



# **ModeModel C-1614 Six-Line/Four-Frequency Tone-Remote Control Consoles Instruction Manual**



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### Introduction

The Model C-1614 6-line, four-frequency, tone-remote control console provides reliable remote control of the various functions of two-way radio base stations located at up to 6 different sites. One or any combination of the six remote base stations can be selected.

The C-1614 remote console is normally used in conjunction with up to six functionally matching Vega 223 Series (or equivalent) tone-remote panels located at the base stations. The consoles are compatible with General Electric, Motorola, and other tone-remote control systems employing the industry-standard sequential tone-control format.

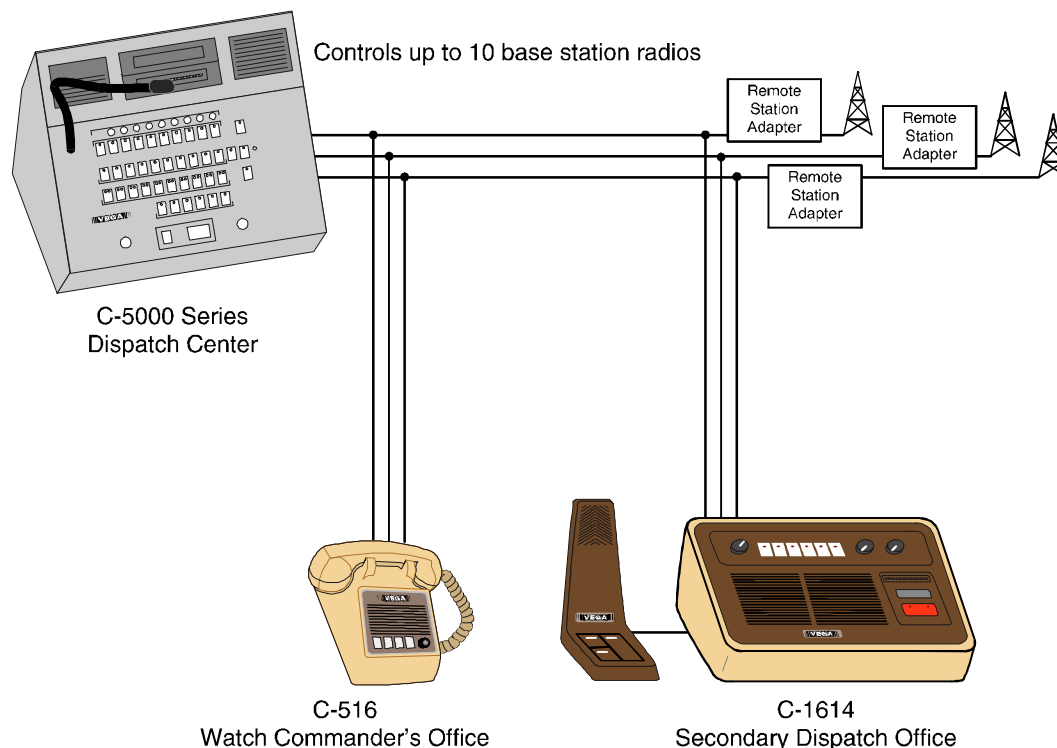
The C-1614 is connected to the mating panels by means of voice-grade or better leased or private lines (including microwave circuits). Metallic or DC continuity is not required.

The C-1614 is a desk top console with a desk microphone. The C-1614H is a desk-top unit with a handset, cradle, and hookswitch.

The C-1614W is a wall-mount unit with a handset and cup. All models include a speaker and are ready to operate in the simplex two-wire mode. Push-to-talk, CTCSS disable (monitor), a 2175-Hz notch filter, F1/F2/F3/F4 frequency select, six transmit/receive lines, six position line select switch and six line-activity-monitor functions are installed and operational.

Plug jumpers are provided for simplex two-wire operation and for simplex or duplex four-wire operation. Additionally, jumpers are provided for proper line termination impedance on all lines with either single or multiple consoles per line. A jumper has also been provided to change from 1-of-N four frequency operation to paired F1/F2 and F3/F4 operation (whereby the F3/F4 control tones are generated only by F3 or F4 switch operation and not by PTT switch operation). Wide-range DIP-switch frequency programming of all six tones has also been provided. Gain and bias jumpers have also been provided to provide compatibility with several desk microphone models. Another jumper allows separate selected and unselected audio when using the optional external speaker amplifier. Other jumpers provide off hook tone generation and lower amplitude command tone sequence if desired.

Accessories available on special order and at extra cost include a gooseneck mic, external speaker with amp and notch filter, CV3, TX 2175 Hz notch filter.



**Figure 1**  
**Typical system, with variety of consoles.**

## Operation and Controls

**Volume Control:** Adjust speaker level of combined selected-line audio and unselected-line audio.

**Transmit (PTT) Switches:** Located on the desk microphone and the handset; enable the sequential tone sequence which keys the radio.

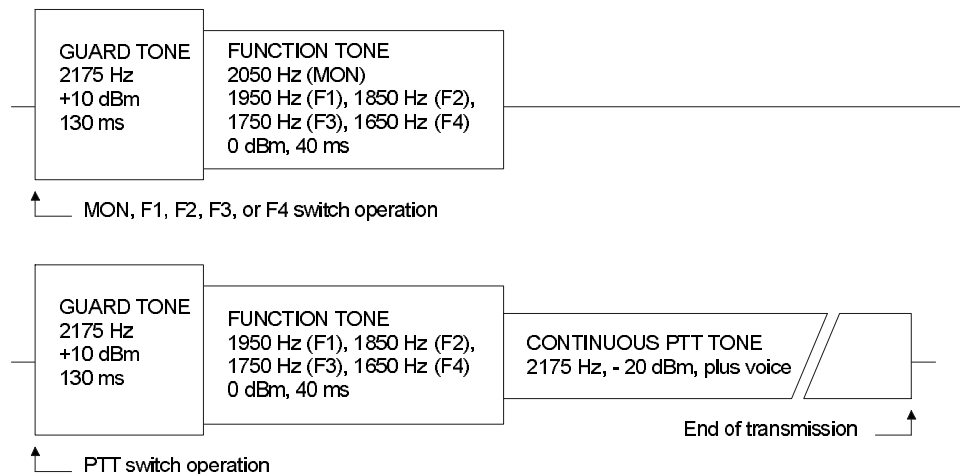
**Intercom:** When pressed and held, removes all control tones from the output and allows the operator to talk to another console on the network without keying the associated transmitter.

**Monitor:** When pushed momentarily, causes the base-station receiver equipped with a subaudible (CTCSS) tone decoder to monitor all activity on the radio channel by disabling this decoder. This action reduces the possibility of accidentally interfering with other users on the channel (who are using a different CTCSS tone frequency), and is required by FCC Rules.

**Frequency Selection:** When the F1, F2, F3, or F4 switch is pressed, a tone sequence is sent to the remote station adapter to select a circuit. That selected circuit latches on and the previously selected circuit is latched off. The outputs of the selected circuits in the adapter are normally used to select one of four frequencies on the remote base station. LED indicators show which frequency has been selected by that console.

**Note:** monitor and frequency-selection commands are audible at parallel consoles. The continuous PTT tone is notched out and cannot be heard on parallel consoles; however, a PTT tone detector causes the transmit LED to glow.

**Frequency Selection in Pair Mode:** In this mode of operation, F1 and F2 will operate the same as in the 1-of-N mode, with F1 or F2 frequency-select tone bursts caused by F1, F2, or PTT switch operation. The F3 and F4 switches, however, are now unaffected by operation of the F1, F2, or PTT switch. When the F3 or F4 switch is pressed momentarily, it latches on, generates a guard-tone/function-tone burst, and releases the other F3 or F4 latch (without affecting the F1 or F2 latch).



**Figure 2**  
**Tone sequence chart.**

**Line Selection:** Operation of six separate lines to control six separate base stations is provided in the C-1614 by means of a six-position line selector switch. Receive audio from the selected line is now heard from the speaker, and when the PTT switch is pressed, PTT command and transmit audio is delivered to the selected line.

