state (unsquelched). Open collector NPN output to ground and will sink at not more than 50v or 100mA.
Disable Inputs:	Low disabled (grounded) high enabled (open) - Same as COR inputs.
Voted Indicator Outputs:	Ground active opto-isolated outputs (not more than 50v or 100mA).
Test Points:	(4) Audio level calibration points - 1 per receiver on edge connector and front panel. (1) Calibration bus on edge connector. (1) Audio output test jack on front panel.
Power Requirements:	+11v to +15v regulated at < 500mA per 4 channels.
Dimensions:	4.5"H x 6.8"L x 1/2"W (4.5" x 6.5") Card only.
Connections:	44 pin edge connector (22 per side) gold plated fingers - 0.156" spacing - similar to Vector R644. (not included)

4RV/2 FRONT PANEL DETAIL



A - BICOLOR LED INDICATORS FOR EACH OF THE 4 CHANNELS. RED FOR RECEIVING OR ACTIVE, AND GREEN FOR VOTED.

B - RED LED FOR AUDIO INPUT LEVEL CALIBRATION.

C - GROUND TEST JACK FOR METERING TEST POINTS.

D - AUDIO INPUT LEVEL POTS.

E - AUDIO MASTER OUTPUT POT, ONLY PRESENT ON THE MASTER VOTER.

F - TEST JACKS. DC LEVELS PROPORTIONAL TO THE VOTER AUDIO INPUT LEVEL. ARE PRESENT FOR EASY ADJUSTMENT.

G - AUDIO OUTPUT TEST JACK.

H - SELECT / DISABLE SWITCHES.

4RV/2 FEATURES

"Vote -n- lock"

After a preset time into the transmission the voter will lock on the voted channel until its COR drops. The factory RC value sets the lock delay to approximately one second. On data systems it can be set to the length of the carrier before data is present on a channel. Grounding pin 1 of the voter enables the " Vote Lock " mode.

"Power Save"

Grounding pin A of the 4RV/2 blanks the LED's for low power mode.

Opto-Isolated I/O

Opto-isolators were incorporated on the COR in, disable in, select in, and voted out lines. This Protects the voter circuitry from lightening damage, RF noise and static damage. The Voted out pin also provides a high drive current to drive external voted indicators without affecting the voters performance. The new voted output is inverted and the active state (Voted) is Ground and can sink 100 mA.

EMI filtering

All connections (except for ground) have series EMI filters to remove any RF that might be present around the voter.

