



Instruction Manual

098-0328

Models C-511 and C-512 Tone-Remote Control Consoles

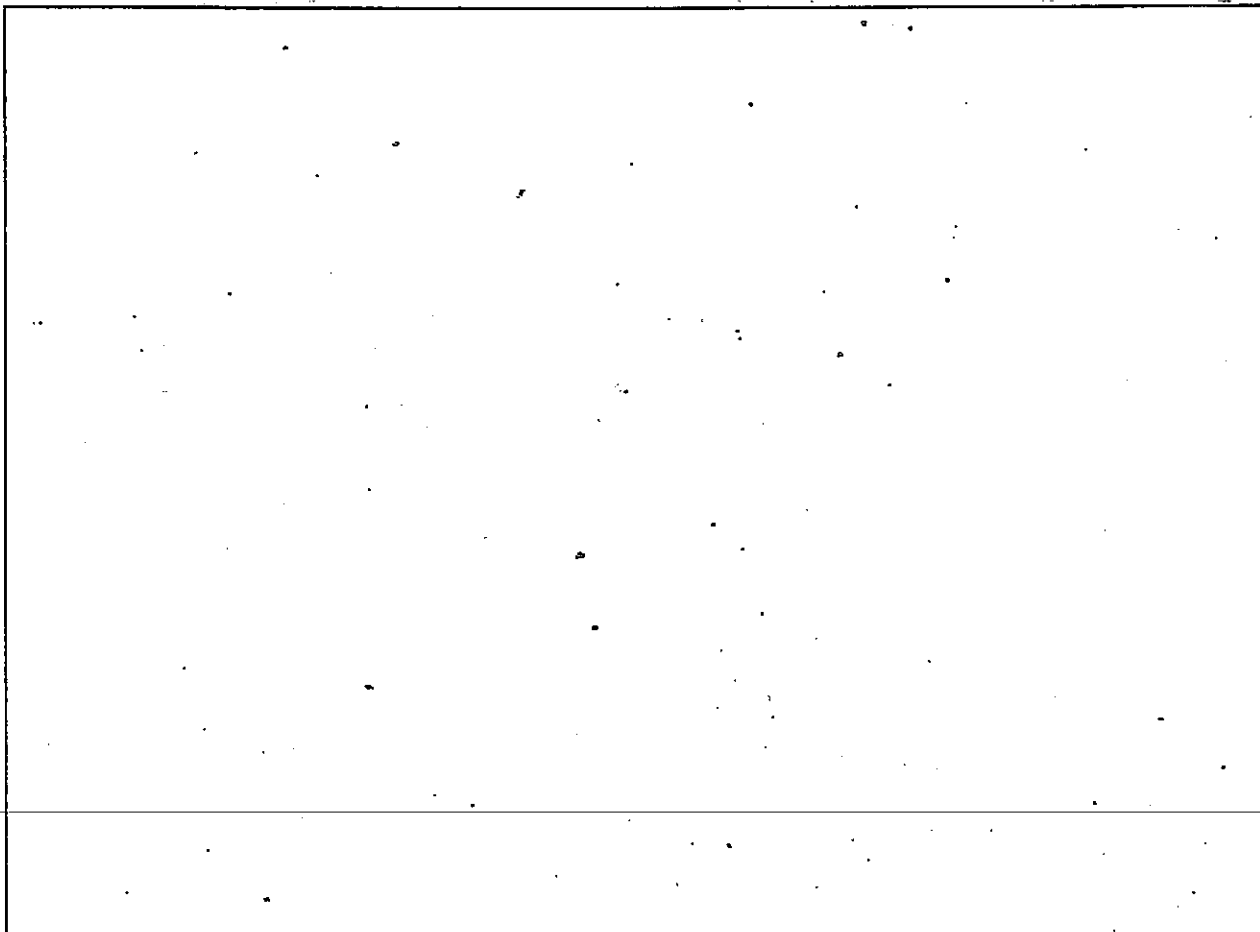


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Introduction

Vega's tone-remote consoles provide reliable remote control of the various functions of a two-way-radio base station. The Models C-511 and C-512 consoles are normally used in conjunction with a functionally matching Vega 223 Series tone-remote control panel, located at the base-station site. These consoles are compatible with GE, Motorola, and other radio tone-remote control systems which employ similar tone formats.

The C-511 is a desk-type console with desk microphone. The C-512 is a wall-mount console with handset.

A Vega tone-remote console is connected to the remote base station by means of any voice-grade or better network, and is compatible with private or leased telephone circuits, including microwave links in the connecting network. Metallic or DC continuity is not required.

The basic C-511 or C-512 tone-remote console is supplied and ready to operate in the two-wire mode with handset or desk mic and speaker, and with push-to-talk, CTCSS monitor, notch filters, and F1/F2 select functions installed and operational.

Jumpers are provided for simplex or duplex four-wire operation, for enabling the speaker when off-hook (C-512 only), for operation without the F1/F2 function, and for proper line-terminating impedance with multiple consoles per line.

Operation and Controls

The C-511 and C-512 tone-remote consoles are designed for maximum ease of operation. Minimum operator familiarization is required. The following controls and indicators are provided and can be identified from the front-cover photograph:

- **Volume Control:** Adjusts both speaker and earpiece (C-512 only) audio level.
- **Transmit PTT Switch:** Push to talk (generates PTT tone) and release to listen; located inside the handset handle.
- **Transmit Lamp:** When lighted, indicates console (or a parallel console) is transmitting (required by FCC rules).
- **Intercom:** When pushed, removes control tones and allows the operator to talk into the network (such as to a parallel console or to a technician at the remote base station) without keying the remote transmitter. Pushing the PTT switch on the handset is not required.
- **CTCSS Monitor:** When pushed momentarily, causes the base-station receiver equipped

with a subaudible-tone (CTCSS) decoder to monitor all activity on the radio channel, by disabling the CTCSS decoder. This function reduces the possibility of accidentally interfering with other cochannel users, and is required by FCC rules for stations equipped with subaudible signaling. The monitor function is also activated when the handset is lifted off hook.