**Unselected-Line Audio:** When a line is selected, audio from the unselected is summed and is present as a background level. This level is adjustable via a front panel control.

**Transmit-Line Monitor:** For the four-wire mode of operation with multiple consoles; audio on the transmit line may be monitored in the same manner as with two-wire operation.

**Line-Activity Monitors:** Activity on any and all of the six lines is indicated by lighting a red LED on the line selector switch. Lighting continues for 2 to 10 seconds (adjustable) after activity stops.

**Parallel Single-Line Console Compatibility**  
The C-1614 and C-1614W are compatible with parallel single-line consoles, such as the Vega Model C-510C, which use the industry-standard sequential-tone-signaling format. Operators with these consoles will have access only to the base station to which their line is connected, while C-1614 operators may access up to six of those lines. The C-1614 is also compatible with the Vega Model C-516 six-line tone-remote console.

## **Installation**

The C-1614 may be installed in any location convenient to the operator. Exposure to extreme dampness, temperature, and radio-frequency energy should be avoided, to insure maximum reliability and operating life.

The C-1614 is not designed to operate on lines carrying direct current. If direct-current lines are to be used, isolate the consoles with external capacitors or with 600:600-ohm transformers designed for the current involved.

The C-1614 has been factory-programmed for single-console-per-line, two-wire half-duplex operation and for +10-dBm guard-tone output into 600-ohm lines.

## **Disassembly, Setup, and Adjustment**

To access internal controls and jumpers, remove the three screws on of the base metal's sides and fold the case backward. This procedure opens up the entire unit for setup and maintenance.

Connect as many of the modular telephone cords as will be used to the modular jacks on the rear of the unit. Each line may be independently programmed for two-wire (half-duplex only) or four-wire lines, and for line-terminating or bridging (for single or multiple consoles). Proper termination impedance is maintained on all lines regardless of line selection. Line drive output and line input sensitivity are independently adjustable.

Refer to the schematic diagrams and to the designators printed on the PC board to identify the programming and adjustments associated with each line.

## Upper PC Board Programming and Adjustment

In this section, “line one” is used for examples. The same procedures should be applied (“mirrored”) to lines two through six. For example, for four-wire-line operation you are told to set JP18, JP25, and JP1 to “B.” You should also set line two’s JP15 and JP24 to “B” (see schematic below) and lines 3 through 6 relative designators to “B” as well.

**For Two-Wire-Line Operation:** set JP18, JP25, and JP1 to A. Mirror settings for lines two through six (default setting).

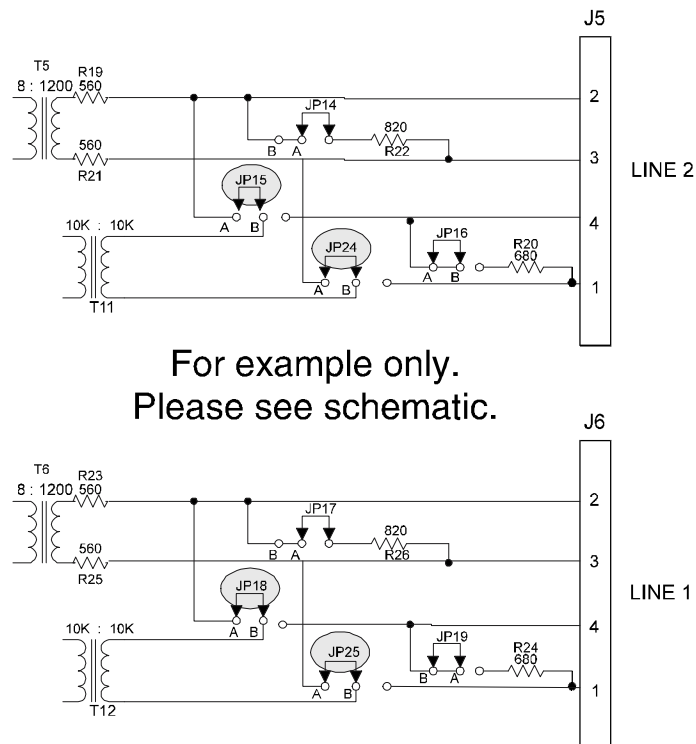
**For Four-Wire-Line Operation:** set JP18, JP25, and JP1 to B. Mirror settings for lines two through six.

**For Multiple Console Operation:** Refer to Chart 1 (two-wire) or to Chart 2 (four-wire).

**For Line-Bridging Operation:** When the line is already terminated by non-Vega consoles, set JP17 and JP19 to B. Mirror settings for lines two through six.

**Line-Drive Adjustments:** The C-1614 and C-1614W are factory-adjusted for about +10 dBm guard-tone line level. The other tones and TX voice levels are fixed relative to the guard tone. At +10 dBm guard tone, the function tone is 0 dBm, the PTT tone is –20 dBm, and voice level is about 2.4 Vpp.

Line level should be measured with the leased line connected by touching the B side of JP17 and JP25 with the meter probes (two-wire line). For ease of adjustment, jumper TP1 to E3 (GND) on the lower PC board and depress the F1 switch. This causes a continuous guard tone to be generated. A continuous PTT tone is generated without jumpers by pressing and holding the PTT switch. Measurement of voice level is not recommended except with the use of an oscilloscope. TX1 (R75) allows adjustment of line drive.



**Figure 3**  
Jumper-plug settings for line 1 should be “mirrored” on all other lines also.

All level controls associated with an unused line (e.g., TX1 and RX1) should be adjusted to their minimum setting.

**Input Level Adjustments:** RX1 (R70) allows adjustment of input sensitivity. This control should be adjusted to slightly above the threshold of compression with typical voice signals on the line.

Sensitivity should not be increased beyond that required by line loss, because increased sensitivity amplifies line and background noise during pauses in voice traffic without increasing the level of voice recognition.

**Line-Activity Monitor Adjustments:** LAM adjustments affect all six circuits. Off delay is adjusted by LAM OFF DELAY control R84.

**Chart 1. Two-wire line programming.**

NUMBER OF CONSOLES	FIRST CONSOLE ONLY <sup>4</sup>				#2 THROUGH N CONSOLES		
	JP1, JP18, JP19, JP25	JP17	R26	RX & TX LOSS <sup>3</sup>	JP1, JP18, JP19, JP28	JP17	R38
1	TO A <sup>1</sup>	TO A <sup>1</sup>	1	0 dB	TO A <sup>1</sup>	TO B	1
2	TO A <sup>1</sup>	TO A <sup>1</sup>	1.5 k $\Omega$ <sup>2</sup>	0 dB	TO A <sup>1</sup>	TO B	1
3	TO A <sup>1</sup>	TO B	1	0 dB	TO A <sup>1</sup>	TO B	1
4	TO A <sup>1</sup>	TO B	1	1 dB	TO A <sup>1</sup>	TO B	1
5	TO A <sup>1</sup>	TO B	1	2 dB	TO A <sup>1</sup>	TO B	1
6	TO A <sup>1</sup>	TO B	1	3 dB	TO A <sup>1</sup>	TO B	1

<sup>1</sup>As shipped

<sup>2</sup>For optimum line match and 0 dB loss

<sup>3</sup>Applies to all consoles

<sup>4</sup>“First” console should be at end of line when consoles are “chained”