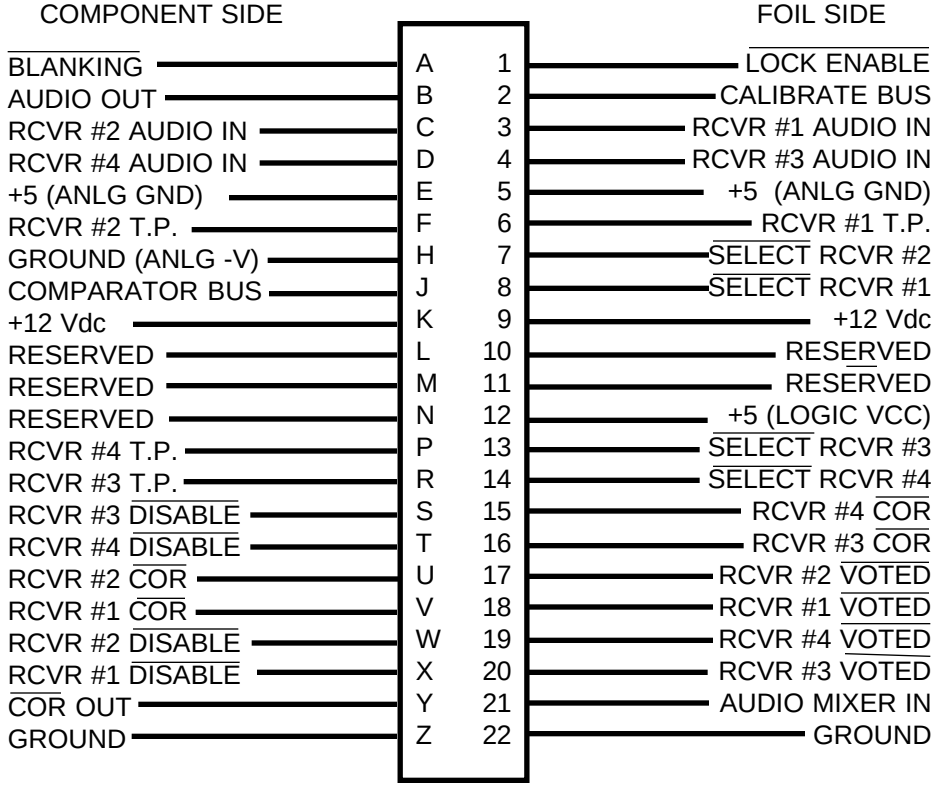
Programmable logic

The logic circuitry of the 4RV/2 is programmable to allow for custom functions and features.

4RV VOTER CARD PINOUT

SHOWN FROM THE CONNECTOR END

CONNECTOR SIMILAR TO VECTOR R644 44 PIN 0.156" SPACING



4RV/2 OPTIONS

C1. CX8 Frequency roll-off

The 4RV/2 has provisions to add de-emphasis and frequency roll-off to the receiver inputs. For individual input compensation adding optional CX8 (CA8,CB8,CC8,CD8) will roll off the frequency response. Values between 0.001 to 0.1 uF will provide common response curves. For overall output frequency roll-off adding C1 will have a global effect

Switches

The front mounted select / disable switches can be special ordered with an optional mechanical locking switch that would be used in console configured voters to prevent accidental changes.

Test points

The front mounted test points can be omitted by special order.

Adjustment pots

The front mounted pots can be ordered so that the pots are only adjustable from inside the voter module. Eliminating the hole in the front panel and removing the adjustment from the front will prevent accidental adjustment.