- **Parallel-Console Notch Filter:** Removes the PTT tone received by a parallel console in the receive mode. This circuit is required whenever two or more consoles are controlling the same base station, and is supplied as standard.
- **Microphone Audio Notch Filter:** Removes PTT tone frequencies which may outphase the PTT tone from microphone audio.
- **F1/F2 Selection:** When the F1 or F2 button is pushed momentarily, it will latch on and release the other channel, and cause a two-frequency station to switch to the desired channel. LED indicators show which channel is selected.

NOTE: When a console switches from one channel to the other, that change is not indicated on parallel consoles. However, when a PTT, F1, or F2 switch is pushed on a parallel console, a new frequency command is generated, thereby placing the remote station on the channel indicated on that console. (The monitor switch does not generate a new frequency command.)

NOTE: Monitor and frequency-selection commands and voice signals are audible at parallel consoles, thereby providing an audible indication of activity or that commands are being generated elsewhere in the radio system. (The continuous PTT tone is notched out and cannot be heard on parallel consoles; however, a PTT tone detector ahead of the notch filter causes the transmit LED to glow.)

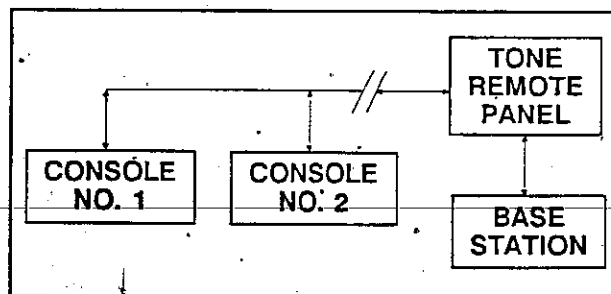


Figure 1. Overall system block diagram.

Typical Applications

The C-511 or C-512 console can be used as a single unit or in parallel with other consoles on the same network, to control a remote base station (as shown in Figure 1). Referring to Figure 1, two consoles are tied to a single leased telephone line feeding a Vega tone-remote control panel at the base station. Either console can exercise full control over the remote base station by use of the push buttons and the handset. A sequence of tones is generated each time the PTT switch is pushed, insuring security and constant status updating of the remote base station.

All base-station activity, whether from a radio or from a parallel console, can be monitored over either the speaker or the handset (C-512 only). Thus, it is unlikely that one console operator would inadvertently interfere with any other console operator. One console operator can talk with another console operator, without keying the remote base transmitter, simply while pushing the INTERCOM switch on the front panel.

The interconnections shown in Figure 1 are typical. Additional consoles may be connected to the common leased telephone line to control the remote base station. (Custom Vega consoles are available for selecting lines to other remote base stations, selecting additional frequencies, controlling other functions, status monitoring, etc. Contact the Vega factory for assistance with your special system requirements.)

Installation

The C-511 or C-512 tone-remote consoles may be installed in any location convenient to the operator. Exposure to extreme dampness, temperature, and radio-frequency energy should be avoided for maximum life and reliability.

If the C-511 is to be used in the factory-prepared, single-console, two-wire-line, simplex mode of operation, the only installation required is to plug the wall power supply into a wall socket and connect the modular line plug to the modular jack of a leased line or audio pair.

The C-512 must be disassembled for mounting to the wall. (See DISASSEMBLY instructions.) Place the console in the desired location and mark the wall through the two keyholes in the base plate. Drive #8 screws or expansion bolts, as appropriate, into the wall, allowing the screwheads to protrude 3/8 inch. Hang the console on the screws and tighten screws as required for a snug fit to the wall. For added security against dislocation from an accidental upward bump, a third mounting hole has been provided at the bottom center of the base.

For multiple-console, four-wire-line, duplex or line-bridging operation of both models, refer to DISASSEMBLY instructions, to Chart 1 or Chart 2, and to the schematic.

NOTE: The console units are not designed to operate on lines carrying direct current. If direct current is on the line, isolate with external capacitors or with a 600-ohm transformer designed for the current involved.

Disassembly and Setup

Access to internal connections, controls, and jumpers is obtained by the following steps:

1. Remove the volume-control knob with a 1/16-inch Allen wrench.
2. Push back the retainer clip located at the top center edge of the grille and lift out the grille.
3. Loosen the two case-retaining screws and lift off the case.

This procedure provides access to all installation connections, adjustments, and programming. Access to all components for maintenance is obtained by removing the three speaker/switch bracket screws.

Two-Wire-Line Operation

P1 and P2 are connected to B per factory programming.

Four-Wire-Line Operation

Move P1 and P2 to A.

Multiple-Console Operation

Refer to Chart 1 (two-wire) or to Chart 2 (four-wire).

Line-Bridging Operation

When non-Vega equipment is loading the line, program all consoles including the first console per the Chart 1 or Chart 2 columns for #2 through N consoles. Losses introduced vary from 1 dB for one console to 4 dB for four consoles on two-wire lines, and from 0 dB for one console to 5 dB for eight consoles on four-wire lines.

Duplex Operation

Move P9 to B for duplex operation (over four-wire lines only).

Level Adjustments

The consoles are factory-adjusted for +10 dBm guard tone, 0 dBm function tone, and -20 dBm PTT tone into a 600-ohm resistive load. Leased

NUMBER OF CONSOLES	FIRST CONSOLE ONLY				#2 THROUGH N CONSOLES		
	P1, P2, P3	P4	R5	RX & TX LOSS ³	P1, P2, P3	P4	R2, R5
1	TO B ¹	TO A ¹	1	0 dB	TO B ¹	TO B	1
2	TO B ¹	TO A ¹	1.5 k Ω ²	0 dB	TO B ¹	TO B	1
3	TO B ¹	TO B	1	0 dB	TO B ¹	TO B	1
4	TO B ¹	TO B	1	1 dB	TO B ¹	TO B	1
5	TO B ¹	TO B	1	2 dB	TO B ¹	TO B	1
6	TO B ¹	TO B	1	3 dB	TO B ¹	TO B	1

¹As shipped²For optimum line match and 0 dB loss³Applies to all consoles

Chart 1. Two-wire line programming.

