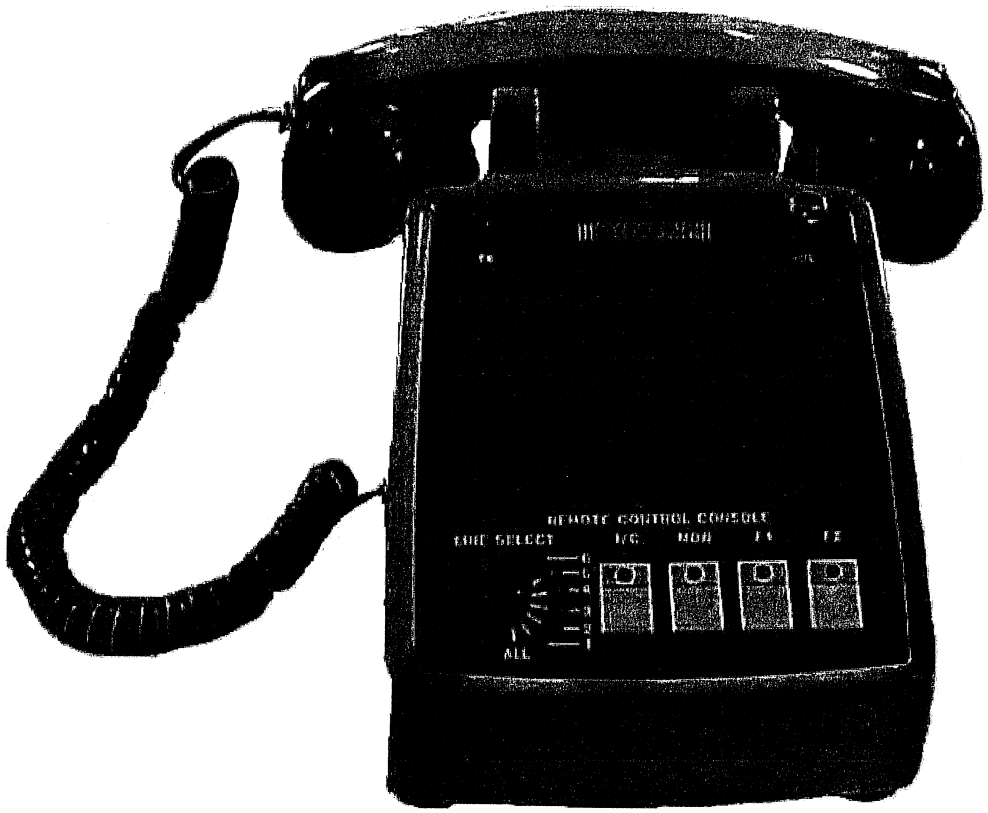
VEGA®

TELEX® Signaling Product Company

Vega C-516
Six-Line Tone-Remote Control Console
Instruction Manual



098-0320C

INTRODUCTION

Vega tone-remote control consoles provide reliable remote control of the various functions of a two-way radio base station.

The Model C-516 remote console is normally used in conjunction with up to six functionally matching Vega 223 Series (or equal) tone-remote panels located at the base stations. The Model C-516 is compatible with General Electric, Motorola, and other tone-remote control systems which employ the EIA tone-signaling format.

The C-516 is connected to the mating tone panel by means of voice-grade or better leased or private lines (microwave circuits included). Metallic or DC continuity is not required.

The C-516 is supplied with a handset and speaker and is ready to operate in the simplex, two-wire mode. Push-to-talk, CTCSS disable (monitor), 2175-Hz notch filter, F1/F2 frequency select, six line-select, and six line-activity-monitor functions are installed and operational. Jumpers are provided for simplex two-wire operation, and for simplex or duplex four-wire operation. Additionally, jumpers are provided to enable the speaker when the handset is off-hook as well as 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 a preset (constant) earpiece volume to control of both the earpiece and speaker from the front-panel volume control.

OPERATION AND CONTROLS

Volume Control: Adjusts the speaker volume audio level (or both the speaker and earpiece audio level depending on the jumper position).

Transmit (PTT) Switch: Located in the handset, this switch enables the sequential tone sequence which keys the radio.

Transmit Lamp: When lighted, indicates that the console (or parallel console when in the two-wire mode) is transmitting (required by FCC rules).

Intercom: When pressed and held, removes all control tones from the circuit and allows the operator to talk to another console on the network without keying the associated transmitter. The handset PTT switch is not used during this operation.

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 accidently interfering with cochannel-user radio traffic and is required by FCC rules. The monitor function is also activated by lifting the handset off of its cradle.

Frequency Selection: When the F1 or F2 switch is depressed, the selected circuit in the remote panel latches on. The circuit not selected is latched off. This feature is normally used to select either frequency one or frequency two on a two-frequency radio. If the radio is a single-frequency model, this feature may be used for any auxiliary purpose or may be ignored. The red LED will show which frequency is currently selected. NOTE: When a console switches from one channel to another, that change is not indicated on parallel consoles. However, when a PTT, F1, or F2 switch is depressed on a parallel console, a new frequency command is generated by the console, thereby placing the radio on the channel indicated by the selecting console. (The monitor switch does not generate an F1 or F2 command.)

Notch Filter: This filter removes the PTT tone from the receive audio when a parallel console is transmitting. This circuit is required whenever two or more consoles control the same base station. This feature is supplied in all Vega tone consoles.

Line Selection and Line Activity Monitor: Operation of up to six separate lines to control six separate base stations is provided in the C-516 by means of a line-selection switch. Proper line-termination impedance is maintained on all lines, regardless of line-selector-switch position. A "receive-all" switch position is provided to allow monitoring of audio on all lines simultaneously. Note: PTT and intercom functions are inhibited in this switch position. Additionally, line-activity-monitor LEDs are provided to identify the active line(s). Line activity causes the associated LED indicator to light and to remain lit for a minimum of eight seconds after the end of activity. This provides a temporary "memory" of line activity should the operator not notice which line the activity was on.