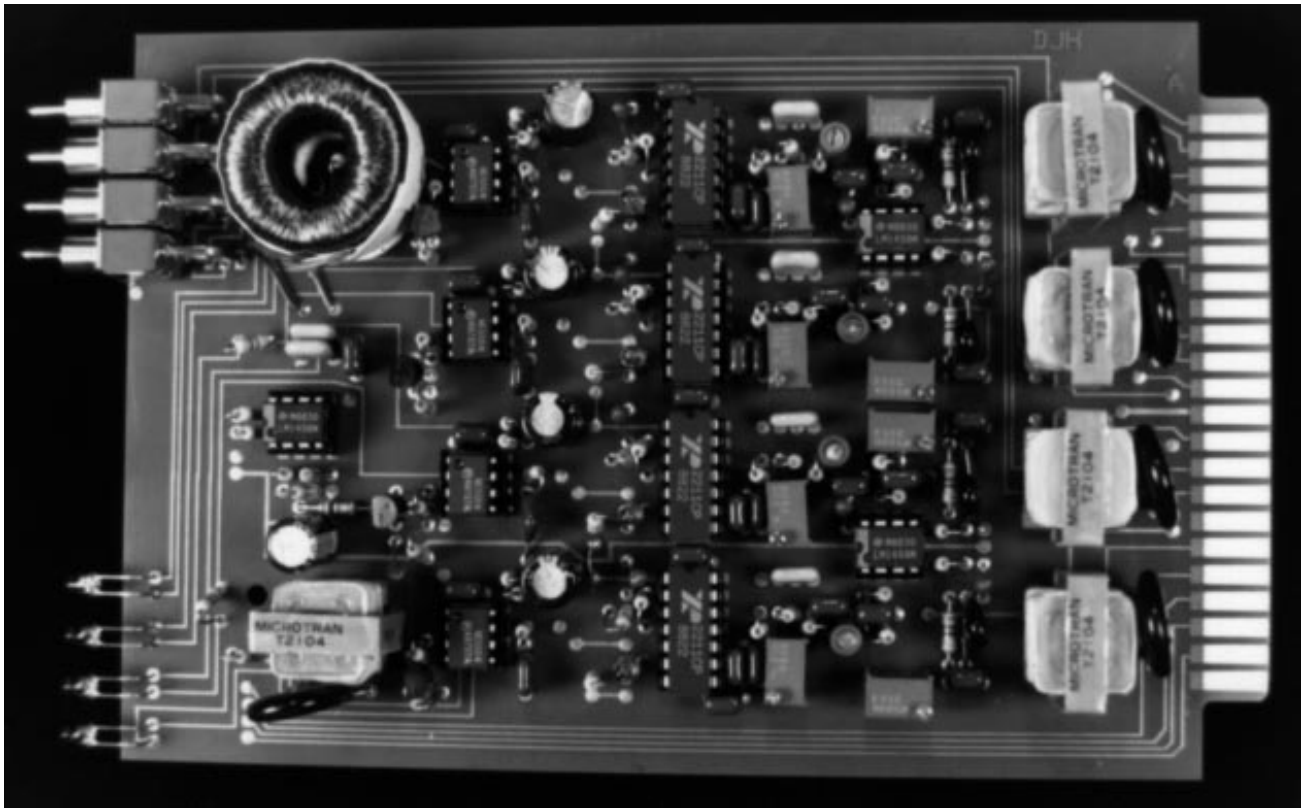
Piggy back card

Provisions were made to allow a piggyback card to be mounted on the 4RV/2 card. J1 is a 42 pin connector allowing all edge connector pins to be available to the optional card. Mounting holes were also provided to mount the board. This allows for maximum custom flexibility.

Opto Isolators

Opto-isolators can be omitted to allow TTL level interfacing if required.