NUMBER OF CONSOLES	FIRST CONSOLE ONLY						#2 THROUGH N CONSOLES	
	P1, P2, P3	R2	P4	R5	RX LOSS ³	TX LOSS ³	P1, P2	P3, P4
1	TO A	1	TO A ¹	1	0 dB	0 dB	TO A	TO B
2	TO A	1	TO A ¹	1.3 k Ω ²	0 dB	0 dB	TO A	TO B
3	TO A	750 Ω ²	TO A ¹	2.7 k Ω ²	0 dB	0 dB	TO A	TO B
4	TO A	820 Ω ²	TO B	1	0 dB	0 dB	TO A	TO B
5	TO A	1.0 k Ω ²	TO B	1	0 dB	1.0 dB	TO A	TO B
6	TO A	1.1 k Ω ²	TO B	1	0 dB	1.9 dB	TO A	TO B
7	TO A	1.2 k Ω ²	TO B	1	0 dB	2.7 dB	TO A	TO B
8	TO A	1.5 k Ω ²	TO B	1	0 dB	3.4 dB	TO A	TO B

¹As shipped²For optimum line match and 0 dB loss³Applies to all consoles

Chart 2. Four-wire line programming.

lines or audio-pair lines seldom present an exact 600-ohm load to the console, and the measured levels probably will be somewhat different. Line output control R44 allows adjustment of all output levels simultaneously.

If adjustment is required, connect the meter to TP1 and TP2. A continuous PTT tone is obtained by pressing the PTT switch on the handset. Because the function tone is preset to be 20 dB higher than the PTT tone, and the guard tone is preset to be 30 dB higher than the PTT tone, normally only the PTT tone needs measurement. If real guard-tone and function-tone measurements are desired, an oscilloscope may be connected to TP1 and TP2 (0 dBm = 2.2 V_{p-p}; +10 dBm = 6.9 V_{p-p}). Voice level is preset for a peak-to-peak out-

put level typically equal to the function-tone level (2.2 V_{p-p}). Voice level should be measured on an oscilloscope, because a meter reading from voice will be 6 to 8 dB below the 0-dBm 2.2-V_{p-p} sine-wave function-tone output.

Output from the auxiliary input is controlled only by the input level, and gives about a 2-dB gain from auxiliary input to the line output.

Input-Level Adjustment

Input-level sensitivity is factory-programmed to just above the threshold of compression with typical line loss. If greater sensitivity is required, adjust R80 (RX LVL) clockwise. If less sensitivity is required, adjust R80 counter-clockwise.

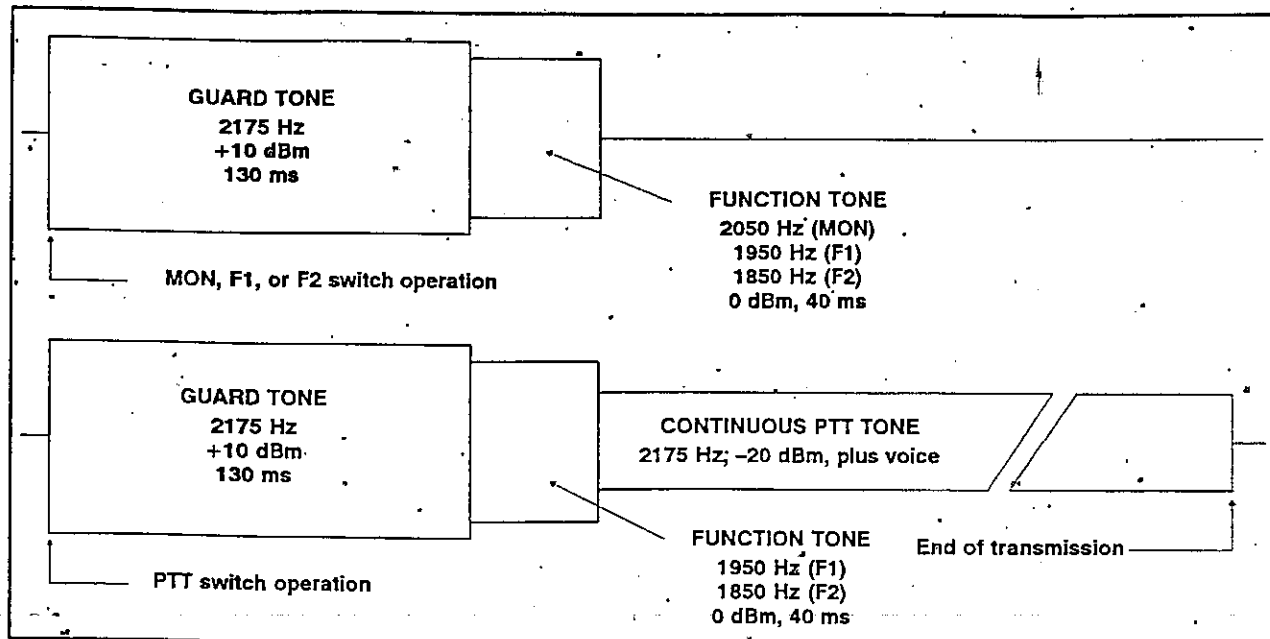


Figure 2. C-510C tone sequence chart.

Line input sensitivity should not be increased beyond that required by line loss, because increased sensitivity amplifies line and background noises during pauses in voice transmissions—without increasing the level of voice reception.

Transmit Monitor Level Programming and Adjustment

When operating in the four-wire mode with multiple consoles and little or no crossover audio between the transmit and receive lines, move P7 to A and adjust TX MON LVL control R82 to just above the threshold of compression while a parallel console is transmitting.

Timer Adjustments

The guard-tone and function-tone duration is factory-adjusted for 130 ms and 40 ms, respectively. If tones of other durations are desired, adjust the guard-tone duration with R79 and the function-tone duration with R80.

Tone-Burst Frequencies

Console tone frequencies are factory-programmed by a diode matrix to 2175 Hz (PTT/guard), 2050 Hz (monitor), 1950 Hz (F1), and 1850 Hz (F2). Consult the factory for diode-programming information to other than these standard frequencies.

Speaker Mute (C-512 only)

The speaker is normally muted when the handset is lifted off-hook. If off-hook speaker operation is desired, move P6 to B.

F1/F2 Defeat

When used with single-frequency remote base stations, the F1/F2 function may be defeated by moving P10 to B. With P10 at B, the F1 LED and associated circuits will remain on at all times, and the F2 LED and associated circuits will be disabled.

