



**Model RP-251**  
**PSTN Remote Panel**

# **Technical Manual**

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**P.N. 0980370b**



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## 1 General

The Vega Model RP-251 Dial-up remote station panel, in combination with Vega's C-550 or C-6124 consoles provide a reliable means of remotely controlling two-way-radio base stations over a standard Public Switch Telephone Network (PSTN) line. Unlisted and dedicated telephone numbers are recommended at both the console and base station panel to maintain near 100% availability. This is not a requirement, however, because of its three-part tone burst to initiate and maintain the base station transmit, the system is very secure against unauthorized use of the base station

**The RP-251 provides the following features:**

- PTT Relay
- Monitor Relay
- 99 programmable dial-out phone number addresses (up to 16 digits)
- PTT, Monitor, Programming, RX activity, Off-hook and Power LED indications
- Programmable 3 DTMF digit Access code from mobile's to allow multi-able panels in a system
- Programmable 3 DTMF digit Connect code from panel sent to console at time of connection.
- Hardware and software gain control
- Automatic Gain Control (Radio RX and TX)
- Programmable via standard telephone
- Balanced and Unbalanced connections to Radio via Terminal Block or DB9

### 1.1 Mobile Originate - General

The RP-251 remote station panel provides dip-switch programmable DTMF access/reset decoders, input terminals for external access/reset logic, I/O connections for base station connections.

Use of the internal DTMF access/reset decoders requires the mobile stations to have means to transmit a Six-digit DTMF access ( 3 access digits, a \* command and 2 address digits) Example: 123\*01 would access panel "123", \*01 for dial the phone number stored in address 01. A Four-digit DTMF reset message access ( 3 access digits, a # command) Example: 123# would reset panel "123" after the C-550 console has answered. A DTMF microphone is usually the most available and least expensive way to provide this capability.

The external decoder input terminals are operated by grounding or by a logic low from 8 to 28 Vdc logic. The external decoders may be extra CTCSS frequency decoders. In this case, the mobile stations are required to have radios with an operator-accessible switch for changing CTCSS frequencies, and the base station is required to have the additional CTCSS decoders.

If mobile-to-mobile communications are seldom, if ever, used, logic from existing CTCSS decoder can often be used to operate the access decode input of the RP-251. In this case, no added equipment is required. However, if mobile-to-mobile transmissions are used with this method of operation, the panel will go off-hook and dial the console telephone number upon the termination of any first transmission. In addition, during "dead air" time (assuming proper input to the panel's COR input), ringback or other call-progress tones will be transmitted. Also, at the end of additional mobile transmissions, a short "off-hook" beep will be transmitted. the mobile operator has no means to terminate the call except by waiting for automatic reset after six rings or 40 seconds.

### 1.2 Dial-up Originate - General

When calling the RP-251's phone number, the RP-251 will answer the phone after waiting for a programmed number of rings to occur, upon answering the phone the RP-251 transmits the 3 digit connect sequence followed by 3 asterisk characters (DTMF) at this point, both offhook, monitor, and power LED's will be illuminated. Mobile RX audio is now being monitored via PSTN.

Once the phone connection has been made, and the receipt of a PTT Tone Burst the RP-251 will go to PTT mode: PTT led on, off-hook on, PTT relay energized and monitor relay de-energized. During PTT, TELCO audio received is routed out TX audio (to mobile). The RP-251 will remain in PTT mode as long as the 2174HZ is present. Upon removal of 2174HZ, the RP-251 will return to monitor the mobile RX-audio, during dial-up after connection programming mode may be entered.

The RP-251 will allow mobile RX audio to be monitored (Mon. relay energized) for 40 seconds and if no 2174HZ "hand-shake" pulse is received within 40 seconds or if receipt of a disconnect sequence (double monitor burst) or a mobile disconnect sequence the RP-251 sends 4 DTMF \* characters out to notify of disconnect pending and the RP-251 goes "on-hook" Off Hook, monitor LED's are now extinguished.

## 2 Installation

### 2.1 Power Supply

The RP-251 requires a 12 to 16 volt DC, 500 ma, of clean power. Three connections are provided to connect the unit to power. The first is J2 a 2.5mm plug receptacle on the rear left of the unit. The positive terminal is the center conductor. The second power connection option is J3 the DB9 connector. Figure 1 shows the pin out of this connector. Connect an external 12 to 16 volt DC supply with the positive connected to Pin 1 and the Ground connected to Pin 6. The third is on the terminal block.

### 2.2 Line Connection

The line connector is the right most connector on the rear of the RP-251. Connect the PSTN line to pins 2 and 3 of J4 the RJ-11 modular connector

### 2.3 Radio Connection

#### 2.3.1 TX Audio Connection

The RP-251 has a number of options when connecting it to the radio. Set the jumpers according to the method outlined in your radio's owner manual.

Connection Type:	JP6	JP12	JP8
Balanced 600 Ohm:	OUT	OUT	IN
Single Ended Low-Impedance:	IN	IN	OUT

If the microphone input of the radio is a high-impedance type, shielded cable is recommended. If the radio has a high-level microphone input, remove JP7 otherwise JP7 should stay in.