VLC

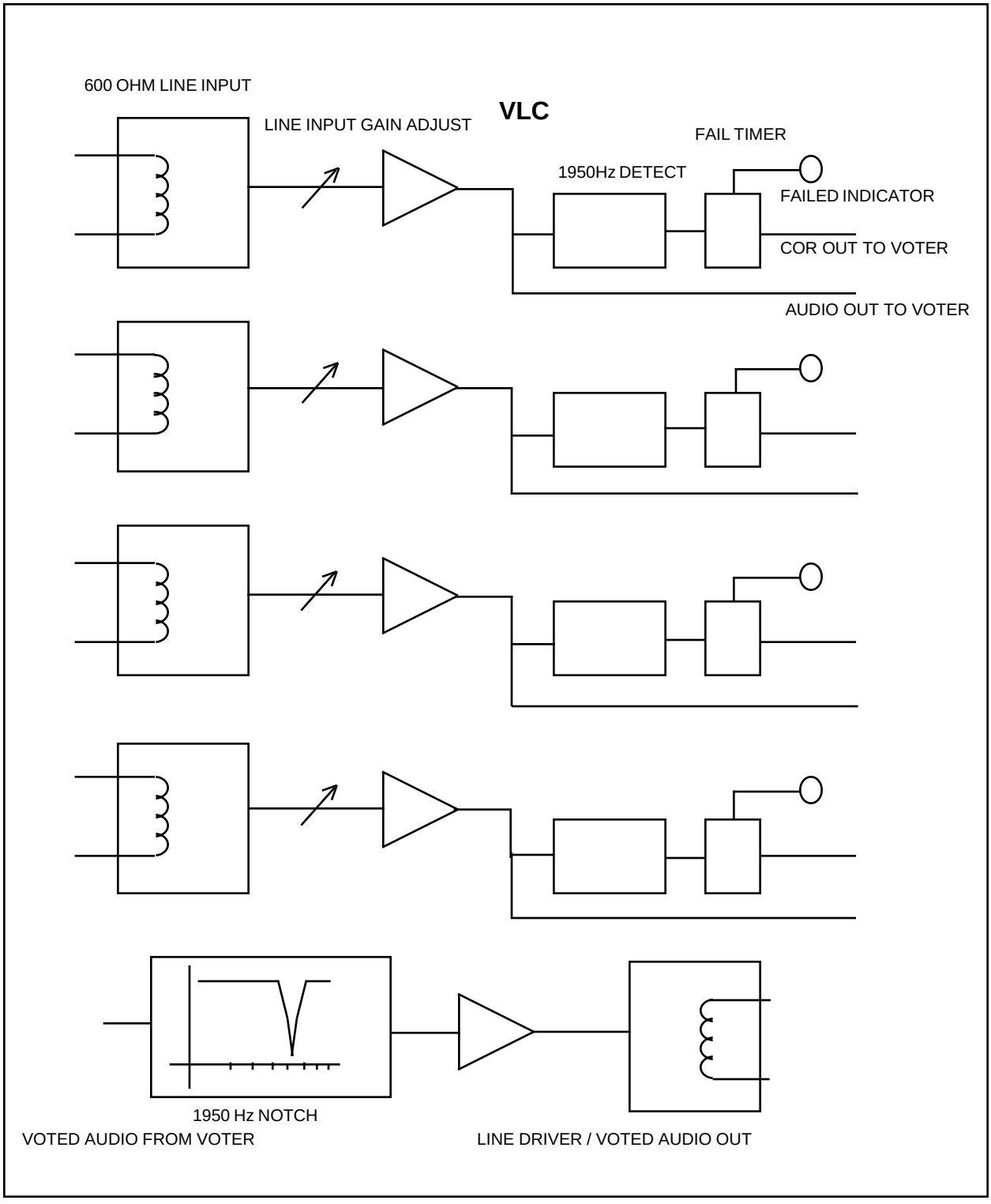


VLC LINE CARD PINOUT

SHOWN FROM THE CONNECTOR END
CONNECTOR SIMILAR TO VECTOR R644 44 PIN 0.156" SPACING

COMPONENT SIDE			FOIL SIDE
FAILED #1	A	1	AUDIO OUT
FAILED #2	B	2	RCVR #3 COR OUT
FAILED #3	C	3	RCVR #1 RING
FAILED #4	D	4	RCVR #2 COR OUT
+24 Vdc	E	5	RCVR #1 TIP
BLANKING	F	6	RCVR #1 COR OUT
SPEAKER OUT	H	7	RCVR #1 AUDIO OUT
LOCK	J	8	RCVR #2 RING
GROUND (ANLG -V)	K	9	GROUND
+5 (ANLG GND)	L	10	RCVR #2 TIP
CLOCK	M	11	RCVR #2 AUDIO OUT
DATA OUT	N	12	EARTH GROUND
STROBE	P	13	RCVR #3 AUDIO OUT
RD/WR	R	14	RCVR #3 RING
RESET	S	15	RCVR #3 TIP
DATA IN	T	16	RCVR #4 AUDIO OUT
COR OUT	U	17	RCVR #4 COR OUT
RCVR #4 DISABLE	V	18	RCVR #4 RING
RCVR #3 DISABLE	W	19	TRANSMIT RING
RCVR #2 DISABLE	X	20	TRANSMIT TIP
RCVR #1 DISABLE	Y	21	RCVR #4 TIP
+12 Vdc	Z	22	+12 Vdc

VLC BLOCK DIAGRAM



VLC FEATURES

The Voter Line Card provides a telephone line front end to the 4RV/2 voter. There are 4 separate telephone line inputs. The VLC provides level adjustment and tone detection for COR functions to the voter. There are "Failed" detection circuits for loss of phone lines. The tone detection of 1950 is standard, other tone like 2175 can be ordered.

The VLC card also provides a line output that is driven from the output of the voter selection circuit. This is capable of redriving phone lines. There is a 1950 notch circuit included in the output circuits.

The Microwave Line Card provides the 600 Ohm input and output circuits for the voter without the tone detection and notch circuits.