Theory of Operation

Crystal oscillator Y1 and U12-5,6 drives an 8-bit programmable divider (U6). The most significant bit at U6-14 is wired high, causing the programmable division range to be 255 to 128. This provides an output at U6-1 of from 11.09 kHz to 22.09 kHz. U17 is a divide-by-10 counter, used to synthesize a sine wave. Since this stage divides by 10, the output frequency range of U17 is 1.109 kHz to 2.209 kHz. The synthesized sine wave has a strong tenth harmonic, which is greatly attenuated at the active low-pass filter output U10-7.

At idle, the crystal oscillator is disabled by a high at U12-3. Going off-hook (C-512 only) or operation of a MON, F1, or F2 switch triggers the guard-tone timer U7A, which enables the crystal oscillator and the "+10 dBm" gate at U9-5. The 2175-Hz programming diode CR4 is enabled by the "off" state of the function-tone timer U7B. A "+10 dB" 2175-Hz output signal is therefore delivered to the line in/out jack J1 through R35, U10A, line-level control R44, line driver U1, and transformer T2.

Timeout of guard-tone timer U7A after 130 ms triggers the function-tone timer U7B, which en-

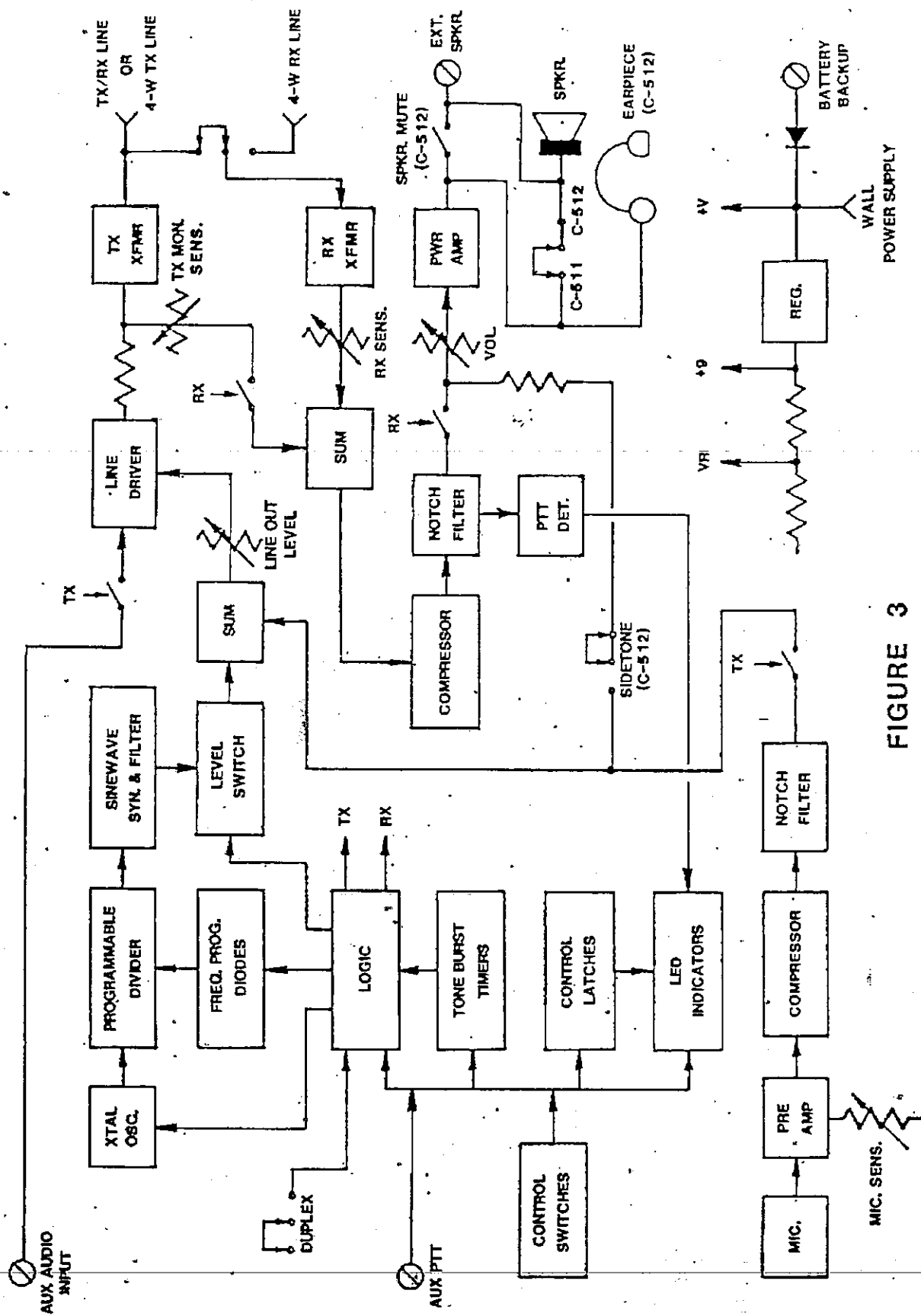


FIGURE 3

C-511/C-512 BLOCK DIAGRAM

ables the "0 dBm gate at U9-13, disables the 2175-Hz programming diode CR4, and enables one of the three rows of function-tone programming diodes at U16-3, U15-6, or U15-10, depending upon which switch has been operated. Timeout of the function-tone timer U7B after 40 ms of operation returns conditions to the idle state.

PTT-switch operation causes the same sequence of operation as from operation of the F1 or F2 switches, except that upon function-tone timeout, the crystal oscillator remains enabled and the "-20 dBm" 2175-Hz PTT tone is conducted to the line through R36 for as long as the PTT switch is held.

Going off-hook (C-512 only) or MON switch operation sets the monitor latch U7C, which enables the monitor row of programming diodes at U16-3 during function-tone timer operation. Timeout of this timer resets the monitor latch through C35 and U16C.

The F1/F2 latch U7D is reset by the F1 switch and set by the F2 switch, causing the proper LED to light and the proper row of programming diodes to be enabled during function-tone timer operation.

In the receive mode, signals present on the 600-ohm line are coupled through transformer T1, RX level control R90, and U13A to the input of the RX compressor U2B. When programmed for four-wire, signals present on the TX line from a parallel console are also coupled to the input of the RX compressor through T2, TX MON LVL control R82, U5D, and U13A.