**Chart 2. Four-wire line programming.**

NUMBER OF CONSOLES	FIRST CONSOLE ONLY <sup>4</sup>					#2 THROUGH N CONSOLES	
	JP1, JP18, JP19, JP25	JP17	R26	R24	TX LOSS <sup>3</sup>	JP1, JP17, JP18, JP25	JP19
1	TO B	TO A <sup>1</sup>	820 $\Omega$ <sup>1</sup>	680 $\Omega$ <sup>1</sup>	0 dB	TO B	TO A <sup>1</sup>
2	TO B	TO A <sup>1</sup>	1.3 k $\Omega$ <sup>2</sup>	680 $\Omega$ <sup>1</sup>	0 dB	TO B	TO A <sup>1</sup>
3	TO B	TO A <sup>1</sup>	2.7 k $\Omega$ <sup>2</sup>	750 $\Omega$ <sup>2</sup>	0 dB	TO B	TO A <sup>1</sup>
4	TO B	TO B	820 $\Omega$ <sup>1</sup>	820 $\Omega$ <sup>2</sup>	0 dB	TO B	TO A <sup>1</sup>
5	TO B	TO B	820 $\Omega$ <sup>1</sup>	1.0 k $\Omega$ <sup>2</sup>	1.0 dB	TO B	TO A <sup>1</sup>
6	TO B	TO B	820 $\Omega$ <sup>1</sup>	1.1 k $\Omega$ <sup>2</sup>	1.9 dB	TO B	TO A <sup>1</sup>
7	TO B	TO B	820 $\Omega$ <sup>1</sup>	1.2 k $\Omega$ <sup>2</sup>	2.7 dB	TO B	TO A <sup>1</sup>
8	TO B	TO B	820 $\Omega$ <sup>1</sup>	1.5 k $\Omega$ <sup>2</sup>	3.4 dB	TO B	TO A <sup>1</sup>

<sup>1</sup>As shipped

<sup>2</sup>For optimum line match and 0 dB loss

<sup>3</sup>Applies to all consoles. RX loss is 0 dB up to 13 consoles with optimum R40 value

<sup>4</sup>“First” console should be at end of line when consoles are “chained”

## **Main (Lower) PC Board Programming and Adjustments**

All adjustments and programming is accessible without removing the upper PC board.

### **Microphone Sensitivity Adjustment**

Microphone sensitivity has been factory-adjusted to cause about 10 dB of compression from a typical male voice about 10 inches in from of the desk microphone. MIC SENS control R97 allows adjustment if desired. Microphone sensitivity should not be advanced beyond that required for the operator's voice, because increased sensitivity only causes an increase in background noise during speech pauses, without increasing the level of the transmitted voice. When an optional dynamic microphone is used, it is connected to E2 or E4 (for lower amplifier gain) for high-impedance dynamic microphones. The microphone amplifier has been designed to operate with several different models of desk microphones. JP7 provides gain switching, and JP8 is used for different biasing requirements. See the chart below for different programming configurations.

<b>Microphone</b>	<b>JP7</b>	<b>JP8</b>
MD-M (Old Merry )	A	B
MD-SB (Brown Shure )	B	B
MD-MS (New Merry, small )	A	A

### **Microphone preamplifier programming.**

#### **Handset Adjustments (C-1614W only)**

Earpiece volume level is adjusted by EARPIECE LVL control R79. Selected, unselected, and sidetone audio is summed into the handset earpiece. Earpiece volume level is unaffected by the front-panel volume controls. If it is desired to adjust earpiece volume by the front-panel volume controls, move JP2 to B. Handset microphone sensitivity is adjusted by the MIC SENS control R97 (same as the desk microphone).

## **Duplex Operation**

The C-1614 console is not designed for duplex operation over two-wire lines. If all lines are four-wire, move DUPLEX jumper plug JP6 to B for duplex operation. In this mode of operation, the receive audio circuits (except TX monitor) is active at all times; however, the line-drive circuits are active only during PTT and intercom.

### **Timer Adjustments**

The C-1614 and C-1614W guard-tone and function-tone duration is factory-adjusted for 130 ms and 40 ms, respectively. If other durations are desired, adjust the guard-tone duration with GUARD TONE control R84 and the function-tone duration with FUNCT TONE control R98.

### **Notch Tuning and Notch Outphase Control**

Notch tuning and notch outphasing has been factory-adjusted and sealed for the best 2175-Hz notch. Adjustment is not required.

### **Auxiliary Audio Input and PTT**

Auxiliary audio signals connected to TB1-1,3 should be externally level-adjusted after all line-drive controls have been set. When a line-drive control has been set for a 0-dBm function tone, -2 dBm into the auxiliary input will drive the line at about 0 dBm. An external switch connected to the AUX PTT input TB1-2,4 causes tone burst, PTT tone, and auxiliary audio line drive, but microphone audio is disabled.

### **Footswitch PTT**

An external switch connected to TB1-5,4 has exactly the same effect as pressing a PTT switch.

### **Tone-Burst Frequency Programming**

Console tone frequencies are factory-programmed by DIP switches to 2175 Hz (PTT/guard), to 2050 Hz (monitor), to 1950 Hz (F1), 1850 Hz (F2), 1750 Hz (F3), and 1650 Hz (F4). Refer to the chart on page 8 for tone programming to other frequencies.



## Paired F1-F2 and F3-F4 Operational Mode

To change frequency-select mode of operation from 1-of-N to paired mode, change PAIR MODE jumper plug JP3 to B. In this mode, one of the F1-F2 pair remains latched on and one of the F3-F4 remains latched on. F1 and F2 tone bursts occur from PTT, F1, or F2 switch operation, while “F3” or “F4” tone bursts occur only from “F3” or “F4” switch operation. A typical use of this paired mode is F1 and F2 for frequency control and F3 and F4 for scan up and scan down of the remote radio.

## Defeat F2, F3, and/or F4

Any of the frequency-select switches may be defeated by reprogramming the unwanted-frequency switch to the same frequency as one of the other frequency switches.

## Special Uses for F2, F3, F4

One of the many possible uses for F2, F3, and F4 with single-frequency radios is selective control of up to four base-station radios on a single leased line. The four radios could all be at the same site or 50 miles apart. In a three-station system on the same line, one frequency can be used for simulcast.

## Off-Hook Tone Generation (Handset versions only)

Going off hook normally generates a monitor function tone automatically. If desired an F4 function tone may be generated by moving JP4 to C. If no function tone is desired, move JP4 to B. If an off-hook monitor function tone is desired with an automatic switch to F4 install jumpers in both JP4 A and JP4 C.

FUNCTION TONE FREQUENCY	S1, S2, S3, S4 DIODE								PERCENT ERROR
	1	2	3	4	5	6	7	8	
2175 Hz	0	0	0	0	0	0	1	0	±0.000
2050 Hz	0	0	0	0	1	0	1	0	-0.053
1950 Hz	0	0	0	1	0	0	0	1	±0.000
1850 Hz	0	0	0	1	1	0	0	1	-0.106
1750 Hz	0	0	1	0	0	0	1	0	-0.265
1650 Hz	0	0	1	0	1	0	1	1	+0.213
1550 Hz	0	0	1	1	0	1	1	0	+0.230
1450 Hz	0	1	0	0	0	0	1	1	±0.000
1350 Hz	0	1	0	1	0	0	0	1	+0.213
1250 Hz	0	1	1	0	0	0	1	0	+0.088
1150 Hz	0	1	1	1	0	1	1	0	-0.053
1050 Hz	1	0	0	0	0	1	1	1	-0.265
950 Hz	1	0	0	1	0	1	0	1	-0.124
850 Hz	1	0	1	0	0	1	1	0	+0.195
	f/2	64	32	16	8	4	2	1	
		BINARY VALUE							

0 = Switch Off

1 = Switch On

Other function-tone frequencies may be obtained by using the formulas below, where

f = function-tone frequency, and

N = binary value of switch positions 2 through 8

$f = 282,750 / (N + 128)$  when switch position 1 is off

$f = 141,375 / (N + 128)$  when switch position 1 is on

$N = (282,750 / f) - 128$  when switch position 1 is off (program to the nearest whole number)

If the desired N is greater than 255, switch position 1 must be on, and the following formula used:

$N = (141,375 / f) - 128,$

and program to the nearest whole number.

Although the maximum frequency range is from 554.4 Hz to 2209 Hz, the maximum frequency range used in any one system must not exceed 3 to 1 minus 100 Hz. This is due to the strong third harmonic generated by typical decoder limiters at the base station. (Exception: Model D-342C-type decoders do not have this limitation.)

**Chart 3**  
**DIP-switch settings for F3 and F4 function-tone frequency programming.**

## Speaker Mute (Handset versions only)

The speaker is normally muted when the handset is off the hook. If on-hook speaker operation is desired move JP1 to B.

## External Speakers

For extended audio coverage an 8-ohm external speaker of any size may be connected to TB1-6,7. This connection drives the external speakers with power equal to the internal speakers. Maximum power output is slightly reduced.