Connect the radio transmit audio input to pins 8 and 9 of the rear panel DB9. If the receive audio is connected to the terminal block use TB2-3 and -4.

### 2.3.2 RX Audio Connection

To connect the radio receive audio to the RP-251, several settings are required. Set the internal jumpers according to the charts below:

Connection Type:	JP10	JP13	
Balanced 600 Ohm:	OUT	OUT	
Single Ended:	IN	IN	
Receive Input Impedance:	JP9	JP11	
8 Ohms	OUT	IN	(for a speaker output)
600-Ohm	IN	OUT	
10k Ohm	OUT	OUT	

Connect the radio receiver audio output to pins 4 and 5 of the rear panel DB9 or pins 1 and 2 of TB2 can be used. The audio source must be after the squelch circuit, to prevent sending continuous noise to the remote console. If a high-impedance point in the receiver is used, shielded cable is recommended.

Note that when the speaker output is used, the radio volume control will affect the audio levels of the RP-251.

### 2.3.3 PTT Connection

Connect the radio PTT circuit to the PTT relay contact terminals of the panel. This can be done on either the rear DB9 or the terminal block. Usually the common of the relay contact switch is grounded and the normally open contact connects to the PTT input

### 2.3.4 Monitor Connection

Connect the radio MON circuit to the MON relay contact terminals of the panel. Usually the common of each relay contact switch is grounded and the normally open contact connects to the MON input.

## 3 Level Setting

Once the unit is connected into the system, as it will be in general usage, the level potentiometers can be set.

### 3.1 Line Receive Level

R78 = TELCO Receive Adjustment *for -20db at TP4 with PTT.*

### 3.2 Line TX Level

R103 = TELCO Transmit Adjustment *for -9db at TP15 with nominal RX input.*

### 3.3 Radio TX Level

R123 = Mobile TX Adjustment.

### 3.4 Radio RX Level

R124 = Mobile Receive Adjustment *for 0db at TP2 with nominal RX input.*

### 3.5 Dial Tone Detector Level

R4 = Call Process Detector Adjustment *adjust for -5db at TP1 with dial tone.*

### 3.6 Notch Filters Adjustments

R8 & R37 = Mobile Receive 2174hz Notch Adjustment *factory adjusted for -45db at TP5 with 2174 0db at RX input*

R43 & R79 = TELCO Receive 2174hz Notch Adjustment *factory adjusted for -45db at TP9 with PTT*

### 3.7 2174Hz Phase Lock Loop Adjustments

R84 = Phase Lock Loop Adjustment *factory adjusted for 2174hz at U22-6*

R86 = Phase Lock Loop Input Amp *adjust for -7db at TP11 with PTT.*

### 3.8 DTMF Detector Adjustment

R87 = DTMF Detect Adjustment *for -12db at TP17 with DTMF received*

## 4 Programming

### 4.1 RP-251 DTMF Access/Reset Codes

The RP-251 remote station panel provides dipswitch programmable DTMF access/reset digits through switches SW4 and SW3 (Refer to figure 1)

### 4.2 RP-251 Number of rings

SW1 positions 1 through 4 select the number of incoming rings before the RP-251 will answer. (Refer to figure 1)

### 4.3 RP-251 Connect Code

The RP-251 remote station panel provides dip-switch programmable connect code response through switches SW3 and SW2. (Refer to figure 1)

### 4.4 RP-251 Autodial Address #01

SW1 position 8 will select if the panel will dial the number stored in address 01 or disconnect if fifth digit is not received during mobile originate. (Refer to figure 1) SW1-8 "ON" = 4 digit access code

### 4.5 RP-251 Dip-Switch Array (figure 1)

SW-1		SW-2		Position Binary value Least/most	SW-3		SW-4	
1 2 3 4	5 6 7 8	1 2 3 4	5 6 7 8		1 2 3 4	5 6 7 8	1 2 3 4	5 6 7 8
1 2 4 8	auto	1 2 4 8	1 2 4 8		1 2 4 8	1 2 4 8	1 2 4 8	1 2 4 8
L M	01	L M	L M		L M	L M	L M	L M
# of rings		Connect 3	Connect 2		Connect 1	Access 3	Access 2	Access 1

Figure.1 Dip Switch Array

### 4.5.1 Dip-Switch programming

The RP-251 dip-switch array uses binary codes to program Access, Connect and Number of Rings parameters into the control panel, use table to select value;

### 4.6 Autodial Programming

The RP-251 programming of the 99 autodial addresses is accomplished through the use of a standard telephone or a C-550 with a DTMF pad.

**xx** = 01,02,03,04,05,06,07,08,09,10 etc. up to 99 phone addresses

#### \* : Increase Radio TX Gain

Sending this command will increase the Radio TX gain by 6dB. Multiple repetitions of this sequence will increase the Radio TX Gain up to +12dB.