VLC SPECIFICATIONS

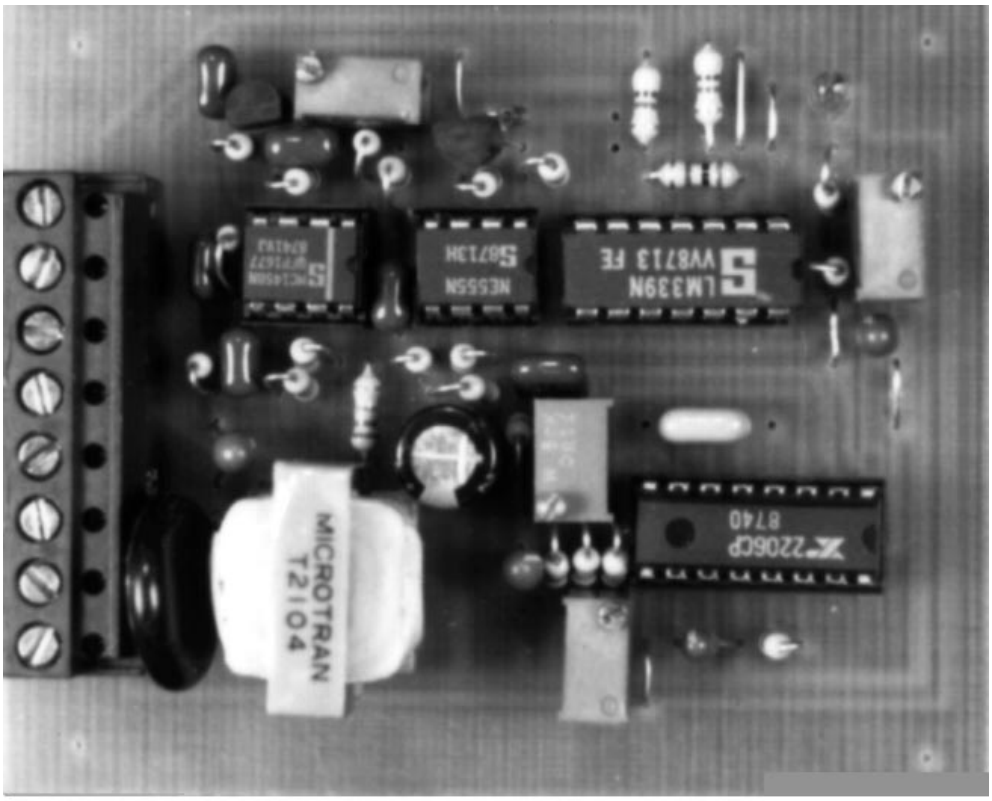
VLC Voter Line Card

Input Audio:	600 OHM Balanced, -30 to +2 DBm
Cor Input:	1950 Hz Adjustable detect frequency, approximately +/- 40 Hz. Detect bandwidth +/- 5Hz 10 DBm range.
Output Audio:	Unbalanced Approximately 200mV. Directly connecting to the 4RV Voter.
Cor Output:	Open collector. (Low active) Directly connecting to the 4RV Voter.
Fail Circuit:	If 1950 isn't detected within 3 minutes the Associated Line will "Fail" and become inactive.
Power:	+12 to +15 VDC.
Size:	4.5"H X 6.5"L
Connections:	44 Pin Edge connector. 0.156" spacing gold plated contact.
Indicators:	4 Red Phone Line "Failed" indicators. 3 Minute time-out on lack of 1950 tone detection.
Controls:	Force Vote and Disabled switches on front panel. Line in, and tone detect frequency adjust internal.