## Battery Backup or DC Supply Operation

A 12-volt (13.8-V nominal) vehicular-style battery connected to TB1-8,2 will provide backup in case of power failure.

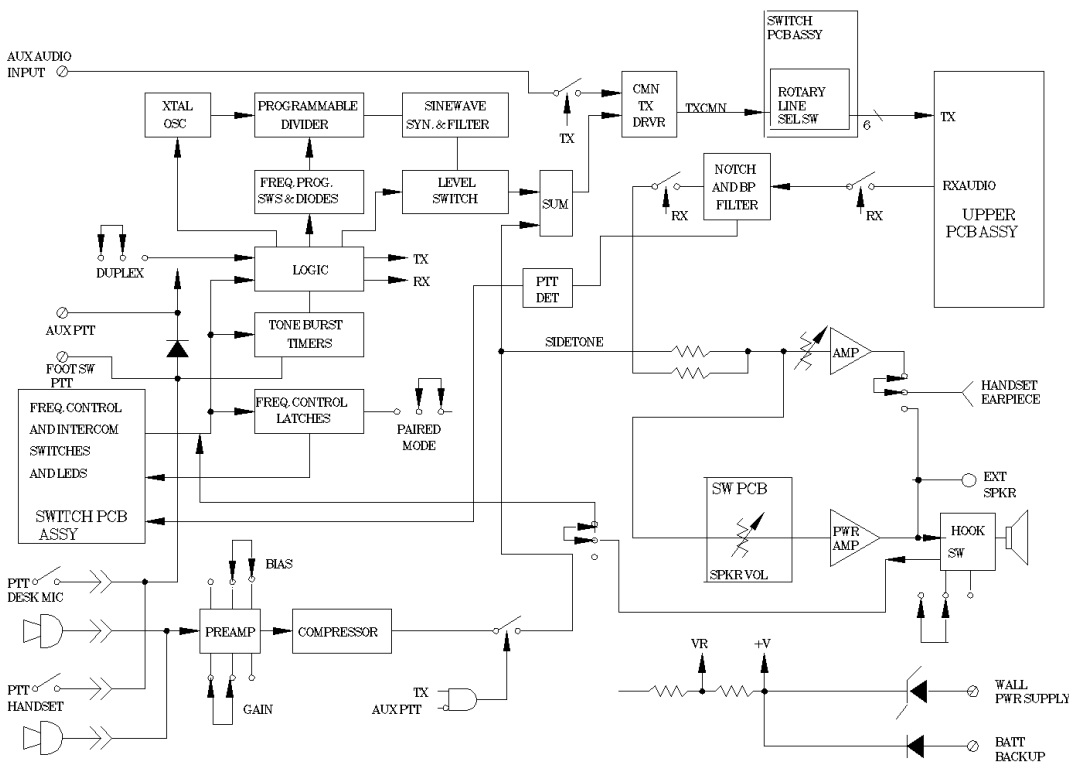
## Main PCB Assembly Description

Referring to the lower main PCB schematic, crystal oscillator Y1 and U21-3,6 drive an 8-bit programmable divider U20. The most significant bit at U20-14 is high, causing the programmable division range to be 255 to 128.

This provides an output at U20 -1 of from 11,088 kHz to 22.09 kHz. U16A is a programmable divide-by-two counter.

This provides drive to U19 of from 5.54 to 22.09 kHz. U19 is a divide-by-ten counter used to synthesize a sinewave. The output of U19 is therefore 554 Hz to 2209 Hz. The synthesized sinewave has a strong tenth harmonic which is eliminated at the lowpass filter output U3-1.

At idle the crystal oscillator is disabled by a high at U21-4. Going off-hook, or operation of the MON, F1, F2, F3, or F4 switches triggers the guard-tone timer U23C, which enables the crystal oscillator and the “+10 dBm” gate at U11-13. The PTT DIP switch S6 is enabled by the timed-out state of the function-tone timer U13A. The guard-tone signal from U11-2 drives the upper PCB TX circuits through R43, U3-6,7, C15, P1-9(TXCMN) and rotary switch S100B on the switch PCB assembly.



**Figure 4**  
**Model C-1614 main PCB assembly block diagram.**

Timeout of the guard-tone timer after 130 ms triggers the function-tone timer at U23-3. U23-13 goes high, which enables the “0 dBm” gate at U11-5, disables the PTT DIP switch S6 and enables one of the function-tone-programming DIP switches S1, S2, S3, or S4, depending upon which frequency-select switch has been depressed. A “0 dBm” function-tone-frequency sinewave therefore appears at the TXCMN output P1-9. Timeout of the function-tone timer after 40 ms of operation returns conditions to the idle state.

PTT-switch operation causes the same sequence of operation as above, except that upon function-tone timeout, the crystal oscillator remains enabled and the “æ20 dBm” PTT tone is conducted to output pin P1-9 through R20 for as long as the PTT switch is held.

For applications requiring lower amplitudes, moving JP5 to B reduces all tones by 10 dB.

In addition to triggering the guard-tone timer, going off-hook or monitor-switch operation sets the monitor latch U23B, which then lights the monitor LED through U2G-7,10. Upon function-tone-timer operation, the monitor DIP switch S5 and diode arrays DN6 and DN12 are enabled and the F1, F2, F3, and F4 programming DIP switches are disabled. Upon function-tone-timer timeout, the monitor latch is reset through C62 and U22-8,10 and conditions return to the idle state.

Operation of one of the frequency-select switches (F1, F2, F3, F4) sets one of the U9 latches and applies reset logic to all four of the latches through DN1 and RN2. When a U9 latch is simultaneously set and reset, set dominates and Q goes high. Upon release of the frequency-select switch, the set input of U9 remains high for about 5  $\mu$ s longer than the reset input, due to the charge on one of the 0.01-mF capacitors C3, C4, C13, or C42, the associated latch remains set, and whichever of the other latches previously set has now been reset.

A frequency-select LED is energized through U2 by a high from a set latch U9. When the function-tone timer is triggered, one of the U15 outputs or U14-6 goes high, enabling F1, F2, F3, or F4 programming.

When the paired mode of operation is programmed (JP3 to B), U16B-10 and U16B-8 are low at idle. F3 or F4 switch operation applies a set pulse to U16B-8 through CR11 or CR12, C51, U10-5,6 and U17-12,3. Simultaneously, the guard-tone timer is triggered, which applies a reset pulse to U16B-10 through C61, U10-5,6, and U17-8,10. The set pulse is 10 times longer than the reset pulse and the set pulse prevails. Thus, only F3 or F4 programming is enabled during function-tone operation. F1 or F2 switch operation generates only the reset pulse, which resets U16B, if set, and enables only the F1 or F2 programming. PTT-switch operation also generates only the reset pulse, which insures that only F1 or F2 programming is enabled during function-tone-timer operation. Pair-mode programming also activates all sections of U8, which connects U9 latch Q to the reset input of the other latch of the pair. If one of the pair of latches is set, the other consequently is reset.

In the 1-of-N mode, upon power up, the F1 latch is set with a 470-ms pulse at U9-12 by C11 through CR4. A 47-ms set pulse is also applied to the F4 latch by C64, R93, R83 through U10-9,8 and CR8. A 100-ms reset pulse generated by C31 is applied to all latch reset inputs. Only the F1 latch, therefore, is set.

In the paired mode, the C31-to-latch-reset-input path is short-circuited effectively by the activated analog gates U8. Both the F1 and F4 latches receive a set pulse during power up and both become latched.

When JP4 is in C, going off-hook sends a negative pulse through C33 and U10-1,2 where it is inverted. The positive output goes through CR8, to U9-14 (setting the F4 latch), DN1D, U10-3,4 where it is inverted again. The negative output goes to U14-2, C55, U23-11 firing the guard-tone timer. In the 1-of-N mode a positive pulse goes through CR6, RN2 resistors, resetting the frequency latches. When JP4 is in A and C going off-hook triggers the monitor timer as described previously, in addition it sets the F4 latch through C33, U10-9,8, CR8 to U9-14.