The maximum gain of compressor U2B is determined by the bias voltage on capacitor C11, which is set by resistor R13. Input signals are full-wave rectified within U2B and when the rectified input signal exceeds the bias set by R13, capacitor C11 is charged to a higher level, which lowers gain and thus maintains a near-constant average output signal at U2-10 (TP4) for all input signals above threshold.

Output signals from compressor U2B drive the RX notch/bandpass filter U14. Bandpass output at U14C-8 (TP9) is amplified and rectified by U18C and U18B, lighting the TX LED through U8E. The TX LED is also activated by TX through U12A and U8D. This maintains TX LED activation during TX when in the four-wire mode, since TX monitor audio is disabled at this time by U5D.

RX bandpass-filter output is summed with the unfiltered signal at U14A-2, causing a sharp notch at the U14A-1 output (TP8) when the two signals have been adjusted for equal amplitude by R54 and for 180° phase shift by R43.

Notched output signals from U14A-1 are conducted through analog gate U9D and R37 to the high side of volume control R101 and then to the speaker and earpiece (C-512 only) through power amplifier U3. Analog gate U9D is disabled during tone burst, intercom, and PTT (enabled during PTT if programmed for duplex operation).

In the transmit mode, audio from the desk microphone (C-511 only) or the handset (C-512 only) is amplified by U13B, level-adjusted by MIC SENS control R55, and compressed by U2A in the same manner as receive signals by U2B.

TX compressor output is applied to the TX notch filter U19 through U5C. This filter removes 2175-Hz harmonics present in some voices, which could otherwise outphase the -20 dBm PTT tone and cause PTT dropout at the base station.

Notched TX voice audio signals are conducted through analog gate U9C and R39 to the transmit audio summing point at U10A-2. Voice audio signals from analog gate U9C are also conducted through R33 (C-512 only) to the high side of volume control R101, which provides sidetone to the handset earpiece.

The microphone-to-line audio path is disabled at U9C during RX, guard tone, and function tone by U12C.

The auxiliary audio path from TB1-1 to the line jack J1 is disabled at U5B-5 during RX and tone burst. A low applied to the auxiliary PTT terminal TB1-2 activates the PTT sequence through CR2 in the same manner as the handset PTT switch, except that microphone audio is disabled by CR1 at U9C.

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.

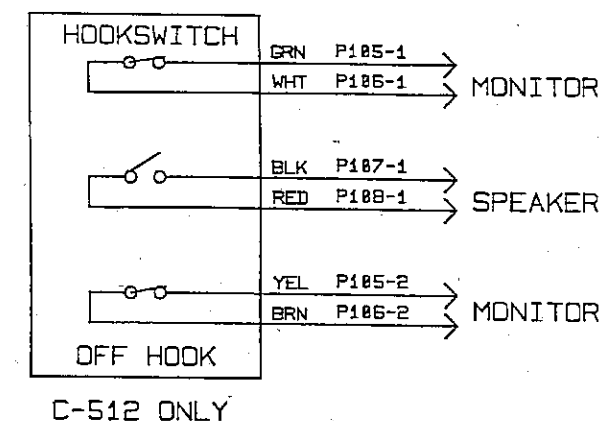
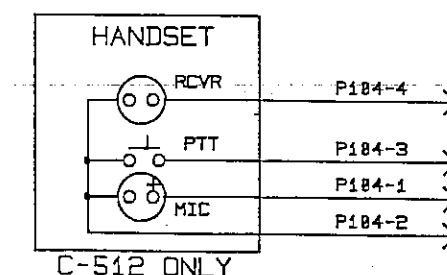
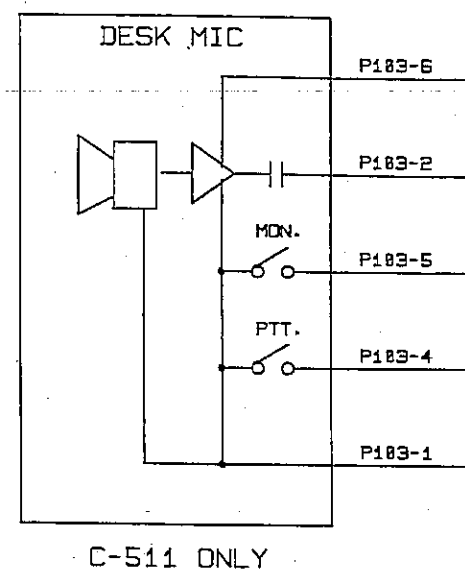
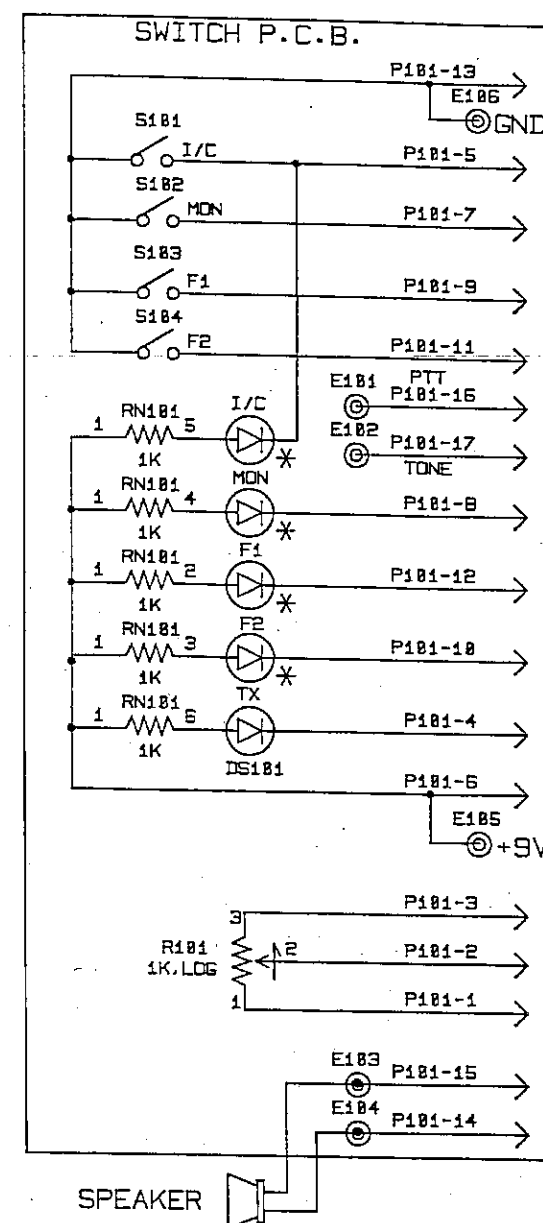
Warranty

Vega signaling products are guaranteed to be free from defects in material and workmanship for a period of three years from the date of shipment. Warranty is for factory repair or replacement only.