When a line is selected, a preset (adjustable) "feedthrough" audio from all other lines is present in the speaker and earpiece except during PTT and intercom. This "feedthrough" may be eliminated altogether (if desired) by internally adjusting the "feedthrough" level to zero.
The C-516 is compatible with parallel, single-line EIA tone-remote consoles, such as the Vega Model C-510 series. Operators with these consoles will have access only to the base station to which their line is connected, while operators with the Vega Model C-516 will have access to up to six of these lines.

INSTALLATION

The C-516 six-line tone-remote console 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-516 is not designed to operate on lines carrying direct current. If direct-current lines are to be used, isolate the C-516 with external capacitors or with 600:600-ohm transformers designed for the current involved.

The C-516 has been factory programmed for single-console-per-line, two-wire (half-duplex) operation, and has a guard-tone output of +10 dBm.

DISASSEMBLY, SETUP, AND ADJUSTMENT:

Access to internal controls and jumpers is obtained by loosening the two large screws on the bottom of the console and "folding" the case forward. This procedure opens up the entire unit for set-up and maintenance.

Connect the wall transformer power supply cord to the power input jack at the rear of the lower main PC board assembly. Connect as many of the modular telephone cords as will be used to the modular jacks on the upper main PC board assembly. Lines should be connected in order of usage so that the operator does not have to pass the selector switch through unused positions to select an active line.

Each line may be independently programmed for two-wire or four-wire lines, for line termination or bridging (for single or multiple consoles). Proper termination impedance is maintained on all lines regardless of the line selector switch position. Line drive output and line input sensitivity are independently adjustable.

Refer to the designations printed on the PC board and to the schematic diagram to identify the programming and adjustments associated with each line. The designators given in the following programming and adjustment guide apply to line "one" only. The same procedure, using the individually associated controls, follows through for lines two through six.

Two-wire operation:

JP-1 and JP-4 jumpers set to "B" per factory programming.

Four-wire operation:

JP-1 and JP-4 jumpers set to "A".

Line Bridging Operation:

When the C-516 is connected in parallel (bridged) with other consoles (or other equipment) each console so connected must be set to high impedance to minimize loading. This is done by setting jumper JP-2 to "A" (factory programmed) and JP-3 to "A". Refer to Chart 2 for losses introduced into other 600 ohm equipment.

Multiple Console Operation:

All consoles connected in parallel should be configured per Chart 1. Refer to Chart 2 for configuration of the terminating console.

Line Level Adjustments:

The Model C-516 is factory adjusted for approximately +10-dBm guard-tone line level. The other tones and voice levels are fixed relative to the guard tone. At +10 dBm guard tone, the function tone is 0 dBm, and the PTT tone is –20 dBm with 2.2 V_{p-p} voice.

Line level should be measured with meter probes touching JP3- and JP4-3 (the top of JP-3 and JP-4 jumper plugs when in th two-wire mode) with the line connected. For ease of adjustmen jumper TP3 to TP6 on the lower main board and depress the F switch. This causes a continuous guard tone to be generated. A continuous function tone will be generated if TP2 is jumpered t TP6 and F1 is depressed. Continuous PTT is generated withou using jumpers by merely depressing and holding the PTT switch Measurement of voice audio level is not recommended excep with the use of an oscilloscope.

The line drive controls (TX) on any unused lines should b adjusted to their minimum setting.

Input Level Adjustments:

R12 (RX-1) allows adjustment of the line input sensitivity. This control should be adjusted to slightly above the threshold of compression with typical voice signals on the receive line. Sensitivity should not be increased beyond that required by line loss as increased sensitivity amplifies line and background noise during pauses in voice traffic without increasing the level of voice reception. If the line input sensitivity is adjusted too low, the line-activity monitor LEDs will not always trigger. The input level controls on unused lines should be adjusted to their minimum setting.

Summed Audio Feedthrough Control:

The summed audio level control, (R-13) on the main upper PC board, adjusts the summed receive audio level of all active unselected lines when the line selector switch is in one of the line select positions. This allows the selected line to be heard at a higher level than the other line positions. If this feedthrough is not desired, adjust R13 to its minimum setting. Note: When the audio from the selected line is above the compressor threshold, the feedthrough level will be reduced by the amount of compression.

Line Activity Monitor:

No line activity monitor adjustments are provided. With the RX sensitivity controls at mid range, (as shipped) the line activity monitor LEDs are activated by about 330 mVp-p of line audio and remain energized for approximately 8 to 10 seconds after the last activation.

Microphone Sensitivity Adjustment:

Microphone sensitivity has been adjusted to cause about 10 dB of compression from a typical male voice directly into the microphone. R1 (MIC SENS) allows adjustment, if desired. Microphone sensitivity should not be advanced beyond that required for the operators voice. Increased sensitivity only causes an increase of background noise during pauses in transmission without increasing the level of the transmitted voice.

Earpiece Volume Adjustment:

As shipped, the earpiece audio level is independent of the front panel volume control. The earpiece audio level may be adjusted with R24 (EAR VOL) in this mode. If adjustment of the earpiece audio level from the from panel volume control is desired, open JP-27 with a small sharp knife and close JP-28 with a low wattage soldering iron.

Speaker Mute:

The speaker is normally muted when the handset is lifted off-hook. If off-hook speaker operation is desired, close JP-30. In this mode of operation, the speaker is always enabled. Feedback may occur from the sidetone in the PTT and intercom modes if both the volume and microphone sensitivity controls are near maximum.

Duplex Operation:

The C-516 console is not designed for duplex operation over two-wire lines. If all lines are four-wire, close JP-29 for duplex operation. In this mode of operation, the receive audio circuits are active at all times, however, the line drive circuits are active only during PTT and intercom.

Timer Adjustments:

The C-516 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 on the lower main PC board with R7 (GRD TIME) and the function tone duration with R3 (FUNC TIME).