## Main PCB Receive Circuits

The RXAUDIO signal from the upper PCB is applied to the RXAUDIO compressor at U6-15 and U6-11. Maximum gain of the compressor (actually an automatic-level-control or ALC circuit) is determined by the bias voltage on capacitor C29. This bias voltage is set by R58. Input signals are full-wave rectified within U6 and applied to C29. When the rectified input signal exceeds the bias set by R58, it charges C29 to a higher voltage, which lowers stage gain and thus maintains a near-constant average output signal at U6-10 for all signal inputs above the bias threshold.

Output signal at U6-10 drives a 2175-Hz notch/bandpass filter through U7-1,2. Bandpass output at U12-8 is amplified and rectified by the U13-1,2,3,5,6,7 circuit. Detector output at U13-1 lights the TX LED through U2F whenever parallel console PTT tone is present on the selected line. The TX LED is also energized by PTT-switch operation through another path.

Bandpass-filter output is summed with unfiltered signals at U12-2, causing a sharp 2175-Hz notch to appear in the summed output at U12-1 when the two signals have been adjusted for equal amplitude by R68 and for 180° phase differential by R67.

Notched output signals from U12-1 are conducted through U7-8,9 and R34 to the high side of the R102 volume control on the switch PCB and then to the speaker through U4, a power-amplifier. Analog gates U7-8,9 and U7-1,2 are disabled during PTT, intercom, and tone burst, unless the unit has been programmed for duplex operation (by moving JP6 to B).

Notch filter output is also applied through R34 to R79 ear volume control to U1-1,2,3 and is applied to the handset. When JP2 is in B the handset signal is derived from the speaker amp U4.

Audio from the above sources is also summed by U1-6,7 and applied to an optional VU-meter circuit.

## Main PCB Transmit Circuits

During mic-PTT or intercom, the audio signal path is from a mic input such as the desk mic through R102, C23, U5-6,7 and C35 to the TX compressor input at U6A-2. This circuit is identical to the RXAUDIO compressor previously described. TX compressor output at U6-7 is applied through gate U7-11,10 and R35 to the high side of volume controls to provide the sidetone audio to the earpiece and speaker. The TX signal path from the TX compressor output to the upper-PCB TX circuit is through U7-11,10, R42, U3-6,7, P1-9 (TXCMN) and S100B on the switch PCB assembly. Analog gate U7-11,10 is enabled only during PTT or intercom.

## Upper Main PCB Audio Circuits Description

The six line drive/line receive circuits are identical. The transmit audio that is applied to line one originates on the main PC board, TXCMN, is conducted through the first position of the TX section of the S100B line selector switch, R15 (TX1), R74, T6, R23, and R25.

The receive audio path from line one is through T12, R77 (RX1), RN5-8,7,6,5, U17-6,7, the first position on the S100A line selector switch, P1-29 (RX CMN), R82, R83, and U17-13,14 to the receive audio circuits on the lower main PC board.

Receive audio from all six lines is summed at U17-8 through RN5, R67, and R79. The selected audio, RX CMN, is subtracted from the summed audio by R80 and R81 to form the unselected audio at U17-8. The unselected audio level is controlled by R79, R88, and R101 on the switch PCB assembly. It is applied to the optional external amplifier through C17 and TB1-1,2. It is also applied through R89 to U17-12 to be summed in the RXAUDIO signal as a lower background level. Moving JP26 to B shorts out this path so that RXAUDIO consists of selected audio only.

## Line Activity Monitor Circuits

The six line activity monitor circuits are identical. The receive from line one through T12, RN5-5,6,7,8, R77 (RX1), U17-5,6, and C15 is applied to U7-6. At idle, U7-7,3,1 are high and line one LED DS101 is off. When a line one audio signal peak exceeds the bias set at U7-6 by R41 and R42, U7-7 goes low, pulling U7-3,1 low, energizing line one LED DS101, and charging capacitor C21. A low is also applied to U7-5 through C16. This positive feedback stretches short pulses into long ones.

When line one activity ends, C21 discharges through R53 and U12-1 until the voltage at U7-3 exceeds the VR7 bias voltage at U7-2. U7-1 then goes high and LED DS101 goes off. The LAM off delay R84, R71, R72, and U12-3,1 provide a variable DC voltage source for capacitor C21 discharge. C21 discharge time and therefore the LAM off delay is determined by this voltage.

## Technical Assistance

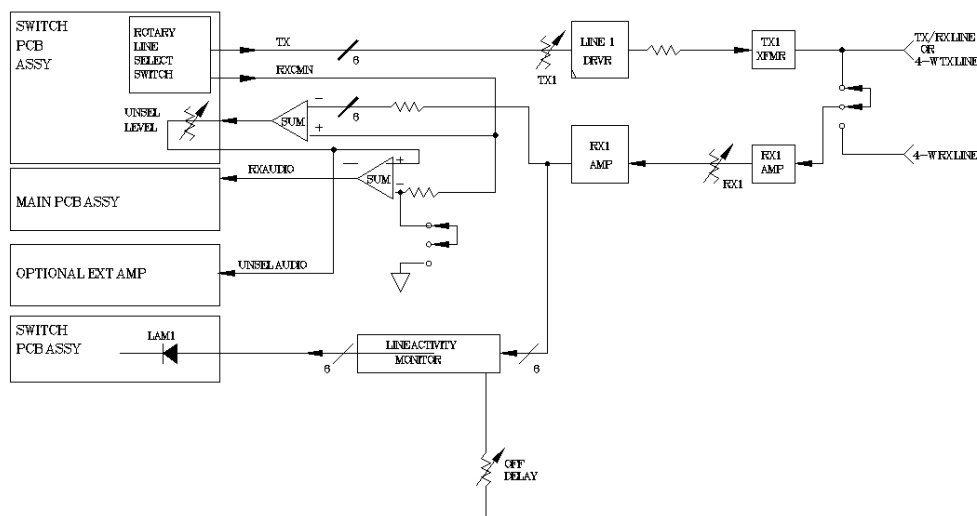
Vega products are engineered to meet your requirements of performance, reliability, and compatibility. Technical assistance is offered by correspondence or telephone, should it be required, to assure your satisfaction.

## Warranty (Limited)

All Vega signaling products are guaranteed against malfunction due to defects in materials and workmanship for three years, beginning at the date of original purchase. If such a malfunction occurs, the product will be repaired or replaced (at our option) without charge during the three-year period, if delivered to the Vega factory. Warranty does not extend to damage due to improper repairs, finish or appearance items, or malfunction due to abuse or operation under other than the specified conditions, nor does it extend to incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives the customer specific legal rights, and there may be other rights which vary from state to state.

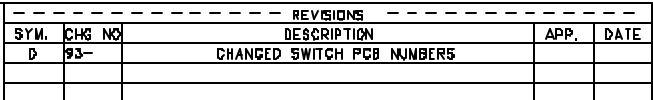
## Claims

No liability will be accepted for damages directly or indirectly arising from the use of our materials or from any other causes. Our liability shall be expressly limited to replacement or repair of defective materials.