#### # : Decrease Radio TX Gain

Sending this command will decrease the Radio TX gain by 6dB. Multiple repetitions of this sequence will decrease the Radio TX Gain down to -12dB.

**\*1xx - Write command** - Store received characters up to 16 DTMF digits into Novram. A \* character represents a 1 second pause during dial out. A # character ends the entry. This is acknowledged by 4 \* characters transmitted by RP-251. The digits have been written into Novram.

**\*2xx - Read command**- The read command causes the RP-251 to read the entry at that location in Novram and transmit the dial string back to console operator. This allows confirmation of correct entries.

**\*376 - Clear command**- The Clear command causes the RP-251 to clear the entry at all locations in Novram.

**#### - Exit programming**- the RP-251 will transmit \*\*\*\* to confirm and go "on-hook". The program led/off hook LED's are now extinguished.

The RP-251 will transmit the following DTMF digits.

**\*\*\*\* = Invalid command received**

**\*\* = Transmitted by RP-251 upon receipt of a valid command.**

**\*\*\*\* = Upon completion of current write command sequence** (i.e., # received at end of write command).

Programming of the 99 autodial addresses is accomplished through the use of a standard telephone or a C-550 with a DTMF pad option.

**To enter the RP-251 programming mode follow these simple instructions:**

1. Dial the RP-251 to be programmed via any phone wait for it to answer.
2. When the RP-251 answers send a DTMF message to the panel consisting of the 3 digit address of the panel selected by the dip-switches followed by 3 "\*", message may resemble 123\*\*\*.
3. Program LED will light and a access acknowledge sound of 2"\*" will be heard.
4. To program a address enter \*1xx (xx=address) acknowledge sound of 2"\*" will be heard.
5. Enter phone number to be called followed by a #. Use Fig.2 to fill in for programming. (Example 18008771771#)
6. Repeat steps 4 & 5 for each address needing to be programmed.

DTMF DIGIT or # of rings	SW1 THRU SW-4 Switch Positions
	1 2 3 4 5 6 7 8
1	1 0 0 0
2	0 1 0 0
3	1 1 0 0
4	0 0 1 0
5	1 0 1 0
6	0 1 1 0
7	1 1 1 0
8	0 0 0 1
9	1 0 0 1
0	0 1 0 1
0=off 1=ON	



7. Enter 4 "#" (####) to exit programming mode.

**NOTE:**

When in the programming mode you may lockout any address by entering two \* and a # (\*\*#) into its address

Address #	NAME	PHONE NUMBER	Address #	NAME	PHONE NUMBER
01			51		
02			52		
03			53		
04			54		
05			55		
06			56		
07			57		
08			58		
09			59		
10			60		
11			61		
12			62		
13			63		
14			64		
15			65		
16			66		
17			67		
18			68		
19			69		
20			70		
21			71		
22			72		
23			73		
24			74		
25			75		
26			76		
27			77		
28			78		
29			79		
30			80		
31			81		
32			82		
33			83		
34			84		
35			85		
36			86		
37			87		
38			88		
39			89		
40			90		
41			91		
42			92		
43			93		
44			94		
45			95		
46			96		
47			97		
48			98		
49			99		
50			00		

## 5 Theory of Operation

The RP-251 is a microprocessor-based device that implements all essential control functions via the processor and a data bus. Specialized IC's are used for the telephone line interface, call process detection, DTMF decode/encode and tone detection. A non-volatile RAM memory device is included to store the telephone numbers to be dialed by the RP-251 to control consoles.

The RP-251 connects to the telephone line by means of an approved telephone line coupler (U25). This device separates the audio to and from the telephone line into two paths and provides a ring detect output to the control microprocessor (U7). It also has a control input to cause it to seize the telephone line and go off-hook. The audio from the telephone line is applied to the DTMF command decoder (U12), the call process detector (U13) and the RP-251 transmit audio circuitry. The call process detector detects dial-tone and other telephone line conditions and provides status data to the control microprocessor.

The transmit audio circuitry includes a 2174Hz notch filter (U9) to remove the transmit keying tone from the audio going to the base station transmitter and a compressor circuit (U15) to overcome excessive level variations from the incoming telephone audio. The transmit audio circuitry also includes audio gating circuitry (U18), an output driver stage (U24) and a output isolation transformer. Audio from the telephone line is also applied to a 2174Hz PTT tone detector (U22). When the 2174Hz PTT tone is present, the detector outputs a logic signal to the control microprocessor.

Audio from the base station receiver is applied to an isolation transformer, input amplifier section (U19 and U8) and applied to a receiver notch filter (U14). This filter removes audio frequency components near the 2174Hz PTT frequency from the receiver audio in order to improve PTT reliability. A compressor circuit (U15) may optionally be inserted into the receiver audio path to reduce variations in the audio level from the receiver. The filtered receive audio is then applied to an audio switch (U17) and the DTMF command decoder (U12). When commanded by the control microprocessor, the audio switch connects the receiver audio to the output buffer amplifier (U19), which drives the telephone line coupler (U25). The coupler then transmits the receiver audio to the telephone line and ultimately the control console.