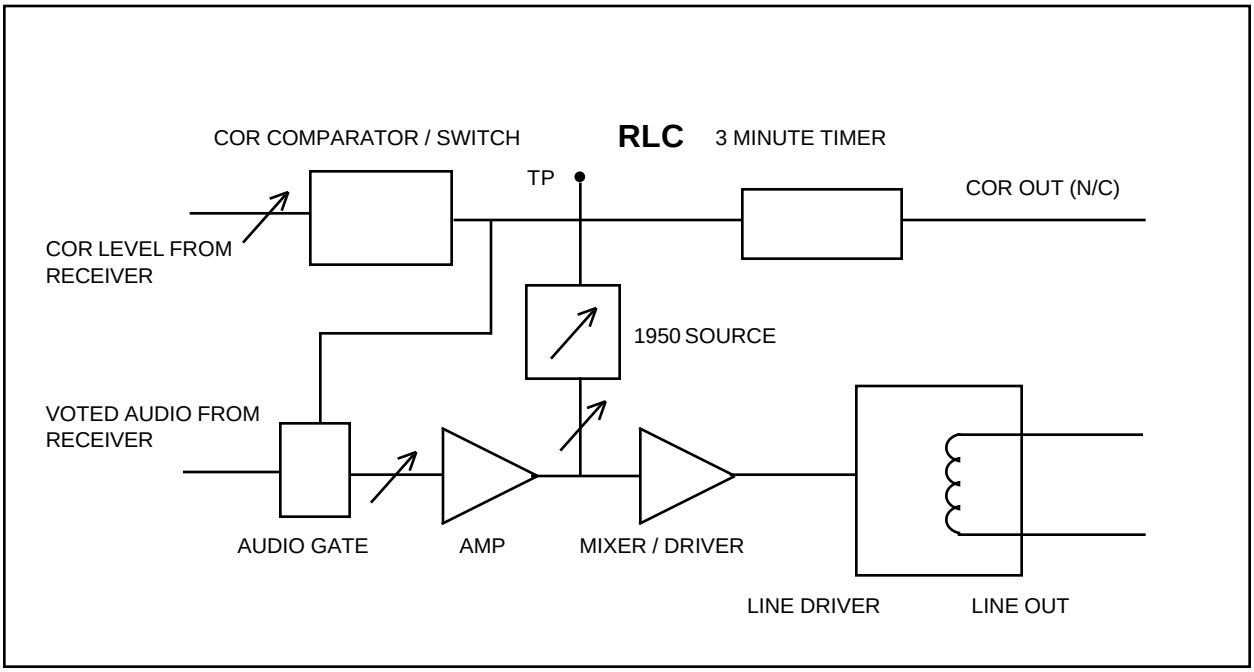
MLC Microwave Line Card

Same as VLC above without COR functions. COR is provided from the Microwave system.

RLC



RECEIVER LINE CARD BLOCK DIAGRAM



RLC FEATURES

The RLC attaches to the remote receiver. The COR and audio from the receiver are adapted to a 600 Ohm balanced phone line. The COR signal is converted to a 1950 carrier. When there is no COR the receiver audio is muted and a 1950 tone is sent down the phone line to indicate the lack of COR. The VLC card converts the detected 1950 signal into the correct COR signal feeding the voter. When the receiver COR becomes active the 1950 tone is removed and the receiver audio is then gated onto the phone line.

The RLC also can be used for interfacing to RF link transmitters. There is a 3 minute timer included to limit the transmit duration. This option is seldom used but included in the standard RLC. The timer is not active in the phone line configuration.

The COR input is fed into a comparator circuit with an adjustable reference. This allows for connection to almost any level transition in any receiver. Jumpering options allow for positive or negative going COR's.

The RLC connections are made to a convenient removable screw terminal accepting stripped wire ends. The RLC is mounded with a detachable plastic clip for easy mounting.

Adjustments are available for receiver audio input, 1950 tone frequency, 1950 tone level and COR threshold.

The RLC can be ordered with special tones such as 1600 or 2175.

