


# CETEC VEGA

## Model 504N

### Tone Remote Control Console



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## MODEL 504N TECHNICAL SPECIFICATIONS

INPUT/OUTPUT LINE IMPEDANCE (BALANCED):	Nominal 600 ohm with taps for 2400 ohm to enable parallel operation.
LINE OUTPUT POWER LEVEL (VOICE):	Adjustable from -20 to +18 dBm.
LINE OUTPUT POWER LEVEL (TONE):	Adjustable from -25 to +18 dBm.
LINE INPUT (RECEIVE) POWER LEVEL:	Adjustable from -25 to +18 dBm.
AUDIO COMPRESSION RANGE (RECEIVE & TRANSMIT):	Less than 3 dB change in output for up to +30 dB change in input.
DISTORTION:	Less than 3% at full compression (worse case).
HUM AND NOISE:	50 dB minimum below adjusted operating levels.
SPEAKER AUDIO DRIVE (8 OHM):	Adjusted by volume control, up to more than 500 milliwatts (½watt).
EARPIECE DRIVE LEVEL (600 OHM):	Adjustable to over 20 milliwatts.
AUDIO FREQUENCY RESPONSE:	+1, -3 dB from 300 to 3000 Hz, except at the transmit tone notch frequency.
FREQUENCY ACCURACY:	PTT — 2175 Hz .01% * MON — 1975 Hz .2% F1 — 1975 Hz .2% F2 — 2375 Hz .1%
OPERATING TEMPERATURE RANGE:	-30° to +70° C
POWER REQUIREMENT:	120 VAC, 50/60 Hz, 10 watts maximum.
VISUAL INDICATORS:	LED's illuminate to indicate selected mode (F1, TX, etc.).
NOTCH FILTER:	2175 Hz notch filter attenuates PTT tone at least 40 dB. (-60 dB below voice levels, typically).
DUAL-FREQUENCY CONTROL:	F1 and F2 function-tones provided.
OPTIONS:	4-wire interface, and special frequencies or formats.
DUAL FREQUENCY CONTROL INFORMATION:	* F1 and F2 function tones provided. In this mode, monitor is the last F1 or F2 tone selected.

### 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.

### 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.

## INTRODUCTION

The Vega Model 504N Tone Remote Console provides a reliable means to remotely control the various functions of a radio communications base station.

The 504N Console is normally used in conjunction with Vega's functionally matching tone remote panel, the Model 215, which is located at the base station site. The 504N may also be used with appropriately configured 211 and 213 panels, if preferred. The 504N is also compatible with older standard Model 503 control consoles.

The 504N Console is interconnected to the base station by means of any voice quality or better circuit. The 504N is compatible with private or leased telephone circuits, including microwave systems in the connecting circuit. METALLIC OR DC CONTINUITY IS NOT REQUIRED.

The Model 504N Console is supplied ready to operate and equipped with handset, speaker, Push-To-Talk, Intercom, Monitor, Notchfilter and F1 - F2.

## OPERATION AND CONTROLS

The 504N is designed for maximum ease of operation and minimum operator familiarization is required. The following controls and indicators are provided and can be identified in Figure 1. (Front Cover)

- Volume Control: Adjusts both speaker and earpiece volume.
- Transmit Switch: Located inside handset handle. (Press-to-talk, release to listen operation.)
- Transmit Light: When lighted, indicates control unit is in transmit condition. (Required by FCC rules.)
- Intercom: When depressed, removes control tones and allows the operator to talk into the telephone circuit without transmitting. Depression of the PTT switch on the handset is not required. This is normally used for intercommunication between remote consoles and for testing.
- C.T.C.S.S. Monitor: When depressed momentarily and released, causes the station receiver equipped with sub-audible signaling (C.T.C.S.S.) to monitor any radio messages that may be occurring on the radio channel. This reduces the possibility of accidentally interfering with other co-channel users and is required by FCC rules for stations equipped with sub-audible signaling. The Monitor function is also activated upon release of the Push-To-Talk switch or when the handset is lifted off hook.
- Parallel Remote Notch Filter: Removes the PTT tone received by a paralleled unit in the receive mode. This is required whenever two or more remotes are operating the same base station, and is supplied in the 504N as standard.

The following operations require that the proper options are installed in the base station tone panel:

- F1/F2 Selection: When one of the channel buttons is depressed, it will latch and release the other channel LED and cause a two frequency station to switch to the desired channel. Visual indication of the selected channel is recognition of which LED is "latched" on.