**Figure 5**  
**Model C-1614 upper assembly and switch PCB assembly block diagram.**

MAIN SWITCH PCB    PIN    ROTARY SW    RIBBON    LOWER MAIN  
PCB                    PCB                    PCB



065-0441

SPARE GATES

VEGA  
A MARK IV COMPANY

C-1614

LOWER MAIN PCB

071-0552

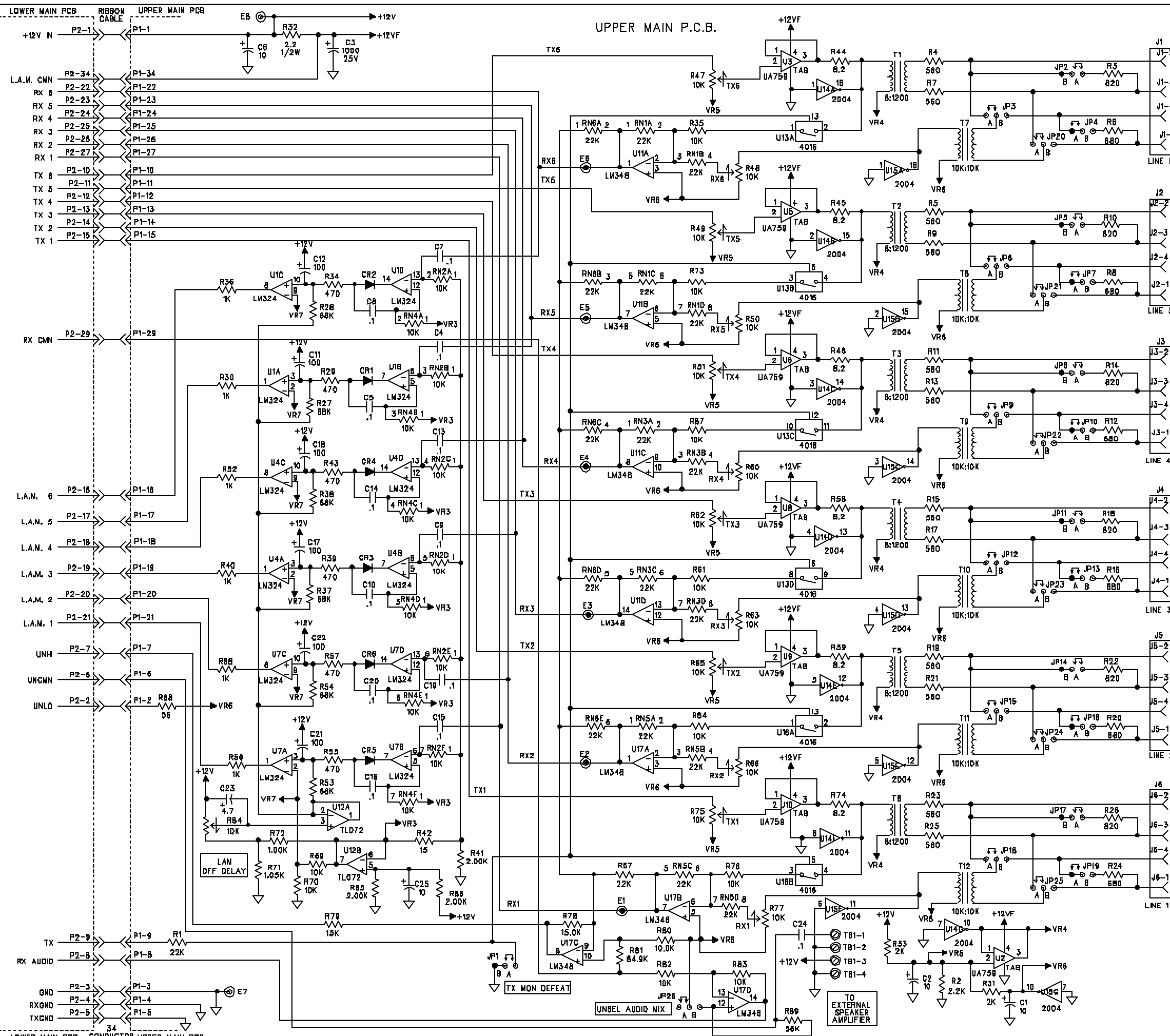
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SCALE: 1:1 SHEET 1 OF 1

PCB# 065-0440

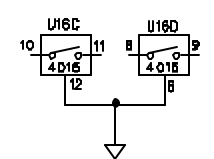
DRAWN	D.R. MCAFEE 2/25/92	
CHECK	ARNDLD RATTNER	
ENGR.	J. BRAND	
APP.		
MODEL		NEXT ASSY.
C-1614		013-0010
NO INFORMATION GIVEN HEREIN MAY BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM MARK IV CORPORATION		

NO INFORMATION GIVEN HEREIN MAY BE  
DISCLOSED TO OTHERS WITHOUT WRITTEN  
PERMISSION FROM MARK IV CORPORATION.

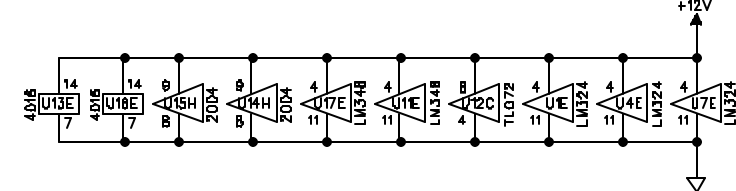


REVISIONS			
SYM.	ECN-NO	DESCRIPTION	APP. DATE
A	92-	RELEASE TO PRODUCTION	M.R. 5/7/92
B	92-	CHANGED J7 TO T81, ADDED JP26	

SPARE GATES



POWER BUSS



PCB# 065-0441

LAST USED		NOT USED		DRAWN		M. JACKSON		VEGA A MARK IV COMPANY C-1614 UPPER MAIN PCB					
				CHECK		ARNOLD RATNER							
				ENGR.		J. BRAND							
				APP.									
				MODEL		NEXT ASSY.		C-1614 012-0055					
				C-1614									
NO INFORMATION GIVEN HEREIN MAY BE REPRODUCED OR OTHERWISE IN ANY MANNER WITHOUT WRITTEN PERMISSION FROM MARK IV CORPORATION.								D		071-0551		B	
								SCALE: NONE		SHEET 1 OF 1			

## C-1614 Parts List

PART#	DESCRIPTION	SYM
<b>010-0120</b>	<b>C-1614E CONSOLE</b>	
011-0090	TOP ASSY C-1614 CONSOLE	
021-6706	BRACKET C-1614	
098-0343	MAN INST C-1614 CONSOLE	
817-0004	BAG POLY 18 X 24 FLAT	
817-0452	CARTON 16X16X8 SELFLOC	
817-0456	KORRVU 16X16X4	
<b>011-0090</b>	<b>TOP ASSY C-1614 CONSOLE</b>	
012-0059	BASE KIT ASSY C-1614	
012-0061	CASE KIT C-1614	
<b>012-0059</b>	<b>BASE KIT ASSY C-1614</b>	
011-0066	PWR SUPPLY ASSY PS-642	
013-0010	PCB ASSY C-1614 MAIN	
013-0011	PCB ASSY C-1614 UPPER	
013-0014	SW ASSY C-1614 SW/ROT	
021-6743	BASE CONS C-5XX/1614	
021-6744	BRACKET RIGHT C-5XX/1614	
021-6745	BRACKET LEFT C-5XX/1614	
021-6762	BRACKET SPKP C-5XX/1614	
031-0217	TEST SPEC C-1614 CONSOLE	
071-0551	SCHEMATIC C-1614 UPPER BD	
071-0552	SCHEMATIC C-1614 LOWER BD	
249-0119	SPEAKER 4"SQ 3W	
286-1900	CONN RBN 34 POS IDC POL	
286-1956	CONN RBN 50 POS IDC DOL	
460-0313	GROMMET 1/2" RUBBER BLK	
460-0317	FOOT RUBBER BLACK	
475-1414	LUG	
528-0024	SCREW PH 6-32 X 3/8	
528-0242	SCREW PH 6-32 1/4 NYLOCK	
534-0001	SCREW PH 4-40X1/4 NYLOK	
538-0075	NUT KEP 4-40	
538-0076	NUT KEP 6-32	
561-0644	STANDOFF MF 4-40X3/4	
567-0371	CLAMP CBL 1/4 DIA NYLON	
674-0239	CORD TEL MDULR 7'PLG-PLG	
674-0248	CABLE RBN 34 CONDUCTOR	
674-0251	CORD PWR L86A 2WIRE BLK	
674-0252	CABLE RBN 50 CONDUCTOR	
850-0426	LABEL INS C-5XX/1614	
<b>012-0061</b>	<b>CASE KIT ASSY C-1614</b>	
011-8022	TOP ASSY MD-MS DESK MIC	
021-6678	PANEL FRNT C-1614 CONSOLE	
024-0012	GRILLE C-511/12/32/33	
550-0285	KNOB BLK 15MM OD 1/8 SHF	
550-0286	KNOB BLK 15MM OD 4MM SHF	
550-0287	KNOB BLK 11MM OD 4MM SHF	
550-0288	CAP KNOB 11MM BLK W/LINE	
550-0289	CAP KNOB 15MM BLK W/LINE	
869-0040	CASE BEIGE 591 W/O HS	
<b>013-0010</b>	<b>PCB ASSY C-1614 MAIN</b>	
065-0440	PCB C-1614 MAIN BOARD	
071-0552	SCHEMATIC C-1614 LOWER BD	
102-0160	CAP CER 30P S2L 5% 50V	C57 C60