The control microprocessor (U7) accepts status signals from the PTT tone decoder (U22), the telephone coupler (U25), the DTMF command decoder (U12) and the call process detector (U13). The processor has an attached data bus (U20, U21, U6, U2, U1, U10 and U16) that read the mode and code set-up switches (SW1 through SW4), and outputs control commands via U1 and U3. A non-volatile memory device (U11) stores the 100 available telephone numbers via a 2-digit address code to be dialed by the RP-251 to control consoles.

Isolated control relays are provided for the PTT and Monitor commands to the base station radio. The processor also drives four status LED's for use in monitoring operation of the RP-251. Other LED's indicate power ON condition and the presence of receiver audio via the line activity circuit (U8). Voltage regulators U26 and U27 provide well-regulated +10vdc to the audio circuitry and +5vdc to the processor and logic circuits, U23 provides reference voltages for various circuits.

### 5.1 Mobile Originate

Using the DTMF microphone method as an example, the mobile-originate sequence is as follows. the mobile operator monitors the radio channel, and, if idle, transmits a Six-digit DTMF access ( 3 access digits, a \* command and 2 address digits) Example: 123\*01 would access panel "123", \*01 for dial the phone number stored in address 01. Access digits are set via dip-switches #3 and #4 on the RP-251 PCB.

The DTMF message is decoded by the RP-251 panel at the base station, which seizes the telephone line. The telephone company (TELCO) detects the off-hook and connects a dialtone generator to the line. The RP-251 panel detects a dialtone and transmits DTMF which has been programmed to

dial the telephone number at the C-550 console. TELCO decodes the autodialed number, connects a ringback tone generator to the base-station line, and connects a ringer-voltage generator to the console line.

The ringback tone on the base-station line is detected by the RP-251 panel which switches the base station to transmit and connects to the modulator for the duration of the ringback TELCO audio signal, the mobile operator hears the transmitted audio. In the meantime, the C-550 console is ringing.

When the C-550 console operator goes off-hook, ringing at the console stops. the TELCO line at the console is dedicated to base-station operation, the console operator knows that a mobile station is calling, presses the PTT switch and answers the mobile's call. The mobile operator may terminate the call by transmitting the four digit reset code ("#" being the forth digit) after console answers.

When the mobile operator dials the access code, the console operator may be monitoring the channel and the TELCO line is already in use. In this case, the RP-251 panel will briefly switch the base station to transmit and generate a beep tone which will be heard by both the mobile and console operators.

If no dialtone is detected after access decode and line seize (all of the telco's lines are busy), the RP-251 panel will wait for dialtone to appear before autodialing. If all of the telco's lines remain busy for some period of time, the TELCO will connect a busy signal to the line. This will not be detected by the RP-251 panel which as the moment is programmed to detect dialtone, and the unit will remain off-hook for about 40 seconds from the initial line seize. The mobile operator will hear nothing if no dialtone occurs, and may think that he is out of range and may retransmit the access code. Anytime the access message is decoded and the RP-251 panel is already off-hook (for more than 2 seconds), and "off-hook" beep tone will be transmitted to the mobile operator.

Upon power-up the RP-251 will check to see if bit 8 of SW1 is "ON", In this condition when the mobile transmits a Four-digit DTMF code ( 3 access digits, a \* command digit) Example: 123\* the panel will wait to see if any other command digits will be received for 10 seconds, if none are received the phone # in address 0I will be dialed otherwise it will transmit to the mobile user that the code was not accepted.

## 5.2 Dial-up Mode

Dial the RP-251's phone number. The RP-251 will answer the phone after waiting for N rings to occur; N= ringcount is set via bits 1-4 on dip switch #1 on the RP-251 PCB. Upon answering the phone, the RP-251 transmits the 3 digit connect sequence followed by 3 asterisk characters (DTMF); The connect sequence is set via switch #2 and #3 on the RP-251 PCB. At this point, both offhook, monitor, and power LED's will be illuminated. Mobile RX audio is now being monitored via PSTN.

Once the phone connection has been made, and the receipt of a PTT Tone Burst (47mSec 2174HZ followed by DTMF "C" character, then low level 2174HZ). The RP-251 will go to PTT mode: PTT led on, off-hook on, PTT relay energized and monitor relay de-energized. During PTT, TELCO audio received is routed out TX audio (to mobile). The RP-251 will remain in PTT mode as long as the 2174HZ is present. Upon removal of 2174HZ, the RP-251 will return to monitor the mobile RX-audio.

The RP-251 will allow mobile RX audio to be monitored (Mon. relay energized) for 40 seconds and if no 2174HZ "hand-shake" pulse is received within 40 seconds or if receipt of a disconnect sequence, double monitor burst bursts (47mSec 2174HZ followed by DTMF "B") are received within a 1 second period or a disconnect sequence NNN# = 3 access digits that match the access code set via dip switches 5/3 mobile). The RP-251 sends 4 DTMF \* characters out to notify of disconnect pending and the RP-251 goes "on-hook" Off Hook, monitor LED's are now extinguished.