Description	TB-1
Receiver Audio IN	1
PTT OUT	2
COR INPUT	3
+ 10 to + 12 Reg	4
AUDIO OUT TIP	5
GROUND	6
AUDIO OUT RING	7
TEST POINT	8

RLC SPECIFICATIONS

RLC Receiver Line Card

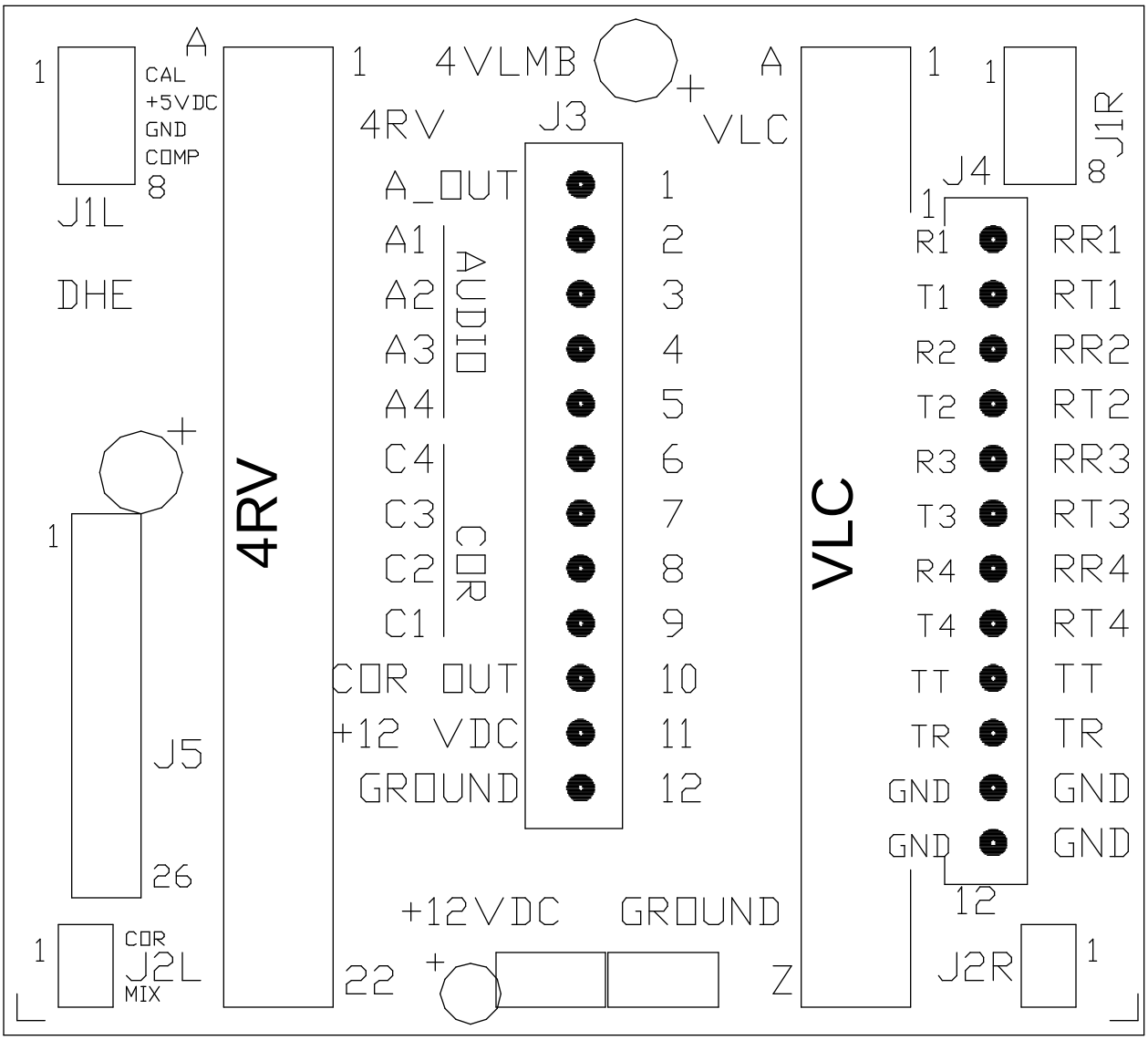
Input Audio:	>10K Impedance 10-500mV Unbalanced.
Cor Input:	Input- 0.6-10VDC Threshold adjustable. Polarity jumper selectable.
Output Audio:	600 OHM Balanced, Adjustable up to 0DBm.
Cor Output:	1950 Hz Adjustable to -10 DBm audio or Open collector. (GND True)
Power:	+12 to +15 VDC.
Size:	3.0" X 3.25"
Connections:	Miniature Terminal Strip; 8 point.