### C-1614 Parts List (continued)

PART#	DESCRIPTION	SYM
102-0390	CAP CER 270P S2L 5% 50V	C26
105-1002	CAP MYLAR .0015MF 10% 100	C17
105-1009	CAP MYLAR .022MF 10% 100V	C52
105-1099	CAP MYLAR .01MF 10% 100V	C32
110-1319	CAP CER .01MF SM 50V	C 3
		C 4
		C13
		C42
		C55
		C61
110-1320	CAP CER .001MF 20% 50V	C18
		C34
		C46
		C47
		C63
110-1340	CAP CER .1MF SMALL	C 5
		C 7
		C 8
		C 9
		C15
		C27
		C33
		C39
		C48
		C50
		C51
		C58
		C62
		C66
110-1345	CAP CER .0022MF 5% NPO	C43
		C44
112-1606	CAP ELEC 10MF 25V	C 6
		C38
		C49
		C64
112-1608	CAP ELEC 1.0MF 20% 25V	C 2
		C14
		C28
		C29
		C30
		C35
		C36
		C40
		C53
		C54
		C65
112-1673	CAP ELEC 2.2MF 20% RAD	C12
		C59
112-1676	CAP ELEC 100UF 16V	C10
		C11
		C31
112-1678	CAP ELEC 1.0UF 50V NP	C16
		C23
		C24
		C25
		C37
		C41

### C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
112-1689	CAP ELEC 470MF 25V RAD	C 1 C19 C20 C21 C22 C45
112-1703	CAP ELEC 0.22UF 50V 20%	C56
130-0526	RES VAR 100K VER MT LIN	R89 R98
130-0629	RES VAR 10K HOR MT	R68
130-0673	RES VAR 10K 20T 3/8SQ	R67
130-0734	RES VAR 1K LOG H-ADJ	R79
130-0746	RES VAR 100K LOG H-ADJ	R97
133-0001	RES CRBN 1.0 OHM 5% 1/2W	R12
133-0002	RES 2.2 OHM 5% 1/2W	R 9 R13
134-0194	RES RN55D 49.9K 1% 1/4W	R21
134-0209	RES RN55D 432K 1% 1/4W	R20
134-0250	RES RN55D 178K 1% 1/4W	R75
134-2837	RES RN55D 15.0K 1% 1/4W	R42
134-2847	RES RN55D 32.4K 1% 1/4W	R45 R46 R47 R48 R52 R69
134-2867	RES RN55D 7.50K 1% 1/4W	R41
134-2877	RES RN55D 20.0K 1% 1/4W	R49 R66
134-2885	RES RN55D 562. 1% 1/4W	R51
134-2947	RES RN55D 249K 1% 1/4W	R76 R77
134-3017	RES RN55D 442K 1% 1/4W	R78 R87
134-3024	RES RN55D 13.3K 1% 1/4W	R43 R73
134-3042	RES RN55D 31.6K 1% 1/4W	R40
134-3043	RES RN55D 20.5K 1% 1/4W	R22
134-3046	RES RN55D 28.7K 1% 1/4W	R71
136-0024	RES 220 5% 1/4W	R 8
136-0025	RES 270 5% 1/4W	R104
136-0026	RES 330 5% 1/4W	R16
136-0031	RES 820 5% 1/4W	R14
136-0032	RES 1K 5% 1/4W	R 1 R 2 R 23 R 25 R 27 R 29 R 38 R 74 R100
136-0035	RES COMP 1.8K 5% 1/4W	R91
136-0036	RES COMP 2.2K 5% 1/4W	R15

## C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
136-0040	RES COMP 4.7K 5% 1/4W	R 5 R11 R37 R63 R64 R70 R83 R92 R93 R94
136-0044	RES COMP 10K 5% 1/4W	R 39 R 80 R101
136-0047	RES COMP 18K 5% 1/4W	R34
136-0048	RES COMP 22K 5% 1/4W	R 3 R 4 R 7 R19 R32 R33 R36 R50 R53 R54 R56 R57 R59 R60 R62 R65 R81 R88 R96
136-0052	RES COMP 47K 5% 1/4W	R55
136-0056	RES COMP 100K 5% 1/4W	R61 R 6 R10 R17 R18 R44 R84 R85 R86 R95 R99
136-0060	RES COMP 220K 5% 1/4W	R 24 R 26 R102
136-0068	RES COMP 1M 5% 1/4W	R28 R31 R58 R72
136-0080	RES COMP 10M 5% 1/4W	R90
136-0096	RES COMP 2K 5% 1/4W	R103
136-0289	RES COMP 200K 5% 1/4W	R35 R82

## C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
136-1962	RES COMP 36K 5% 1/4W	R30
138-0017	RNET CMN 7X100K SIP	RN3
138-0048	RNET CMN 5X4.7K SIP	RN1
138-0053	RNET CMN 5X100K SIP	RN2
161-0366	DIODE 1N4003	CR1
161-0426	DIODE 1N4148	CR2-15
161-0558	DIODE MBR120P SCHOTKY	CR16
162-0001	DNET CMNA QUAD DIODE SIP	DN2-13
162-0002	DNET CMNC 4XCR	DN 1
165-1216	XTAL 2.8275MHZ HC-18	Y 1
286-1766	CONN JUMPER PLUG	JP1-9
286-1768	PIN TEST POINT	TP1-3
286-1772	CONNECTOR 36PIN STRIP TIN	JP1-9
286-1830	CONN PCB MODULAR HANDSET	J2
286-1850	CONN PCB MOD LINE 6-WIRE	J3
286-1851	RECPT PCB SPADE LUG DUAL	J4-7
286-1863	TERM STRIP 2 PIN MINI	TB1-2
286-1898	HEADER PWB 34PIN LO-PROF	P 2
286-1957	HEADER PWB 50 PIN LO-PROF	P1
299-0315	SWITCH 8 POSITION DIP	S1-6
425-0158	IC CMOS 4013 DUAL D FF	U16
425-0164	IC CMOS 4011 QUAD 2NAND	U17
425-0171	IC CMOS 4081 QUAD 2AND	U22
425-0178	INT CKT NE570N	U 6
425-0181	IC OPAMP TL084 QUAD BFET	U12
425-0186	IC CMOS 4018 PROG CNTR	U19
425-0202	IC OPAMP 5532 DUAL RL600	U 1
		U 3
		U 5
425-0203	IC 4569 PROG CNTR	U20
425-0204	IC CMOS 4025 TRIP 3NOR	U21
425-0206	IC CMOS 4584 HEX TRIG	U10
		U18
425-0215	INT CKT ULN2004A	U 2
425-0230	IC OPAMP LM358 DUAL	U13
425-0262	IC CMOS 4044 QUAD LATCH	U23
425-0273	INT CKT CD4073B	U14
		U15
425-0274	INT CKT CD4043B	U 9
425-0285	IC CMOS 4066 QUAD SW	U 7
		U 8
		U11
425-0291	IC PWRAMP TDA2003H 10W	U 4
523-0081	RIVET 1/8 X 1/4 POP	
561-0652	SWAGE STDF 4-40X1/4	
614-0429	HEAT SINK TO-220 HAT	
<b>013-0011</b>	<b>PCB ASSY C-1614 UPPER</b>	
065-0441	PCB C-1614 UPPER BOARD	
071-0551	SCHEMATIC C-1614 UPPER BD	