NOTE: When more than one 504N console is connected to a common multiple frequency station, it is possible that another console has selected a channel other than the one indicated locally. However, when the Monitor button is pressed or the handset is lifted "off-hook," a new command corresponding to the local selection is sent to the station. This immediately switches the station to the locally selected channel and activates the Monitor function.

- NOTE: Speaker can be jumpered in for continuous operation. The speaker is normally muted when the handset is lifted.

"Monitor" and frequency selection commands and voice signals are audible to paralleled consoles, providing an audible indication that commands are being generated elsewhere in the radio system.

## TYPICAL APPLICATIONS

The Model 504N can be used as a single unit to feed a remote base station or it can be used with several attached to the same telephone line as shown in Figure 2. Referring to Figure 2, we see that there are two 504N's tied to a single phone line feeding a Vega Tone Remote Control Panel. Either 504N can exercise full control over the remote base station by the push buttons and the handset. In the standard configuration, a sequence of tones is generated each time the PTT switch on the handset is depressed. This sequence insures high security and constant status updating of the remote base station. Any use of the remote base station by either operator can be monitored by the other operator over either the loud speaker or the handset. Thus, there is not tendency for one operator to inadvertently interfere with any other operator that might be operating the remote base station. If desired, the two Model 504N's can be used as voice intercoms. All that is required is to depress the INTERCOM switch on the panel and talk to the other control unit.

While the interconnections shown on Figure 2 are typical, this is not intended to be restrictive. Additional 504N's can be tied on any party line to control a single remote base station.

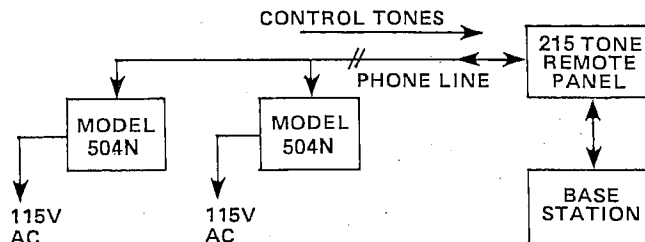


Figure 2  
OVERALL SYSTEM BLOCK DIAGRAM

## INSTALLATION

The 504N Console may be located in any convenient position to the operator. Areas of exposure to extreme dampness, temperature, and radio frequency radiation should be avoided for maximum life and reliability.

## DISASSEMBLY

Access to internal controls and the telephone line terminals is obtained by lifting the retaining clip at the top of the front panel and "folding" the panel off to one side, lifting the panel outward. This opens up the entire circuit assembly for maintenance and connection of the telephone line. Make sure the AC line transformer unit is unplugged before opening up the console to prevent accidental short circuits during disassembly and reassembly.

The external connections normally required are:

- Connect telephone line to the terminals provided inside the console on the circuit board as follows: (SEE FIGURE 3 FOR LOCATION)
- For single-unit operation select the 600 ohm terminals (E14 & E15).
- For multiple-unit operation select the 2400 ohm terminals (E14 & E16).

Plug the wall-transformer into a 120 VAC 60 Hz outlet.

## LEVEL ADJUSTMENTS

With the system connected, select telephone line level desired, for example: -10 dBm. With telephone line connected to the proper terminals discussed previously, and TP8 grounded, adjust R23 (TX LEVEL) to -10 dBm on an audio voltmeter (.25 Vrms). Release ground from TP8. With the receiver feeding voice into the telephone line, monitor TP10 with a VOM or Scope and adjust R70 (LINE LEVEL) just to level at which positive voltage changes are seen during speech peaks. (Threshold of compression).

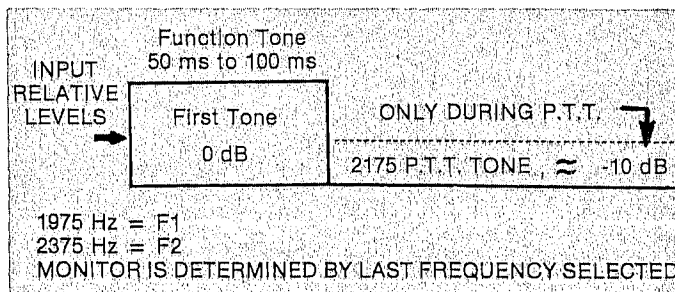
## THEORY OF OPERATION

The schematic diagram of Figure 4 illustrates the circuitry of the Model 504N Tone Remote Console. Several parts of the circuit are used in both the receive and transmit modes. The theory of each mode will be discussed individually for clarity.