Auxiliary Audio Input and PTT:

Auxiliary audio signals connected to TB1-2, 4 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 that same line at about 0 dBm. An external switch connected to TB1-1,4 has the same effect as pressing the PTT switch.

Defeat:

Close JP26 on the lower main PC board to defeat F2 tone burst only if all base-station radios are set up for single-frequency operation. If a mixture of single-frequency and two-frequency radios are used, and the tone-remote adapters at the base stations are Vega 223 Series, single-frequency radios will operate from either an F1 or an F2 tone burst.

External Speaker:

An external 8-ohm speaker of any physical size may be connected to TB1-4,3 for extended audio coverage from the console. Maximum output from the console speaker is only slightly reduced with an external 8-ohm speaker connected.

Battery Back-Up or DC Supply Operation:

A 12-volt (13.8 V nominal) vehicular-style battery connected to TB1-5,4 will provide backup in case of power failure. An external 12 to 15 Vdc, 500 mA source connected to the same terminals allows operation without the wall power supply.

TWO-WIRE LINE

	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6
To "B"	JP1	JP5	JP9	JP13	JP17	JP21
To "B"	JP4	JP8	JP12	JP16	JP20	JP24
To "A"	JP3	JP7	JP11	JP15	JP19	JP23

Losses when bridging other 600-ohm equipment: RX = 1.2 dB with one console, to 4.2 dB with four consoles.
TX = 0.3 dB with one console, to 3.2 dB with four consoles.
Losses when bridging a C-516 terminating console: See Chart 2.

FOUR-WIRE LINES

	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6
To "A"	JP1	JP5	JP9	JP13	JP17	JP21
To "A"	JP2	JP6	JP10	JP14	JP18	JP22
To "A"	JP3	JP7	JP11	JP15	JP19	JP23
To "A"	JP4	JP8	JP12	JP16	JP20	JP24

Losses when bridging other 600-ohm equipment: RX = 0.3 dB with one console, to 2.3 dB with four consoles.
TX = 0.1 dB with one console, to 4.8 dB with four consoles.
Losses when bridging a C-516 terminating console: See Chart 2.

Chart 1. Line Bridge Programming

TWO-WIRE LINE

Line 1	JP3	R17
Line 2	JP7	R21
Line 3	JP11	R25
Line 4	JP15	R29
Line 5	JP19	R33
Line 6	JP23	R37

1 Console	To "B"	820 Ω*
2 Consoles	To "B"	1.5 kΩ**
3 Consoles	To "A"	820 Ω*
4 Consoles	To "A"	820 Ω*
5 Consoles	To "A"	820 Ω*
6 Consoles	To "A"	820 Ω*

**For optimum line match and 0 dB loss
* As shipped

All Consoles RX Loss	TX Loss
0 dB	0 dB
0 dB	0 dB
0 dB	0 dB
1 dB	1 dB
2 dB	2 dB
3 dB	3 dB

FOUR-WIRE LINE

Line 1	JP1,4	JP3	R17	JP2	R16
Line 2	JP5,8	JP7	R21	JP6	R20
Line 3	JP9,12	JP11	R25	JP10	R24
Line 4	JP13,16	JP15	R29	JP14	R28
Line 5	JP17,20	JP19	R33	JP18	R32
Line 6	JP21,24	JP23	R37	JP22	R36

1 Console	To "A"	To "B"	820 Ω*	To "B"	680 Ω*
2 Console	To "A"	To "B"	1.3 kΩ**	To "B"	680 Ω*
3 Console	To "A"	To "B"	2.7 kΩ**	To "B"	750 Ω**
4 Console	To "A"	To "A"	820 Ω*	To "B"	820 Ω*
5 Console	To "A"	To "A"	820 Ω*	To "B"	1 kΩ**
6 Console	To "A"	To "A"	820 Ω*	To "B"	1.1 kΩ**
7 Console	To "A"	To "A"	820 Ω*	To "B"	1.2 kΩ**
8 Console	To "A"	To "A"	820 Ω*	To "B"	1.5 kΩ**

**For optimum line match and 0 dB loss
*As shipped

With optimum line match per above, no loss with up to four consoles on TX and no loss with up to 13 consoles on RX. With five to eight consoles, TX loss varies from 1.0 to3.4 dB.

Chart 2. Line Termination Programming

NOTE: This programming applies to a single C515 system and to the first C-516 in a multiple C-516 system. Program other C-516s per Chart 1.

Notch Tuning and Notch Outphase Controls:

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

Tone-Burst Frequencies:

Control tone frequencies are factory-programmed by a diode matrix to 2175 Hz. (PTT/guard) 2050 Hz, (monitor) 1950 Hz (F1) and 1850 Hz (F2). Other frequencies may be obtained on special order and at extra cost. Contact the factory.

Line-Bridging Operation:

When one or more C-516 consoles are connected to a line which is already terminated by other equipment, all consoles must be set to high impedance to minimize line loading. This is done on line 1 by setting jumper JP2 and JP3 to "A". Refer to chart 1 for other lines and for losses introduced.

Multiple Console Operation:

When only C-516 consoles are loading the lines, one console is used to terminate the lines and all other parallel consoles are set for the line bridging operation per Chart 1. Refer to Chart 2 for programming the line-terminating console.

THEORY OF OPERATION

Referring to the lower main PC board schematic, crystal oscillator Y1 and U11,8 and 9 drive an 8-bit programmable divider, U14. The most significant bit at U14-14 is always high through R60 and R61 causing the programmable division range to be 255 to 128. This provides an output at U14-15 of from 11.088 kHz to 22.09 kHz. U13 is a divide-by-10 counter used to synthesize a sinewave. The output frequency range of 13 is therefore 554.4 Hz to 2209 Hz. The synthesized sinewave has a strong tenth harmonic which is greatly attenuated at the low-pass filter output U15-1. At idle, the crystal oscillator is disabled by a high at U11-1. Going off-hook, or operation of the "MON", "F1", or "F2" switches triggers the guard tone timer at U1-7. U1-9 goes high enabling the +10 dBm gate at U12-6. The high at U1-9 also causes a low at U11-1 through U7-11, 10 enabling the crystal oscillator. The 2175 Hz programming diode CR11 is enabled by the high at U4-12 caused by the off state of the function tone timer output at U1-13. A +10-dBm 2175-Hz sinewave signal therefore is conducted to the lower main board signal output at P2-23 through U12-3,4, R46, C35, and U15-6,7.