Safety and Life Support Policy

Vega's products are not authorized for use in applications where nonperformance may be life-threatening or where substantial risk to life and property may be present, without express written approval by the President of Vega.

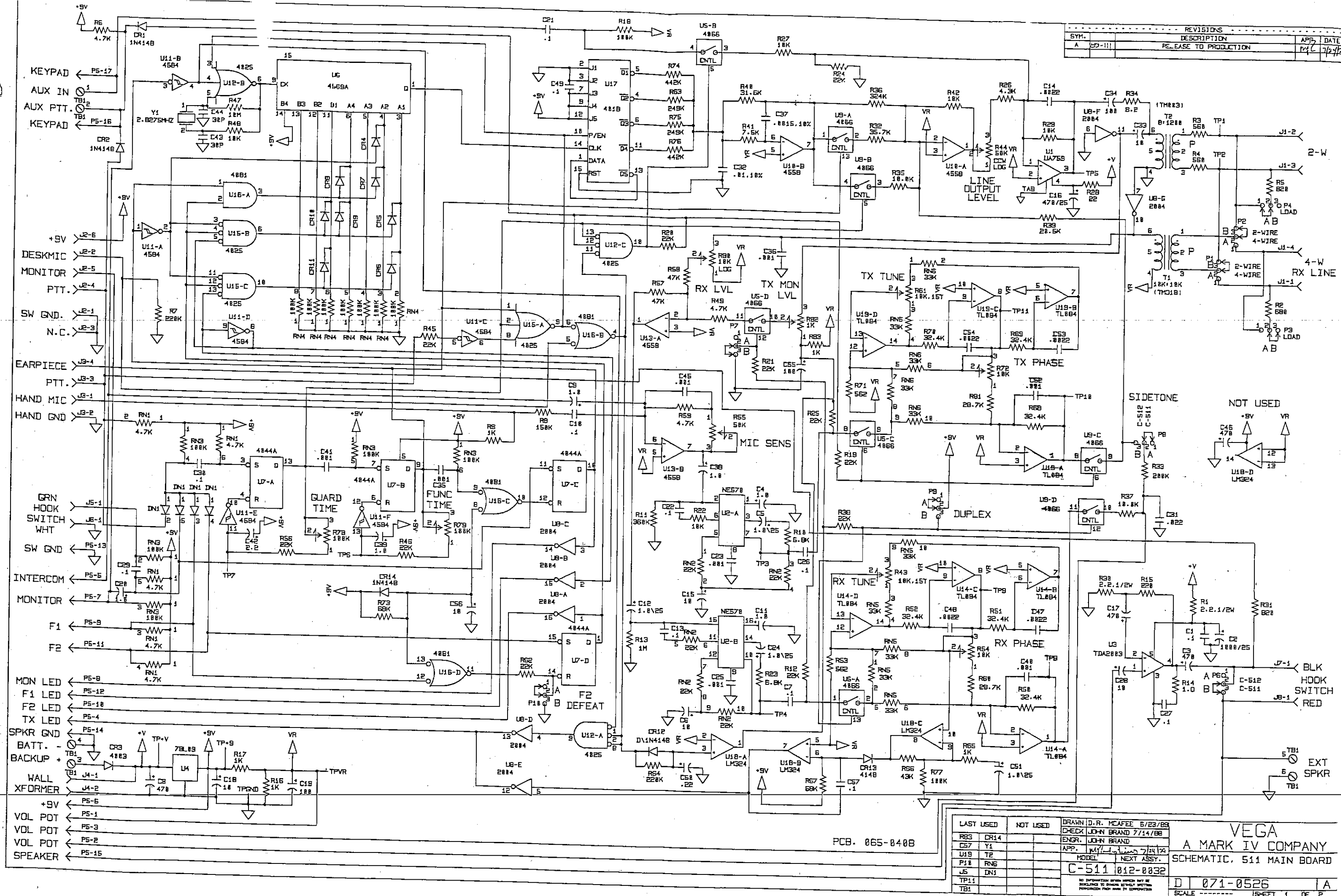
REVISIONS			
SYM.	DESCRIPTION	APP.	DATE
A	89-111	RELEASE TO PRODUCTION	WJC 7/24/89



* LED PART OF ASSOCIATED SWITCH.

PCB. 065-0408

LAST USED	NOT USED	DRAWN	D.R. MCAFEE 7/17/89	VEGA A MARK IV COMPANY SCHEMATIC, 511 SW BOARD AND EXTERNAL CIRCUITS	
		CHECK	J. BRAND 7/14/89		
		ENGR.	J. BRAND		
		APP.	M. Rodas 7/24/89		
		MODEL	C-511	NEXT ASSY.	012-0031
NO INFORMATION SHOWN HEREIN MAY BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM MARK IV CORPORATION				C	071-0526
				SCALE	SHEET 2 OF 2



SPECIFICATIONS

Input Impedance

Two-Wire: 600 Ω or 2.0 k Ω , transformer isolated

Four-Wire: 600 Ω or 2.6 k Ω TX line, transformer isolated; 600 Ω or 8 k Ω RX line, transformer isolated

Line Input Level: -30 dBm to +15 dBm, adjustable

Output Impedance: 600 Ω or 2.0 k Ω (two-wire), 2.6 k Ω (four-wire), transformer-isolated

Line Output Level: -25 to +12 dBm into a 600- Ω line

Audio Compression (Receive and Transmit): Less than 3 dB change in output level for a 30-dB change in input above threshold

Distortion: 2% maximum at full compression

Hum and Noise: 50 dB below operating levels

Speaker: 4 inch, 8 Ω , heavy-duty

Amplifier Power: 1.7 W at 10% THD into 8 Ω ; 2.25 W at 10% THD into 4 Ω (8- Ω internal speaker plus external 8- Ω speaker)