MOTHER BOARD CONNECTIONS

J1 Provides interconnection to other mother boards.
J3 Provides all COR and Audio inputs and outputs to the mother board.
J4 Provides all phone line connections in and out.

Description	J3 Pin
Audio Out	1
RX 1 Audio IN	2
RX 2 Audio IN	3
RX 3 Audio IN	4
RX 4 Audio IN	5
RX1 COR IN	6
RX2 COR IN	7
RX3 COR IN	8
RX4 COR IN	9
COR OUT	10
+ 12V	11
GROUND	12

Description	J4 Pin
RX1 RING	1
RX1 TIP	2
RX2 RING	3
RX2 TIP	4
RX3 RING	5
RX3 TIP	6
RX4 RING	7
RX4 TIP	8
OUTPUT TIP	9
OUTPUT RING	10
GROUND	11
GROUND	12



ORDERING INFORMATION

DHE-X-XXX — INDIVIDUAL CARDS / MODULES

- 4RV — (M) VOTER - MASTER
- 4RV-S — (S) VOTER - SLAVE
- VLC — (L) LINE / 1950 DETECT
- MLC — (6) MICROWAVE / 600 OHM
- RLC — RECEIVER LINE CARD (CARD ONLY)

- C — CARD ONLY
- M — CARD AND MODULE

DHE-C-4RV — SAMPLE: 4 CHANNEL VOTER CARD ONLY.

DHE-X-XX-XX-XX-XX-## — RACK CONFIGURATIONS

- 00-32 — # OF RLC CARDS

- _M — MASTER VOTER / BPL
- _ S — SLAVE VOTER / BPL
- _X — BLANK PANEL
- _B — EMPTY BOX

- D_ — LINE CARD
- 6_ — 600 OHM AUDIO CARD
- X_ — BLANK PANEL
- B_ — EMPTY BOX
- PX — POWER SUPPLY / BLANK PANEL

- R — RACK
- E — EXPANSION KIT

DHE-R-DM-XS-XS-XS-04 — SAMPLE: 16 CHANNEL RACK SYSTEM WITH SUPPORT FOR 4 CHANNELS OF PHONE LINES. ALL 8 SLOTS TAKEN BY MODULES WILL REQUIRE AN EXTERNAL POWER SUPPLY.

DHE-A-XXX — ACCESSORIES

- EC — EDGE CONNECTOR
- EXT — EXTENDER CARD
- B — EMPTY BOX / MODULE
- BPL — BACKPLANE / MOTHER BOARD

- A — ACCESSORIES

EXAMPLES OF STANDARD RACK CONFIGURATIONS:

DHE-C-4RV	4 Channel Voter, card only. RF linking.
DHE-R-XM-XS-XX-PX-00	8 Channel rack system for RF linking. This rack system selected comes with a Power Supply, one Master Voter, one Slave Voter, and without Line Cards.
DHE-R-DM-DS-DS-DS-16	16 Channel Telephone line system. An external power supply is required.
DHE-R-XM-XX-XX-XX-00	4 Channel rack system. This configuration does not incluse a Power Supply.

Note: The racks come with 1 Extender Card. The rack is a standard 19" width and is 5 1/4" tall and has a total of 8 - 2" slots. Each module occupies one slot. The internal Power Supply requires 2 slots. The standard rack has filler plates in unused slots. The backplane (Mother Board) does not come installed for unused slots. There are provisions for them to be added with our Rack Expansion set. Two Racks can be joined for a total of 32 channels of voting. Systems with larger requirements should contact us for details.