Timeout of the guard-tone timer after 130 ms triggers the function tone timer at U1-3. U1-3 goes high which enables the 0 dBm" gate at U12-13, disables the 2175 Hz programming diode and enables one of the function-tone diode programming rows (MON, F1, F2) depending upon which switch has been depressed. A "0 dBm" function-tone-frequency sinewave therefore appears at the P2-23 output pin. 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-timer timeout, the crystal oscillator remains enabled and the "–20-dBm" 2175-Hz PTT tone signal is conducted to the output pin through R45 for as long as the PTT switch is held.

In addition to the triggering of the guard tone timer, going off-hook or monitor switch operation sets the monitor latch at U11 which then lights the monitor LED through U3-2,15. Upon function-tone-timer operation, the monitor-diode-programming row is enabled and F1, F2 rows are disabled by the high at U1-10. Upon function-tone-timer timeout, the monitor latch is reset through C32 and U8-1, 3.

Operation of the F1 frequency-select switch resets the F1/F2 latch at U1-14 and operation of the F2 switch sets the F1/F2 latch at U1-15, causing the proper LED to light and the proper row of programming diodes to be enabled during function-tone-timer operation.

A low at U5-3 from the PTT switch, guard-tone timer, or function-tone timer energizes the TX LED through 11-4,5,6 and U3-5,12. Intercom (IC) switch operation energizes the IC LED directly, enables TX audio through U5-6,4,2,3 and U11-13,10, and disables the crystal oscillator at U11-2 and the TX LED at U11-3 through U4-11,10. Output audio voice signals are therefore present without burst or PTT tones and without TX LED energization.

When the line selector switch is in the ALL (receive all) position, the transmit audio output at U15-7 is connected to U3-7. The DC bias from U15-7 causes a low at U3-10 and U5-1 which disables transmit output logic by causing a high at U5-3. This high holds the audio circuits in the receive mode, which disables the crystal oscillator and the TX and IC LEDs. PTT/intercom operation or indication is therefore not possible in this switch position.

Lower-Main PC Board Audio Circuits:

Receive audio from the upper-main PC board at P1-8 is applied to the input of the RX compressor (actually an automatic level control or ALC stage) at U2-2 through C20. Maximum gain of the ALC stage is determined by the bias voltage at U2-1 and C10 which in turn is determined by the resistance from U2-2 to ground (R26). Input signals are full-wave rectified within U2 and filtered by C10. When this rectified and filtered input signal exceeds the bias set by R26, it charges C10 to a higher voltage level, which lowers stage gain and thus maintains a near-constant average output signal at U2-7 for all signal inputs above the bias threshold.

Output signals from the ALC stage drives the 2175 Hz notch/bandpass filter U-6. Bandpass output at U6-7 is amplified and rectified by U9 to light the TX LED through U3-6,11. The TX LED is also energized by the PTT switch through a long path and U3-5,12 (U3 has open-collector outputs). This causes the TX LED to light from the PTT switch closure when the unit is connected to four-wire lines.

Bandpass output is summed with unfiltered signal at U6-13 causing a sharp notch at the U6-14 output when the two signals have been adjusted for equal amplitude by R12 and 180 degree phase shift by R11.

Notched output signals from U6-14 are conducted through analog gate U12-10,11 and R40 to the high side of volume control R101 and then to the speaker through U16 and to the earpiece through U10-3,1. Analog gate U12-10,11 is disabled during PTT, intercom, and tone burst unless JP-29 has been solder-bridged for duplex operation.

In the transmit mode, audio from the handset microphone is compressed by U2B in the same manner as receive signals. TX compressor maximum gain set by "MIC SENS" control R1 has been factory adjusted to be typically 10 dB above the threshold of compression from a loud male voice directly into the microphone. Compression output at U2-10 is conducted through analog gate U12-9,8 and R47 to the transmit audio summing point at U15-6. Transmit voice signals from U12-8 through R41 to the high side of the volume control provides sidetone voice audio to the earpiece and speaker.

When JP-29 is closed for duplex operation, (four-wire lines only) the receive path is enabled at all times by a high at U12-12 from the low at U5-11,12, but the microphone-to-output path is enabled at U12-6 only from PTT switch operation (after tone burst completion) or from intercom switch operation.

Upper Main PC Board Audio Circuits:

The six line-drive/line-receive circuits are identical. The transmit audio that is applied to line one originates on the main PC board, is conducted through the first position of the TX section of the S101 line selector switch, R6 (TX 1), U6-2,3, R39, T4, and R15, R18.

The receive audio path from line one is through T3, R12 (RX1), U12-5,7, the first position of the RX section of the S101 line selector switch, R66 and U12-9,8 to the receive audio circuits on the lower main PC board.

In the "ALL" (receive all) position of the S101 selector switch, receive audio from all six lines is summed at U12-13 through RN1 resistors and applied to the lower main PC board receive audio circuits through U12-13,12, the "ALL" position of the RX section of the S101 selector switch, R66 and U12-9,8.

Another path for summed receive audio exists from U12-14 through R60, R13 and U12-10,8 to the lower main circuit board receive audio circuits. This path allows audio feedthrough from nonselected lines to be adjusted by R13. During PTT or intercom, this path is short circuited by Q1 and Q2 from lower main PC board logic.