Handset Earpiece Level (C-512): Volume-control adjustable

Sidetone Level (C-512): About 25 dB below receive level

Audio Frequency Response: ± 1.5 dB, 300 to 3000 Hz, except at the transmit tone notch frequency

Notch Filter: 2175 Hz; typically attenuates the parallel console PTT tone by 45 dB

Microphone Audio Notch Filter: 2175 Hz; 45 dB typical attenuation. Eliminates PTT tone out-phasing possibility from certain voices or background noises

Tone Frequencies and Accuracies: PTT, 2175 Hz, 0.01%; MON, 2050 Hz, 0.1%; F1, 1950 Hz, 0.01%; F2, 1850 Hz, 0.2%

Operating Temperature Range: 0 to +50°C

Power Requirements: 120 Vac, 60 Hz, 8 W, or 11.5 to 18 Vdc at 95 mA idle to 500 mA at 2.25 W output and 600 mA at 5 W output

Visual Indicators: LEDs for MON, F1, F2, INTERCOM, and TX

Line Interface: Two-wire or four-wire, line-terminating or line-bridging, solder-bridge selectable

Operating Modes: Simplex with two-wire line, simplex or duplex with four-wire lines

Miscellaneous: Crystal-controlled, diode-programmable tone frequencies; adjustable duration of tones; electret microphone element (C-512); modular-cord line connector; auxiliary audio input terminals; external-speaker terminals; battery-backup input terminals; speaker mute when off-hook (C-512) (defeatable) amplified dynamic desk microphone (C-511) (no hook switch)

C-511/C-512 PARTS LIST

Part No.	Description	Ckt Sym
011-0076	TOP ASSY C-511	
012-0031	PCB ASSY SWITCH C-511	
012-0032	PCB ASSY C-511/12 MAIN	
021-6610	BASE CONS C-511/12/32/33	
021-6611	BRKT SPKR C-511/12/32/33	
024-0010	PANEL FRT DESK C-511/32	
024-0012	GRILLE C-511/12/32/33	
031-0206	TEST SPEC C-511/C512	
071-0526	SCHEMATIC C-511/C512	
130-0752	RES VAR 1K LOG PNL	R101
249-0119	SPEAKER 4"SQ 3W	
249-0149	MIC DESK W/PTT/MON SW	
286-1833	TERM QUICK CONNECT	
286-1881	CONNECTOR 20 PIN IDC	
450-0016	PWR SUPPLY 12DC .5A UNREG	
460-0313	GROMMET 1/2" RUBBER BLK	
460-0317	FOOT RUBBER BLACK	
518-0115	WASH LOCK 6 INT	
528-0024	SCREW PH 6-32 X 3/8	
530-0003	SCREW TRHD4-40X1/4 STL	
536-0362	NUT TINNERM	
538-0076	NUT KEP 6-32	
550-0243	KNOB BLACK1/2OD 1/8I	
567-0371	CLAMP CBL 1/4 DIA NYLON	
674-0239	CORD TEL MDULR 7'PLG-PLG	
674-0246	CABLE RBN 20 CON	
850-0331	LABEL ID TONE CONSOLE	
869-0040	CASE BEIGE 591 W/O HS	
011-0077	TOP ASSY C-512	
012-0031	PCB ASSY SWITCH C-511	
012-0032	PCB ASSY C-511/12 MAIN	
021-6610	BASE CONS C-511/12/32/33	
021-6611	BRKT SPKR C-511/12/32/33	
024-0011	PANEL FRT WALL C-512/33	
024-0012	GRILLE C-511/12/32/33	
031-0206	TEST-SPEC C-511/C512	
071-0526	SCHEMATIC C-511/C512	
130-0752	RES VAR 1K LOG PNL	R101
249-0119	SPEAKER 4"SQ 3W	
249-0121	HANDSET ELECTRET PTT	
286-1833	TERM QUICK CONNECT	
286-1881	CONNECTOR 20 PIN IDC	
450-0016	PWR SUPPLY 12DC .5A UNREG	
460-0313	GROMMET 1/2" RUBBER BLK	
460-0317	FOOT RUBBER BLACK	
518-0115	WASH LOCK 6 INT	
523-0081	RIVET 1/8 X 1/4 POP	
528-0024	SCREW PH 6-32 X 3/8	
528-9002	SCREW PH 6-20X1/2 TYPEB	
530-0003	SCREW TRHD4-40X1/4 STL	
536-0362	NUT TINNERM	
538-0076	NUT-KEP 6-32	
550-0243	KNOB BLACK1/2OD 1/8I	
567-0371	CLAMP CBL 1/4 DIA NYLON	
568-0003	BRACKET CRADLE ASSY MTG	
674-0239	CORD TEL MDJLR 7'PLG-PLG	