In the receive mode, signals present on the phone-lines are coupled thru T2 and the contacts of the T/R relay to the input of the compressor-amplifier. R70, input sensitivity, adjusts the drive to the compressor-amp to its optimum operating point, indicated by the threshold of positive spikes at TP10. The output of the compressor-amp (TP5) is approximately 1 Vrms and will not rise more than 3 dB for a line-level rise of up to 30 dB. The signal at TP5 remains the same except that a narrow band of frequencies centered around 2175 Hz (by adjustment of R85-Notch Freq.) is attenuated at least 40 dB. This provides rejection of the otherwise annoying PTT tones from other 504N consoles often used in paralleled applications. Signals at TP5 are applied to the input of the speaker-amp, U6 through the receive-audio gate, U13B. R24-Volume Control, controls the drive to the amp and, subsequently, the speaker volume. The output of U6 (TP6) drives the speaker and earpiece thru the contacts of K1B.

In the transmit mode, the PTT switch is activated on the handset, initiating a tone sequence as follows:

## SINGLE TONE REMOTE FORMAT



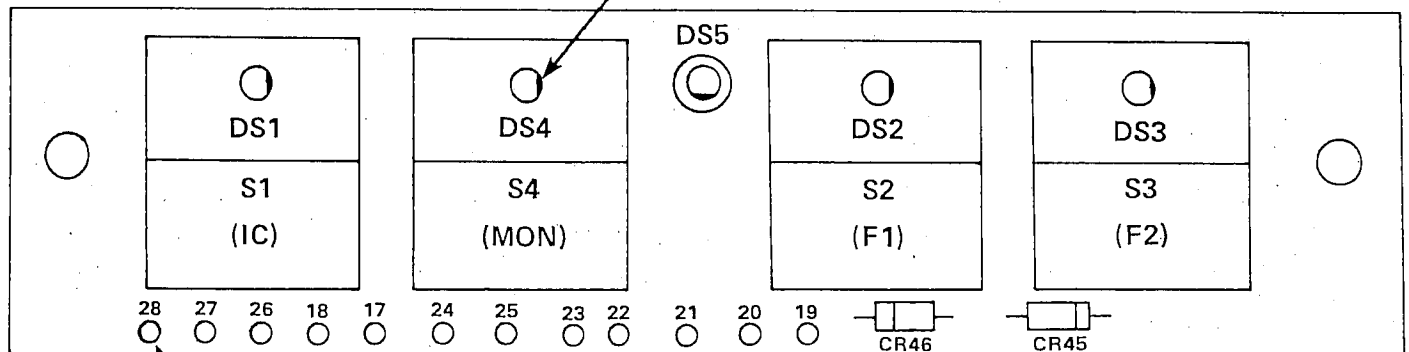
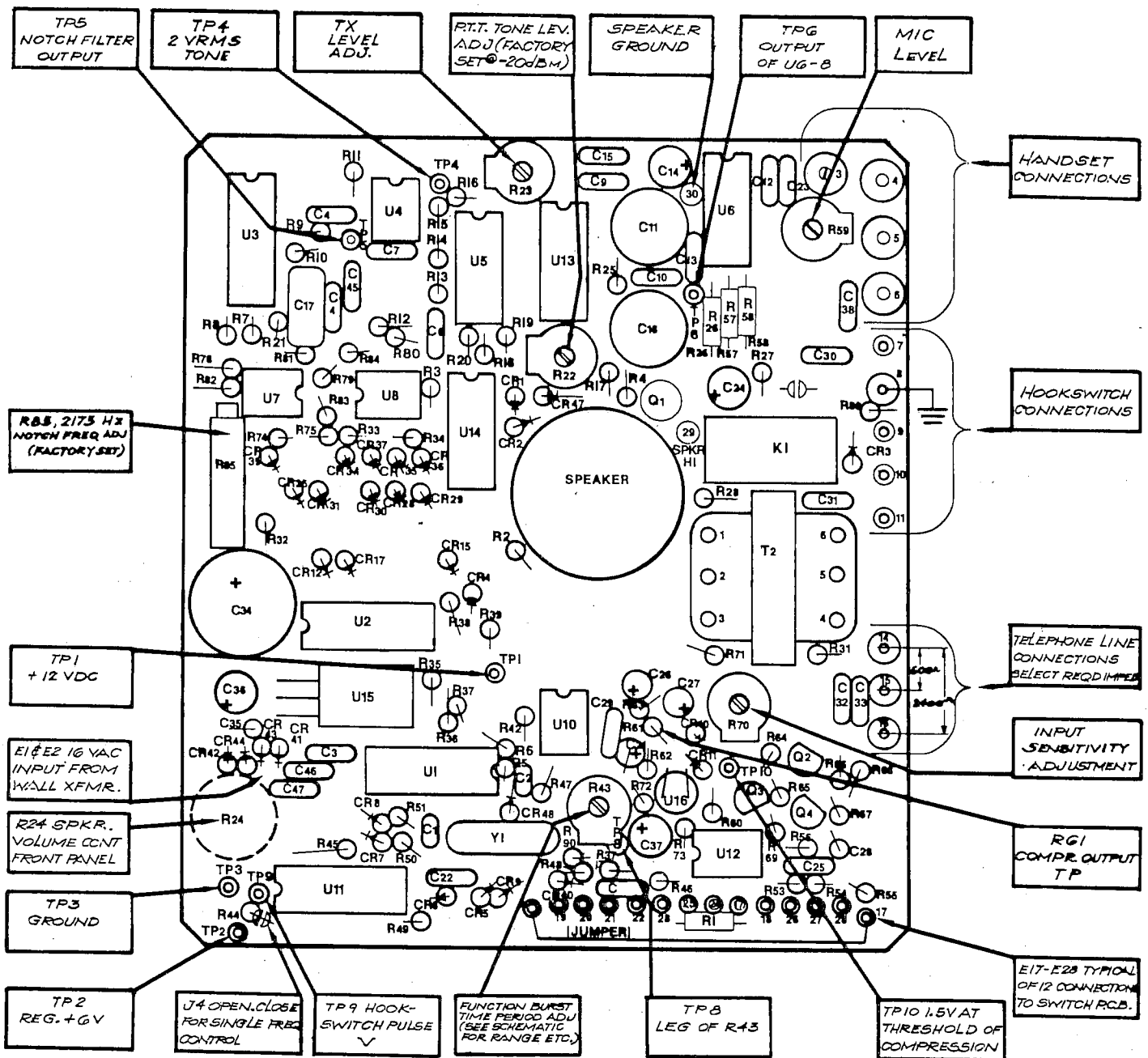
In the transmit mode, the PTT switch is activated on the handset causing closure of the T/R relay (K1) and generation of the 2175 Hz PTT tone via the logic of U14. The "F1 - F2" command is initiated by selection of the front panel buttons, setting the latch (U11A & B) and triggering the function-timer, U10. When U10-3 goes high, the tone generator circuits stop generating 2175 Hz (via logic of U1B) and commence generating 1975 or 2375 Hz (F1 or F2) by command of the latch. If the "MON" command is initiated, the timer is triggered as before and the last F1 - F2 selection is enabled. The logic of U14 enables the T/R relay and the function-tone is transmitted for the timer duration, approximately 350 ms @ 0 dBm. When the function-tone transmission is complete, the tone-generator circuits return to the normal mode, generating 2175 Hz.

The PTT tone (2175 Hz, -10 dB) is adjustable for special applications, via R22.

Logic-control of the diode-matrix (CR12-CR39) provides selection of the proper tones required. The tone generator circuit is based on a simple division of the 4.3935 MHz clock at U1A. U2 is a programmable divider (controlled by the diode matrix) outputting 10X the desired tone frequency. U3 divides this frequency by 10 and formulates a 10-step sine-wave approximation at U4-1. The approximation is low-pass filtered by U4B and appears as a low-distortion, high-stability tone at TP4 to be gated-out as previously discussed.

During the time the PTT switch is down, K1 is enabled, and voice audio from the microphone is applied to the compressor amp. R59, mic level, provides adjustment of drive to optimize the compressor-amp operating point, indicated by the threshold of positive spikes at TP10. Voice audio appears at TP5 and is summed with any tones present at R23. Note that U5C & U5D gates inhibit the mic audio during the two tone bursts. The combined signal is gated thru U13A to the line-amp, U6, which drives the line transformer, T2, through the contacts of K1. The TX-audio appears at secondary of T2 to drive the telephone line at the desired level set by R23.