Line Activity Monitor Circuits:

The six line activity monitor circuits are identical. The receive audio from line one through T3, R12 (RX1), U12-5,7, and C22 is applied to U14-6. At idle, U14-7,10,8 are high and line one LED DS101 is off. When a line one audio signal peak exceeds the bias set at U14-6 by R81 and R82, U14-7 goes low, pulling U14-10,8 low, energizing line-one LED DS101, and charging capacitor C17. A low is also applied to 14-5 through C23. This positive feedback stretches short pulses into longer pulses.

When line one activity ends, C17 discharges through RN2 for about 8 to 10 seconds until the voltage at U14-10 exceeds the VR3 bias voltage at U14-9. U14-8 goes high and LED DS101 goes off.

WARRANTY

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

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.

NOTICE

Referring to "DUPLEX OPERATION" on page 3 of this manual. ALL LINES on the C-516 must be in the 4-WIRE mode for duplex operation to occur. You cannot match 2- and 4-WIRE circuits when duplex operation is desired

DWG. NO. 071-0519 D

REVISIONS				
SYM	CHG. NO	DESCRIPTION	DATE	APPROVED
A	88-194	RELEASE TO PRODUCTION	8-9-88	[illegible]
B	88-249	SUM INSERT LVL CONTROL UPDATE	12-8-88	[illegible]
C	88-263	CHG'D R40 FROM 11K TO 7.5K ON LOWER PCB.	12-29-88	[illegible]
D	90-061	R62 WAS 1.0 1/2 CHG'D TO 2,2 1/2	3-27-90	P.H. [illegible]

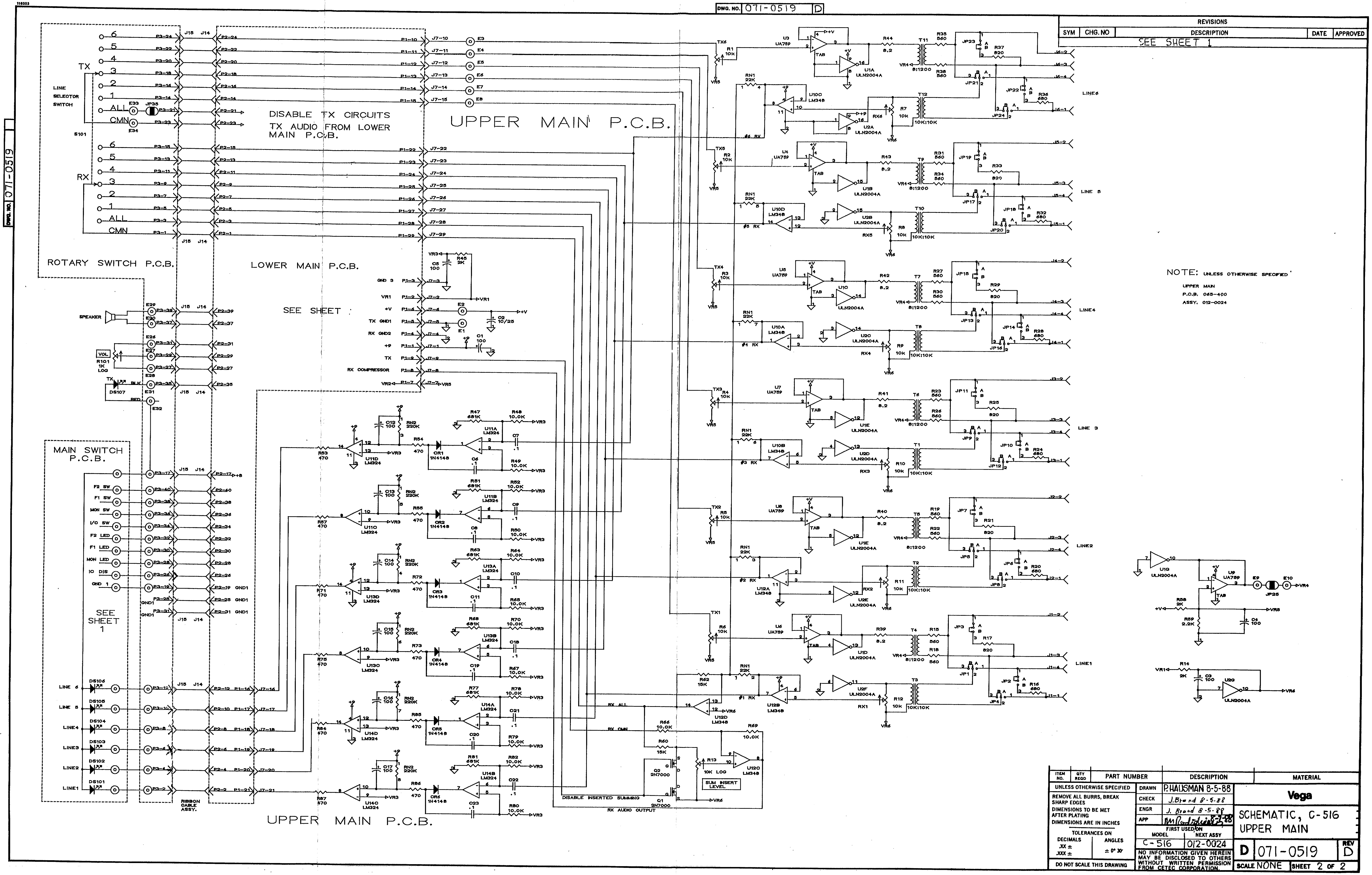
DWG. NO. 071-0519

AUX AUDIO INPUT
VR2 ON UPPER MAIN
TO TX-CMN ON ROT. SW. P.C.B.
TO TX-ALL ON ROT. SW. P.C.B.
DISABLE SUMMED AUDIO
EXT SPKR
AUX PTT
HANDSET
RECEIVE AUDIO
RX AUDIO
BATT BACKUP
117 VAC
MAIN SW PCB
TX

NOTE: UNLESS OTHERWISE SPECIFIED.

1. * L.E.D. IS PART OF ASSOCIATED SWITCH.