## C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
110-1340	CAP CER .1MF SMALL	C 4 C 5 C 7 C 8 C 9 C10 C13 C14 C15 C16 C19 C20 C24
112-1606	CAP ELEC 10MF 25V	C 1 C 2 C 6 C25
112-1645	CAP ELEC 4.7UF 25V MINI	C23
112-1676	CAP ELEC 100UF 16V	C11 C12 C17 C18 C21 C22
112-1684	CAP 1000MF 25V RAD	C3
130-0639	RES VAR 10K H-MTG PCB	R47 R48 R49 R50 R51 R60 R62 R63 R65 R66 R75 R77 R84
133-0002	RES CRBN 2.2 OHM 5% 1/2W	R32
134-0212	RES RN55D 10.0K 1% 1/4W	R35 R61 R64 R69 R70 R73 R76 R80 R82 R83 R87
134-2837	RES RN55D 15.0K 1% 1/4W	R78
134-2903	RES RN55D 1.00K 1% 1/4W	R72
134-2985	RES RN55D 64.9K 1% 1/4W	R81
134-2992	RES RN55D 2.00K 1% 1/4W	R41 R85 R86

### C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
134-3074	RES RN55D 1.05K 1% 1/4W	R71
136-0003	RES COMP 8.2 5% 1/4W	R44
		R45
		R46
		R58
		R59
		R74
136-0010	RES COMP 15 5% 1/4W	R42
136-0017	RES COMP 56 5% 1/4W	R88
136-0028	RES COMP 470 5% 1/4W	R29
		R34
		R39
		R43
		R55
		R57
136-0029	RES COMP 560 5% 1/4W	R 4
		R 5
		R 7
		R 9
		R11
		R13
		R15
		R17
		R19
		R21
		R23
		R25
136-0030	RES COMP 680 5% 1/4W	R 6
		R 8
		R12
		R16
		R20
		R24
136-0031	RES COMP 820 5 % 1/4W	R 3
		R10
		R14
		R18
		R22
		R26
136-0032	RES COMP 1K 5% 1/4W	R30
		R36
		R40
		R52
		R56
		R68
136-0036	RES COMP 2.2K 5% 1/4W	R2
136-0046	RES COMP 15K 5% 1/4W	R79
136-0048	RES COMP 22K 5% 1/4W	R1
		R67
136-0053	RES 56K 5% 1/4W	R89

### C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
136-0054	RES COMP 68K 5% 1/4W	R27 R28 R37 R38 R53 R54
136-0096	RES COMP 2K 5% 1/4W	R31 R33
138-0013	RNET ISO 4X22K SIP	RN1 RN3 RN5
138-0029	RNET CMN 7X10K SIP	RN2 RN4
138-0032	CMN 5X22K SIP	RN6
161-0426	DIODE 1N4148	CR 1 CR 2 CR 3 CR 4 CR 5 CR 6
286-1766	CONN JUMPER PLUG	JP 1 JP26
286-1772	CONNECTOR 36PIN STRIP TIN	
286-1831	CONN PCB MODULAR LINE	J1 J2 J3 J4 J5 J6
286-1863	TERM STRIP 2 PIN MINI	TB1
286-1898	HEADER PWB 34PIN LO-PROF	P1
318-0246	XFORMER 10K CT-10K CT	T 7 T 8 T 9 T10 T11 T12
318-0260	XFORMER 8-1200 OHM	T1 T2 T3 T4 T5 T6
425-0207	IC OPAMP LM324 QUAD	U1 U4 U7
425-0210	IC OPAMP LM348 QUAD	U11 U17
425-0215	INT CKT ULN2004A	U14 U15
425-0233	IC TL072 DUAL LN	U12

## C-1614 Parts List (continued)

PART#	DESCRIPTION	CKT SYM
425-0235	INT CKT UA759	U 2 U 3 U 5 U 6 U 8 U 9 U10 U13 U16
425-0285	IC CMOS 4066 QUAD SW	
528-0003	SCREW PH 4-40X1/4	
538-0075	NUT KEP 4-40	
<b>013-0014</b>	<b>SW C-1614 SW/ROT</b>	
065-0442	PCB C-1614 MAIN SWITCH	
065-0443	PCB C-1614 ROTARY SWITCH	
071-0552	SCHEMATIC C-1614 LOWER BD	
130-0745	RES VAR 10K LOG	R101 R102
138-0044	CMN 7X1K SIP	RN101
161-0573	DIODE LED T1 3/4 RED DIF	DS107
161-0604	LED RED T1 SUPER	DS101 DS102 DS103 DS104 DS105 DS106
286-1833	TERM QUICK CONNECT	
286-1884	PIN STRIP SPACER 16X1/4"	P15 P16 P17 P18
286-1885	SIP 8POS	J15 J16 J17 J18
286-1957	HEADER 50 PIN LO-PROF	P4
296-0588	SWITCH PCB PUSH MOM W/LED	S101 S102 S103 S104 S105 S106 S100
296-0614	SWITCH 2P 6POS ROTARY	
530-0003	SCREW TRHD4-40X1/4	
561-0652	SWAGE 4-40X1/4	
561-0657	SPACER .2L FOR T1 LED	
674-0226	CORD 2C 24 GA	



## C-1614 and C-1614W Specifications

<b>Panel Switch Selectable Lines:</b> .....	Six
<b>Each Line Input Impedance (unaffected by the selector switch position):</b>	
<b>Two-Wire:</b> .....	600 $\Omega$ or 2 k $\Omega$ , jumper selectable, transformer isolated
<b>Four-Wire:</b> .....	600 $\Omega$ or 8 k $\Omega$ , jumper selectable, transformer isolated
<b>Each Line Output Impedance (unaffected by selector switch position):</b>	
<b>Two-Wire:</b> .....	600 $\Omega$ or 2 k $\Omega$ , jumper selectable, transformer isolated
<b>Four-Wire:</b> .....	600 $\Omega$ or 2.6 k $\Omega$ , jumper selectable, transformer isolated
<b>Each Line Input Level:</b> .....	-30 dBm to +15 dBm, adjustable
<b>Each Line Output Level:</b> .....	-20 dBm to +12 dBm into a 600- $\Omega$ line, adjustable
<b>Audio Compression (receive and transmit):</b> .....	Less than 3-dB change in output level for a 30-dB change in input above threshold
<b>Distortion:</b> .....	2% maximum at full compression
<b>Hum and Noise:</b> .....	50 dB below operating levels
<b>Speaker:</b> .....	4 inch, 8 $\Omega$ , heavy duty
<b>Amplifier power:</b> ...	1.0 W minimum at 10% THD into an 8-W load; 1.5 W at 10% THD into a 4- $\Omega$ load (internal 8- $\Omega$ speaker plus an external 8- $\Omega$ speaker in parallel)
<b>Sidetone level:</b> .....	About 25 dB below receive level
<b>Handset Earpiece Level:</b> .....	Adjustable preset level independent of speaker volume control or dependent upon speaker volume control, solder-jumper selectable
<b>Audio Frequency Response:</b> .....	+1.5 dB, 300 to 3000 Hz, except at the transmit tone notch frequency
<b>Notch Filter:</b> .....	2175 Hz; typically attenuates a parallel console PTT tone by 45 dB
<b>Tone Frequencies and Accuracies:</b> .....	PTT/Guard, 2175 Hz, 0.01%; MON, 2050 Hz, 0.1%; F1, 1950 Hz, 0.01%; F2, 1850 Hz, 0.2%; F3, 1750 Hz, 0.3%; F4, 1650 Hz, 0.2% (all six frequencies are DIP-switch programmable)
<b>Burst-Tone Duration:</b> .....	Guard, 130 ms; Function, 40 ms; both adjustable
<b>Operating-Temperature Range:</b> .....	0 to +50°C
<b>Visual Indicators:</b> .....	13 LEDs (TX, MON, F1, F2, F3, F4, I/C, and six line-activity monitor)
<b>Line Selector:</b> .....	Six-position rotary switch
<b>Operating Modes:</b> .....	Simplex (half-duplex) with two-wire lines, simplex or full-duplex with four-wire lines
<b>Line Interface:</b> .....	Modular cords for two-wire or four-wire line in line-terminating or line-bridging modes, jumper selectable
<b>Receive Audio Feedthrough From Nonselected Lines:</b> .....	Adjustable from 56 dB to 11 dB below the selected-line audio level
<b>Power Requirements:</b> ...	117 V <sub>ac</sub> , 60 Hz, 10 W maximum, or 12.0 V <sub>dc</sub> at 300 mA idle, 500 mA maximum



DEC 1999

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