During dial-up after telephone call has been completed, program mode may be entered by receipt of the access code followed by 3 \* characters. The RP-251 will acknowledge entry into program mode by

transmitting the access code + 3 \* characters back to the console operator via position. The 2174HZ "hand-shake" tones are now ignored. \*\* are transmitted by the RP-251 when invalid digits are received.

3 TX levels are available, minimum, middle, and maximum, pressing the asterisk(\*) will increase the level and a pound (#) will decrease the level to the base station (TX mobile).

NOTE: Nothing happens if \* is received and already maximum. Nothing happens if # is received and already minimum.

### **5.3 Auto Dial Mode:**

When the momentary switch SW5 is depressed, the RP-251 is directed to dial #01. Once the call is connected the operation is the same as during dial-up mode with the following exceptions:

Program mode and Up-Down TX volume commands will not be accepted and have no effect.

### **5.4 External Access Mode:**

Functions the same as Auto dial except uses TB2-9 to ground instead of SW5 to start dialing and TB2-10 to ground to disconnect.

The RP-251 is a Digital Signal Processor (DSP) based product. Because of this, many of the signals that once could be probed on older products, are handled within the DSP itself. This would include DTMF decoders, notch filters, tone decoders, and all of the audio summing. Most of the gain controls are also included within the software of the DSP. Because of this, hardware is simplified at the expense of software creation time and user serviceability. The next sections discuss the portions of the RP-251 that can be tested using a common oscilloscope and voltage meter by a qualified service technician.

### **5.1 Audio Input Paths**

The RP-251 has only a single stereo Analog to Digital Converter (ADC) U25. The left channel converts the Line receive audio and the right channel converts the Radio receive audio. A CMOS switch, U2, is used to break those paths and insert handset audio for transmission down the line or to the radio. Up to the point of entry into the ADC, the audio is analog and handled by standard op-amps. These paths can be followed on the schematic and probed with any high-impedance measurement device.

### **5.2 Audio Output Paths**

The RP-251 has two stereo Digital to Analog Converters (DACs), U3 and U4. U4's left channel drives the sidetone for the handset. U4's right channel is used for the CTCSS tone generation. U3's left channel is the line transmit audio source and the right channel of U3 is the radios transmit audio source. Once the analog signal has been reconstructed on U3 and U4, they can be measured by conventional techniques.

## 6 Factory Test procedure

### Pre Test Setup.

Verify Jumper installation are as follow:

JP1"A", JP3, JP5"A", JP6, JP7, JP10, JP12, JP13 are all installed.

Set Dip Switches as follows:

SW#1	SW#2	SW#3	SW#4
1 OFF	1 ON	1 ON	1 OFF
2 ON	2 OFF	2 ON	2 ON
3 OFF	3 OFF	3 OFF	3 OFF
4 OFF	4 OFF	4 OFF	4 OFF
5 OFF	5 OFF	5 ON	5 ON
6 ON	6 ON	6 ON	6 OFF
7 ON	7 OFF	7 OFF	7 OFF
8 OFF	8 OFF	8 OFF	8 OFF

These settings correspond to:

ACCESS CODE = 123 CONNECT SEQ. = 321 ANSWER NUMBER OF RINGS = 2.

### Power/VR Test.

Attach Earth Ground and apply +12VDC, Check for the following :

CHECK	FOR
PWR LED D6	ON
TP16	+12-15 VDC
TP14	+10 VDC
TP12 & TP8	+5 VDC
TP19	+4.8 VDC

### 2174 Hz Detector Center Frequency setting.

Measure free running frequency at U22, pin 6 with a frequency counter. Adjust R84 until 2174 Hz +/- 1 Hz is obtained.

### Rx Mobil Audio Level Adjust.

Insert a 0 dBm 1KHz tone into TB2-1 and TB2-2 (RX Audio Input).

Adjust R124 for 0 dbm at TP2, -2 dBm at TP6 with JP5 in "A" and 0 dbm in "B" return to "A".

Confirm that the LAM indicator D1 illuminates with the audio input reduced to -3 dB

Short U17-10 to -11 and adjust R103 for -9 dBm at TP15

Change signal to 0 dB, 2174 Hz and adjust R8 and R37 for min. -45 dB at TP5.

### TELCO TX Notch Filter Adjust.

Inject 0 dB, 2174 Hz at TP3 and adjust R43 and R79 for min. -45 dB at TP9.

### TELCO TX Audio Level Adjust.

Call 251 UUT and verify it answers the phone,

Press PTT on C-550 and adjust R78 for -20 dbm Low Guard Tone at TP4.

Adjust R86 for -7 dbm at TP11 and a logic low at TP10.

### DTMF Receive Level Adjust.

Transmit DTMF from C-550 test phone and Adjust R87 so that the peak signal reads -12 dB at TP17.

### PSTN Rcv/TX Audio Output level Adjust.

Insert a 0 dB, 1KHz tone at TP3, PTT to xmit signal to output, Adjust R123 so that output signal level measured at TB2-3 and TB2-4 is at 100mv.