115 Vac power is stepped-down to 16 Vac at the wall-transformer and appears at E1, to be full-wave rectified, filtered and regulated by the power-supply circuits. The power-supply circuits provide regulated +12 and +6 Vdc voltages for the 504N system. Any source of 15 to 20 Volts, AC or DC, may be used in lieu of the wall transformer. (700 ma min.)



SWITCH P.C.B. ASSEMBLY  
 MODEL 504N COMPONENT LOCATION DIAGRAM  
**FIGURE 3**

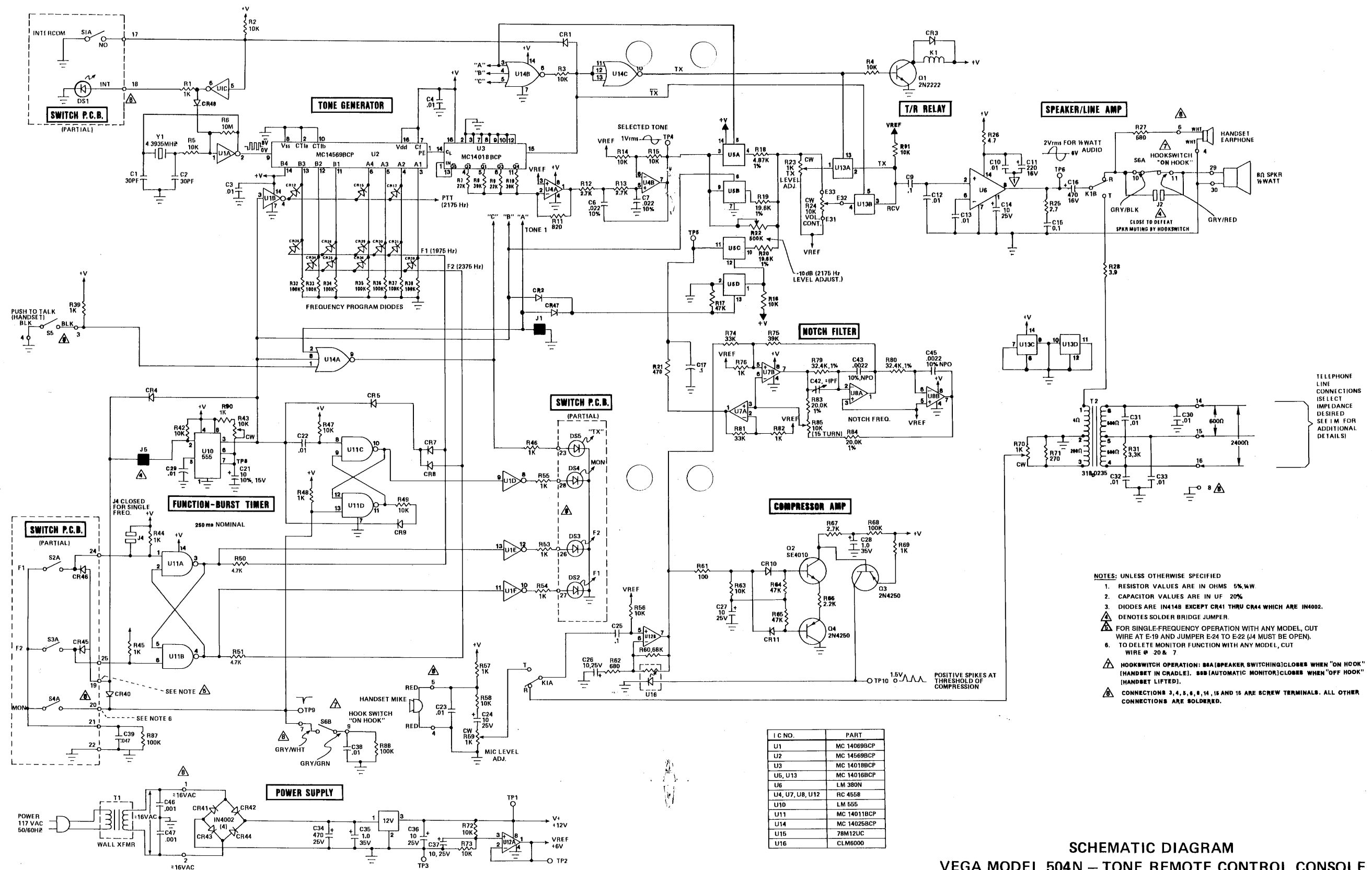


FIGURE 4