ITEM NO.	QTY REQD	PART NUMBER	DESCRIPTION	MATERIAL
UNLESS OTHERWISE SPECIFIED		DRAWN	P.HAUSMAN 8-5-88	Vega
REMOVE ALL BURRS, BREAK SHARP EDGES		CHECK		SCHEMATIC, C-516 LOWER MAIN
DIMENSIONS TO BE MET AFTER PLATING		ENGR		
DIMENSIONS ARE IN INCHES		APP		
TOLERANCES ON DECIMALS .XX ± .XXX ± ANGLES ± 0° 30'		FIRST USED ON MODEL C-516 NEXT ASSY 012-0025		D 071-0519 REV D
DO NOT SCALE THIS DRAWING		NO INFORMATION GIVEN HEREIN MAY BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM CETEC CORPORATION.		SCALE NONE SHEET 1 OF 2



DWG. NO. 071-0519 D
REVISIONS
SYM | CHG. NO | DESCRIPTION | DATE | APPROVED
SEE SHEET 1
UPPER MAIN P.C.B.
DISABLE TX CIRCUITS
TX AUDIO FROM LOWER MAIN P.C.B.
ROTARY SWITCH P.C.B.
LOWER MAIN P.C.B.
SEE SHEET 1
MAIN SWITCH P.C.B.
SEE SHEET 1
LINE SELECTOR SWITCH
S101
TX
RX
ALL
CMN
SPEAKER
VOL
R101 1K LOG
DS107
RIBBON CABLE ASSY.
LINE6
LINE 5
LINE4
LINE 3
LINE2
LINE1
RX ALL
RX CMN
DISABLE INSERTED SUMMING
RX AUDIO OUTPUT
SUM INSERT LEVEL
NOTE: UNLESS OTHERWISE SPECIFIED
UPPER MAIN
P.C.B. 065-400
ASSY. 012-0024
UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS, BREAK SHARP EDGES
DIMENSIONS TO BE MET AFTER PLATING
DIMENSIONS ARE IN INCHES
TOLERANCES ON
DECIMALS .XX ± .XXX ±
ANGLES ± 0° 30'
DO NOT SCALE THIS DRAWING
DRAWN P.HAUSMAN 8-5-88
CHECK J.Brand 8-5-88
ENGR J. Brand 8-5-88
APP
FIRST USED ON
MODEL C-516
NEXT ASSY 012-0024
NO INFORMATION GIVEN HEREIN MAY BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM CETEC CORPORATION.
Vega
SCHEMATIC, C-516 UPPER MAIN
D 071-0519
REV D
SCALE NONE
SHEET 2 OF 2

Parts List

C-516 Top Assembly - Part No. 011-0068

Part No.	Qty	Description	Designator
012-0007	1	Sub Assy Phone Base	
012-0024	1	Pcb Assy C516 Upper Main	
012-0025	1	Pcb Assy 516 Lower Main	
012-0052	1	Sub Assy C-516 Switch	
021-6607	1	Speaker C-516 Console	
024-0035	1	Panel Frnt C516 Finished	
130-0751	1	Resistor, Variable 1K log	R101
161-0564	1	Led Red 250 Mtg 6" Wires	DS107
249-0216	1	Handset Ash	
286-1867	2	Connector, 40 Position IDC	J14 & J15
517-0206	2	Flatwasher	
518-0070	3	Lockwasher, #4 Internal	
528-0002	3	Screw #4-40 x 3/16", pan head	
528-0003	3	Screw #4-40 x 1/4", pan head	
528-0264	2	Screw #3-28 x 5/8" Type B	
536-0357	1	Nut 1/4"	
536-0365	2	Nut .156 I.D.	
550-0260	1	Knob, Control, R-31A HP Vol	
550-0262	1	Knob, Blk 1/8" small	
561-0644	3	Standoff MF #4-40 x 3/4"	
561-0656	3	Spacer Brass # 4-40 x1/4"	
561-0658	1	Standoff Nylon, 1.125"	
674-0244	4	Cable 40 Wire Ribbon	
674-0266	1	Cord Coil 4con Modular 2x	
850-0331	1	ID Label, Tone Console	
869-0050	1	Case, Ash Phone House	

Phone Base Sub Assembly - Part No. 012-0007

Part No.	Qty	Description	Designator
460-0308	4	Foot, rubber, brown	
523-0081	3	Rivet, 1/8 x 1/4 POP	
523-0107	4	Rivet, foot attaching	
531-0272	2	Screw Cabinet Lock	
869-0025	1	Base, Phone Reg'	
869-0026	1	Switch, Hook	

C-516 Lower Main PCB Assemby - Part No. 012-0025

Part No.	Qty	Description	Designator
065-0402	1	PCB C-516 Lower Main	
102-0160	2	Capacitor, Ceramic, 30P S2L 5% 50V	C40 & C41
105-1002	1	Capacitor, Mylar .O015MF 10% 100V	C36
105-1009	2	Capacitor, Mylar .022MF 10% 100V	C18 & C28
105-1099	1	Capacitor, Mylar .01 MF 10% 1OOV	C34
110-1320	7	Capacitor, Ceramic .001MF 20% 50V	C2, C5, C 8, C13, C22, C32 & C38
110-1340	11	Capacitor, Ceramic .1MF small	C 3, C6, C12, C19, C21, C25, C30, C37, C39, C44 & C45
110-1345	2	Capacitor, Ceramic .0022 MF 5% NPO	C23 & C24
112-1606	6	Capacitor, Electrolytic 10MF 25V	C 9, C17, C33, C49, C51 & C52