### Programming.

Enter 123\*\*\*, The RP-251 program mode indicator should illuminate within 1 second.

Enter \*376 (clears addresses) **Note: should be done before programming new numbers.**

Enter \*101 (command to program location 01). Enter 4420183# (console number).

Enter \*105 (command to program location 05). Enter 4420183# (console number).

Exit programming mode Enter #####. This causes the RP-251 to hang-up.

**Call Progress Detector Audio Level Adjust.**

Connect a meter at TP1. Depress SW#5. Adjust R4 so that dial tone level is at -5 dB and U13-13 is a logic low.

**Autodial.**

Depress SW#5. Confirm the lab phone rings. Answer the phone within 3 rings confirm proper PTT/Monitor tone burst detection and proper LED lighting, Double monitor to make RP-251 hang-up.

**Mobile RX Auto Access.**

Connect DTMF encoder to RX input, enter 123\*05 and confirm the RP-251 dials C550 and stops in 7 rings. Enter 123\*06 unit should not sense line.

**COR Test.**

Insert a 0 dBm 1KHz tone into TB2-1 and TB2-2 (RX Audio Input) and check for signal at TP13 with TB2-8 to ground.

**External Access, and External Reset Input Test.**

Toggle TB2-9 to ground and verify that the lab phone rings answer the phone within 3 rings, Toggle TB2-10 to ground and verify that the 251 hangs up.

## 7 FCC Information

### INFORMATION REQUIRED TO BE SUPPLIED TO THE CUSTOMER

#### User's Responsibility

The user is required to notify the telephone company of the connection or disconnection of the device, the make, model number, FCC registration number, and ringer equivalence, and the particular line to which it is to be made. If the proper jack(s) are not available, the user must order the type of jack(s) to be used from the telephone company.

#### Information for the Station Panel

Manufacturer: Vega, a division of EVI Audio  
Model Number: RP-251  
Registration Number: 51XUSA-32176-OT-T

Ringer Equivalence: 0.68  
Jack(s) Which May Be Used: RJ11C

It is prohibited to connect this equipment to pay-telephone or party lines.

#### Telephone Company Rights and Responsibilities

Under certain circumstances, the telephone company may discontinue service if the device causes harm to the telephone network. In this case, the telephone company shall:

Promptly notify the customer of discontinuance.  
Afford the customer the opportunity to correct the situation which caused discontinuance.  
Inform the customer of his rights to bring a complaint to the FCC concerning the discontinuance.

The telephone company may make changes in its facilities and services which may affect the operation of the user's equipment. However, the user shall be given adequate notice in writing to allow the user to maintain uninterrupted service.

In the case of trouble with this unit, return the unit to the manufacturer (VEGA) for repair, or have the manufacturer or his representative repair it in place. Do not attempt to repair the unit as this will violate the FCC rules and may cause danger to persons or to the telephone network.

#### FCC Requirements

This equipment complies with Part 68 of the FCC Rules. On the back of the RP-251 station panel is a label that contains, among other information, the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be given to the telephone company.

The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring with your telephone number is called. In most, but not all areas, the sum of the RENs of all devices connected to one line should not exceed 5.0. To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to determine the maximum REN for your calling area.

If your telephone equipment causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