674-0246	CABLE RBN 20-CON		112-1608	CAP ELEC 1.0MF 20% 25V	C 4
850-0331	LABEL ID TONE CONSOLE				C 5
869-0040	CASE BEIGE 591 W/O HS				C 9
869-0041	ASSY HKSW CRADLE BEIGE				C11
					C12
012-0031	PCB ASSY SWITCH C-511				C20
065-0407	PCB C-511 SWITCH				C24
138-0056	RNET CMM 5X1K SIP	RN101			C38
161-0573	DIODE LED T1 3/4 RED DIF	DS101			C39
286-1891	HEADER PWB20P LO PROFILE	P101			C51
296-0588	SWITCH PCB PUSH MOM W/LED	S101	112-1609	CAP ELEC 100MF 20% 25V	C19
		S102			C34
		S103			C55
		S104	112-1673	CAP ELEC 2.2MF 20% RAD	C42
			112-1684	CAP ELEC 1000MF 25V RAD	C2
			112-1689	CAP ELEC 470MF 25V RAD	C 3
					C 8
012-0032	PCB ASSY C-511/12 MAIN				C16
031-0206	TEST SPEC C-511/C512				C17
					C46
065-0408	PCB C-511/12 MAIN		112-1703	CAP ELEC 0.22UF 50V 20%	C50
071-0526	SCHEMATIC C-511/C512		130-0526	RES VAR 100K VER MT LIN	R78
					R79
102-0160	CAP CER 30P S2L 5% 50V	C43	130-0529	RES VAR 50K HOR MT	R55
		C44	130-0639	RES VAR 10K H-MTG PCB	R54
105-1001	CAP MYLAR .001MF 10% 100V	C23			R72
		C25	130-0641	RES VAR 1K VER MT LIN	R82
		C35	130-0673	RES VAR 10K 20T 3/8SQ	R43
		C36			R61
		C40	130-0725	RES VAR 10K LOG PC.HADJ	R80
		C41	130-0743	RES VAR 50K CCWLG V-ADJ	R44
		C45	132-0004	RES RN55C 32.4K 1% 1/4W	R50
		C52			R51
105-1002	CAP MYLAR .0015MF 10% 100	C37			R52
105-1009	CAP MYLAR .0022MF 10% 100V	C31			R68
105-1099	CAP MYLAR .01MF 10% 100V	C32			R69
					R70
110-1340	CAP CER .1MF SMALL	C 1	133-0001	RES CRBN 1.0 OHM 5% 1/2W	R14
		C 7	133-0002	RES CRBN 2.2 OHM 5% 1/2W	R 1
		C10			R30
		C13	134-0212	RES RN55D 10.0K 1% 1/4W	R35
		C21			R37
		C22	134-2859	RES RN55D 35.7K 1% 1/4W	R32
		C26	134-2867	RES RN55D 7.50K 1% 1/4W	R41
		C27	134-2885	RES RN55D 562. 1% 1/4W	R53
		C29			R71
		C30	134-2947	RES RN55D 249K 1% 1/4W	R63
		C49			R75
		C57	134-3010	RES RN55D 324.K 1% 1/4W	R36
			134-3017	RES RN55D 442K 1% 1/4W	R74
110-1345	CAP CER .0022MF 5% NPO	C14			R76
		C47	134-3042	RES RN55D 31.6K 1% 1/4W	R40
		C48	134-3043	RES RN55D 20.5K 1% 1/4W	R39
		C53	134-3046	RES RN55D 28.7K 1% 1/4W	R60
		C54			R81
			136-0003	RES COMP 8.2 5% 1/4W	R34
112-1606	CAP ELEC 10MF 25V	C 6	136-0012	RES COMP 22 5% 1/4W	R28
		C15	136-0024	RES COMP 220 5% 1/4W	R15
		C18	136-0029	RES COMP 560 5% 1/4W	R3
		C28			R4
		C33	136-0030	RES COMP 680 5% 1/4W	R2
		C56	136-0031	RES COMP 820 5% 1/4W	R 5

136-0032	RES COMP 1K 5% 1/4W	R31	162-0001	DNET CMNA QUAD DIODE SIP	DN1
		R 9	165-1216	XTAL 2.8275MHZ HC-18	Y1
		R16	286-1766	CONN JUMPER PLUG	P 1
		R17			P 2
		R65			P 3
		R83			P 4
136-0040	RES COMP 4.7K 5% 1/4W	R 6			P 6
		R49			P 7
		R59			P 8
136-0042	RES COMP 6.8K 5% 1/4W	R10			P 9
		R23			P10
136-0044	RES COMP 10K 5% 1/4W	R22	286-1772	CONNECTOR 36PIN STRIP TIN	
		R27	286-1773	TERM STRIP 6 PIN MINI	TB1
		R29	286-1784	PWR JACK PC BD 2.5MM	J4
		R42	286-1830	CONN PCB MODULAR HANDSET	J3
		R48	286-1831	CONN PCB MODULAR LINE	J1
136-0048	RES COMP 22K 5% 1/4W	R12	286-1850	CONN PCB MOD LINE 6-WIRE	J2
		R19	286-1851	RECPT PCB SPADE LUG DUAL	J5
		R20			J6
		R21			J7
		R24			J8
		R25	286-1891	HEADER PWB20P LO PROFILE	P5
		R38	318-0246	XFORMER 10K CT-10K CT	T1
		R45	318-0260	XFORMER 8-1200 OHM	T2
		R46	425-0105	IC OPAMP 4558 DUAL	U10
		R56			U13
136-0052	RES COMP 47K 5% 1/4W	R62	425-0171	IC CMOS 4081 QUAD 2AND	U16
		R57	425-0178	INT CKT NE570N	U2
136-0054	RES COMP 68K 5% 1/4W	R58	425-0181	IC OPAMP TL084 QUAD BFET	U14
		R67			U19
136-0056	RES COMP 100K 5% 1/4W	R73	425-0186	IC CMOS 4018 PROG CNTR	U17
		R18	425-0203	IC CMOS 4569 PROG CNTR	U6
		R77	425-0204	IC CMOS 4025 TRIP 3NOR	U12
136-0058	RES COMP 150K 5% 1/4W	R8			U15
136-0060	RES COMP 220K 5% 1/4W	R 7	425-0206	IC CMOS 4584 HEX TRIG	U11
		R64	425-0207	IC OPAMP LM324 QUAD	U18
136-0068	RES COMP 1M 5% 1/4W	R13	425-0215	INT CKT ULN2004A	U8
136-0080	RES COMP 10M 5% 1/4W	R47	425-0235	INT CKT UA759	U1
136-0281	RES COMP 43K 5% 1/4W	R66	425-0262	IC CMOS 4044 QUAD LATCH	U7
136-0289	RES COMP 200K 5% 1/4W	R33	425-0285	IC CMOS 4066 QUAD SW	U5
136-0292	RES COMP 360K 5% 1/4W	R11			U9
136-1958	RES COMP 4.3K 5% 1/4W	R26	425-0448	IC REG-P 78L09 9V .1A	U4
138-0017	RNET CMN 7X100K SIP	RN4	425-0454	IC PWRAMP TDA-2003V	U3
138-0033	RNET ISO 5X22K SIP	RN2	528-0003	SCREW PH 4-40X1/4	
138-0045	RNET ISO 5X33K.SIP	RN5	538-0075	NUT KEP 4-40	
		RN6	561-0652	SWAGE STDF 4-40X1/4	
138-0048	RNET CMN 5X4.7K SIP	RN1	614-0432	HEATSINK TO-220 30C/W	
138-0053	RNET CMN 5X100K SIP	RN3			
161-0366	DIODE 1N4003	CR3			
161-0426	DIODE 1N4148	CR 1			
		CR 2			
		CR 4			
		CR 5			
		CR 6			
		CR 7			
		CR 8			
		CR 9			
		CR10			
		CR11			
		CR12			
		CR13			
		CR14			



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