C-516 Lower Main PCB Assemby - Part No. 012-0025 Continued

Part No.	Qty	Description	Designator
112-1608	8	Capacitor, Electrolytic 1.0MF 20% 25V	C1, C 7, C10, C11, C14, C20, C26, & C31
112-1673	2	Capacitor, Electrolytic 2.2MF 20% RAD	C 4 &C27
112-1678	4	Capacitor, Electrolytic 1.0µF 50V NP	C15, C16, C29 & C35
112-1689	6	Capacitor, Electrolytic 470MF 25V RAD	C42, C43, C46, C47, C48 & C50
130-0629	1	Resistor, Variable 10 K	R12
130-0643	2	Resistor, Variable 100K	R3 & R7
130-0673	1	Resistor, Variable 10K 20T 3/8SG	R11
130-0684	1	Resistor, Variable 250K	R1
130-0724	1	Resistor, Variable 10K Log V-adj	R24
132-0004	4	Resistor, RN55C 32.4K 1% 1/4W	R 8, R13, R14 & R15
133-0002	3	Resistor, CRBN 2.2 ohm 5% 1/2W	R62, R63 & R64
134-0212	5	Resistor, RN55D 10K 1% 1/4W	R31, R46, R59, R69 & R70
134-2788	1	Resistor, RN55D 37.4K 1% 1/4W	R44
134-2867	2	Resistor, RN55D 7. 50K 1% 1/4W	R40 & R54
134-2885	1	Resistor, RN55D 562 1% 1/4W	R9
134-2947	2	Resistor, RN55D 249K 1% 1/4W	R49 & R51
134-3010	1	Resistor, RN55D 324K 1% 1/4W	R45
134-3017	2	Resistor, RN55D 442K 1% 1/4W	R48 & R50
134-3042	1	Resistor, RN55D 31.6K 1% 1/4W	R53
134-3043	1	Resistor, RN55D 20.5K 1% 1/4W	R47
136-0020	1	Resistor, 100 5% 1/4W	R58
136-0024	1	Resistor, 220 5% 1/4W	R65
136-0026	1	Resistor, 330 5% 1/4W	R20
136-0030	1	Resistor, 680 5% 1/4W	R10
136-0031	2	Resistor, 820 5% 1/4W	R32 & R34
136-0032	5	Resistor, 1K 5% 1/4W	R18, R23, R33, R66 & R67
136-0040	1	Resistor, 4.7K 5% 1/4W	R68
136-0042	2	Resistor, 6.8K 5% 1/4W	R28 & R29
136-0045	1	Resistor, 12K 5% 1/4W	R2
136-0046	1	Resistor, 15K 5% 1/4W	R22
136-0048	9	Resistor, 22K 5% 1/4W	R4, R6, R25, R36, R52, R56, R57, R60 & R61
136-0054	1	Resistor, 68K 5% 1/4W	R43
136-0056	7	Resistor, 100K 5% 1/4W	R5, R17, R21, R35, R38, R39 & R42
136-0064	1	Resistor, 470K 5% 1/4W	R37
136-0068	2	Resistor, 1M 5% 1/4W	R19 & R26
136-0080	1	Resistor, 10M 5% 1/4W	R55
136-0281	1	Resistor, 43K 5% 1/4W	R16
136-0289	1	Resistor, 200K 5% 1/4W	R41
136-1956	2	Resistor, 300K 5% 1/4W	R27 & R30
138-0017	1	RNET CMN 7 x 100K SIP	RN4
138-0033	1	RNET ISO 5 x 22K SIP	RN1
138-0045	1	RNET ISO 5 x 33K SIP	RN2
138-0050	1	RNET CMN 7 x 4.7K SIP	RN3
149-0638	1	Transistor, PNP MPS4126 TO92 GP	Q1
161-0366	1	Diode 1N4003	CR12
161-0426	12	Diode 1N4148	CR1, CR2, CR3, CR4, CR5, CR6 CR7, CR8, CR9, CR10, CR11 & CR13
162-0001	1	DNET CMNA Quad Diode Sip	DN1
165-1216	1	Crystal, 2.8275MHz HC-18	Y1
286-1768	1	Pin, Test Point	TP5
286-1784	1	Power Jack, PC BD 2. 5MM	J13
286-1830	1	Connector, PCB Modular Handset	J8
286-1851	4	Receptical, PCB Spade Lug Dual	J9, J10, J11 & J12
286-1866	1	Term Strip Pcb 5pin Mini	TB1
286-1869	1	Pin Strip 40 Pin Dual	P2

C-516 Lower Main PCB Assemby - Part No. 012-0025 Continued

Part No.	Qty	Description	Designator
286-1876	1	Pin Strip Spacer 36 Pos	P1
425-0105	1	IC OPamp 4558 Dual	U9
425-0168	1	IC Reg-P 78L08 8V 1A	U17
425-0171	1	IC CMOS 4081 QUAD 2AND	U8
425-0178	1	INT CKT NE570N	U2
425-0181	1	IC OPamp TL084 QUAD BFET	U6
425-0186	1	IC CMOS 4018 PROG CNTR	U13
425-0202	2	IC OPamp 5532 DUAL RL600	U1O & U15
425-0203	1	IC CMOS 4569 PROG CNTR	U14
425-0204	2	IC CMOS 4025 TRIP 3NOR	U 7 & U11
425-0206	1	IC CMOS 4584 HEX TRIG	U4
425-0215	1	INT CKT ULN2OO4A	U3
425-0255	1	IC CMOS 4093 QUAD TRIG	U5
425-0262	1	IC CMOS 4044 QUAD LATCH	U1
425-0285	I	IC CMOS 4066 QUAD SW	U12
425-0291	1	IC PWRAMP TDA2OO3H 10W	U16
425-0448	1	IC REG-P 78L09 9V 1A	U18
528-0004	1	Screw, pan head #4-40 x5/16"	
538-0075	1	Nut, #4-40	
614-0429	1	Heat Sink T0-220 Hat	