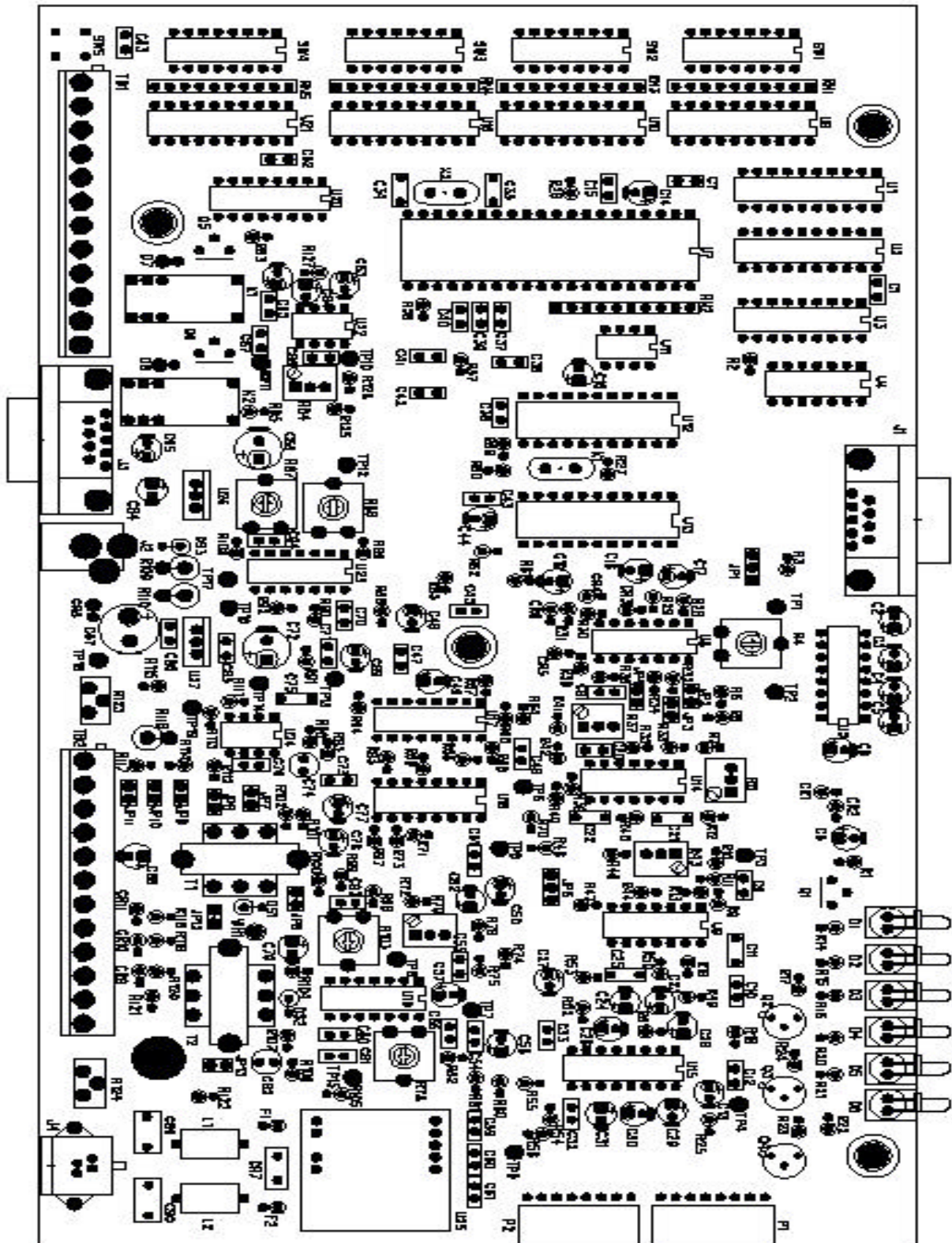


Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper functioning of your equipment. If they do, you will be notified in advance to give you an opportunity to maintain uninterrupted telephone service.

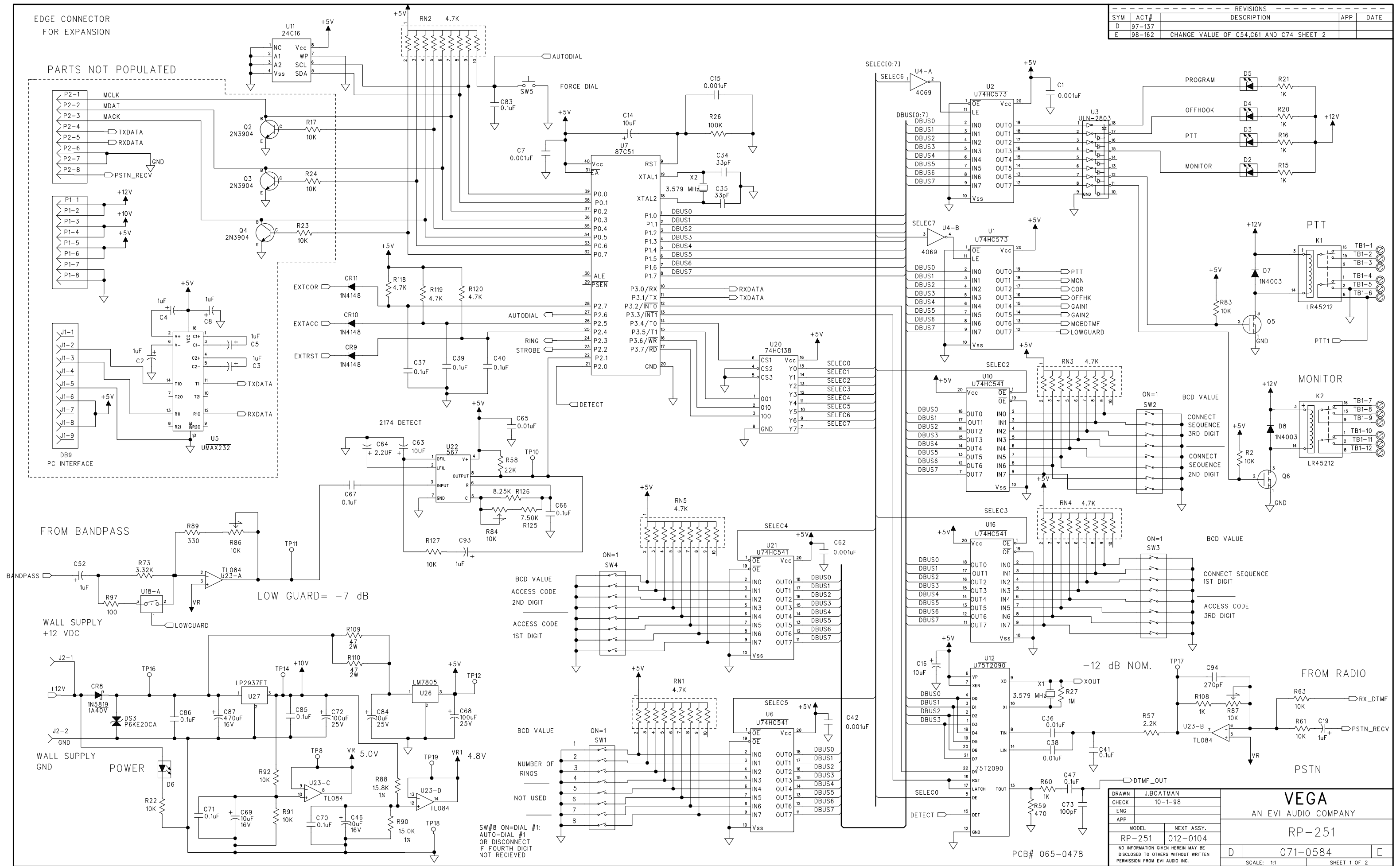
If you experience trouble with this telephone equipment, please contact your telephone company for information on obtaining service or repairs. The telephone company may ask that you disconnect this equipment from the network until the problem has been corrected to until you are sure that the equipment is not malfunctioning.

This equipment may not be used on coin service provided by the telephone company. connection to party lines is subject to state tariffs.

## 8 Schematics and Parts Lists







REVISIONS				
SYM	ACT#	DESCRIPTION	APP	DATE
D	97-137			
E	98-162	CHANGE VALUE OF C54,C61 AND C74 SHEET 2		

DRAWN J.BOATMAN		10-1-98		VEGA	
CHECK				AN EVI AUDIO COMPANY	
ENG				RP-251	
APP				012-0104	
MODEL		NEXT ASSY.		D	
RP-251		012-0104		071-0584	
NO INFORMATION GIVEN HEREIN MAY BE DISCLOSED TO OTHERS WITHOUT WRITTEN PERMISSION FROM EVI AUDIO INC.				E	
				SCALE: 1:1	
				SHEET 1 OF 2	

















## 9 Warranty, Service, Repair, and Comments

**Important! Be sure the exact return address and a description of the problem or work to be done are enclosed with your equipment.**

### 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 Telex 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.

Factory Service Center

### **TELEX Communications, Inc.**

#### **Vega Signaling Products**

8601 East Cornhusker Highway, Lincoln, Nebraska, 68507

Phone: (402) 465-7026 / (800) 752-7560 Fax: (402) 467-3279

E-mail: [vega@telex.com](mailto:vega@telex.com), Web: [www.vega-signaling.com](http://www.vega-signaling.com)

### **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.

### **Suggestions or Comments**

We'd appreciate your input. Please send us your suggestions or comments concerning this manual, by fax (402-467-3279) or e-mail them to: **[vega@telex.com](mailto:vega@telex.com)**

Visit our web site at **[www.vega-signaling.com](http://www.vega-signaling.com)**

## 10 RP-251 Specifications

**Relay Contact Rating:**

2A,30 VDC maximum

**Line Input and Output Impedance:**

600 ohmn nominal

**Receive Audio Input Impedance:**

15k ohmn nominal or 600 ohmn

**Transmit Audio Output Impedance:**

600 ohmn nominal

**Receive Input Sensitivity at Threshold of Compression:**

.007Vrms to 4.4 Vrms

**Mobile RX Sensitivity:**

-40db to +15db (.007Vrms to 4.4 Vrms) in jumper selectable ranges:

-40db to -10db, -25db to+5db, -15db to +15db

**Transmit Output Level:**

-40db to +10db (.007Vrms to 2.4 Vrms) Adjustable via DTMF input in 6db steps.

**Telephone Line Loss:**

0db miniumum to 30db maximum

**S/N Tolerance:**

DTMF Access, Reset Function Tone Decode = 12db

**Receive and Tranmit Audio Compression:**

Less than 3db change in output for 30db change in input above threshold.

**Distortion:**

2% THD maximum at full compression.

**Audio Frequency Response:**

+1.5db, 300 to 3000HZ except at transmit tone notch frequency.

**Hum and Noise:**

60db below operating levels.

**Autodial:**

Digits: 1 to 16

Addresses: 99

Digit Rate: 16 nominal a second

DTMF Duty Factor: 50%

DTMF Output Level: -9db

**Line Output Level:**

Voice: -9db (about 2.2VP-P typical voice)

**Telephone Line Interface:**

Modular cord

**Power Requirements:**

11.5 to 18.5Vdc semi-regulated; .5A maximum at 12Vdc input; 250ma maximum at idle, 12Vdc input and provision for optional 110VAC AC/DC wall power supply.

**Operating Temperature Range:**

0 to +50 C

**Size:**

19" wide X 1 3/4 high rack panel

**TELEX Communications, Inc.**  
**Vega Signaling Products**

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E-mail: [vega@telex.com](mailto:vega@telex.com), Web: [www.vega-signaling.com](http://www.vega-signaling.com)