C-516 Upper Main PCB Assemby - Part No. 012-0024

Part No.	Qty	Description	Designator
065-0400	1	PCB C516 Upper Main	
110-1340	12	Capacitor, Ceramic 1MF small	C6, C7, C8, C9, C1O, C11, C18, C19, C20, C22 & C23
112-1606	1	Capacitor, Electrolytic 10MF 25V	C2
112-1674	10	Capacitor, Electrolytic 100MF 10V RAD	C1, C3, C4, C5, C12, C13, C14, C15, C16 & C17
130-0639	12	Resistor, variable 10K H-MTG PCB	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11 & R12
130-0724	1	Resistor, variable 10K Log V-adj	R13
134-0212	14	Resistor, RN55D 10.0K 1% 1/4W	R48, R49, R50, R52, R64, R65, R66, R67, R69, R70, R78, R79, R80 & R82
134-3065	6	Resistor, RN55D 681K 1% 1/4W	R47, R51, R63, R68, R77 & R81
136-0003	6	Resistor, 8.2 5% 1/4W	R39, R40, R41, R42, R43 & R44
136-0028	12	Resistor, 470 5% 1/4W	R53, R54, R55, R57, R71, R72, R73, R75, R84, R85, R86 & R87
136-0029	12	Resistor, 560 5% 1/4W	R15, R18, R19, R22, R23, R26, R27, R30, R31, R34, R35 & R38
136-0030	6	Resistor, 680 5% 1/4W	R16, R20, R24, R28, R32 & R36
136-0031	6	Resistor, 820 5% 1/4W	R17, R21, R25, R29, R33 & R37
136-0036	1	Resistor, 2.2 K 5% 1/4W	R59
136-0046	2	Resistor, 15K 5% 1/4W	R60 & R62
136-0096	3	Resistor, 2K 5% 1/4W	R14, R45 & R58
138-0049	1	RNET CMN 7X22K SIP	RN1
138-0060	1	RNET CMN 7X22OK SIP	RN2
149-0642	2	Transistor, NDMOS 2N7000 T092 SW	G1 & G2
161-0426	6	Diode 1N4148	CR1, CR2, CR3, CR4, CR5 & CR6
286-1766	24	Connector jumper plug	
286-1772	2	Connector 36 Pin Strip Tin	JP1 & JP24
286-1831	6	Connector, PCB Modular Line	J1, J2, J3, J4, J5 & J6

C-516 Upper Main PCB Assemby - Part No. 012-0024 Continued

Part No.	Qty	Description	Designator
286-1868	1	Receptacle PCB 29 position SIP	J7
318-0246	6	Transformer, 10K CT-10K CT	T1, T2, T3, T8, T10 & T12
318-0260	6	Transformer, 8-1200 Ohm	T4, T5, T6, T7, T9 & T11
425-0207	3	IC OPAMP LM324 QUAD	U11, U13 & U14
425-0210	2	IC OPAMP LM348 QUAD	U10 & U12
425-0215	2	INT CKT ULN2OO4A	U1 & U2
425-0235	7	INT CKT UA759	U3, U4, U6, U7, U8 & U9
475-0143	1	Lug Solder #4 Internal	
528-0269	1	Screw, Pan Head #4-40 x 2"	
538-0075	1	Nut, #4-40	
561-0659	6	Spacer, round #4 x 1/4" brass	

C-516 Switch Sub Assembly - Part No. 012-0052

Part No.	Qty	Description	Designator
065-0401	1	Main Switch, PCB C-516	
065-0403	1	Rotary Switch, PCB C-516	
138-0061	1	RNET CMN 5 x 680 SIP	RN101
161-0604	6	LED, red T1 super brt	DS101, DS102, DS103, DS104, DS105 & DS106
286-1869	1	Pin strip, 40 Pin Dual AU	P3
286-1884	1	Pin strip spacer 16 x 1/4"	
286-1885	2	Receptacle, SIP 8 position	J101 & J102
296-0588	4	Switch, PCB push MOM w/LED	S102, S103, S104 & S105
296-0595	1	Switch, 2P 7 position Rotary	S101
561-0657	6	Spacer, nylon 2L for T1 LED	
561-0660	2	Swage spacer #4 x 1/4	

VEGA MODEL C-516 SPECIFICATIONS

Panel Switch Selectable Lines: Six

Each Line Input Impedance (unaffected by the selector switch position):

Two-Wire: 600Ω or 2 kΩ, jumper selectable, transformer isolated

Four-Wire: 600Ω or 8 kΩ, jumper selectable, transformer isolated

Each Line Output Impedance (unaffected by selector switch position):

Two-Wire: 600Ω or 2 kΩ, jumper selectable, transformer isolated

Four-Wire: 600Ω or 2.6 kΩ, jumper selectable, transformer isolated

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

Each Line Output Level: -20 dBm to + 12 dBm into a 600Ω line, adjustable

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 ohm, heavy duty

Amplifier power: 1.7 W minimum at 10% THD into an 8Ω load; 2.25 W at 10% THD into a 4Ω load (internal 8Ω speaker phis an external 8Ω speaker in parallel.

Sidetone level: About 25 dB below receive level

Handset Earpiece Level: Adjustable preset level independent of speaker volume control or dependent upon speaker volume control, solder-jumper selectable

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

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

Tone Frequencies and Accuracies: PTT/Guard,

2175 Hz, 0.0I%; MON, 2050 Hz, 0.1%; 1,, 1950 Hz,

0.01%; F2, 1850 Hz, 0.2%

Burst-Tone Duration: Guard, 130 ms; Function, 40 ms; both adjustable

Operating-Temperature Range: 0 to + 50°C

Visual Indicators: Ten LEDs (TX, MON, Fl, F2, and six line-activity monitor)

Line Selector: Seven-position rotary switch-six for line selection and one for aU-line receive

Operating Modes: Simplex (half-duplex) with two. wire lines, simplex or full-duplex with four-wire lines

Line Interface: Modular cords for two-wire or four-wire line in line-terminating or line-bridging modes, jumper selectable

Receive Audio Feedthrough From Nonselected Lines: Adjustable from none to 6 dB below the selected-line audio level

Power Requirements: 117 Vac, 60 Hz, 10 W maximum, or 11.5 to 16.5 Vdc at 200 mA idle, 500 mA maximum

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