VEGA®

TELEX® Signaling Product Company

Model C-1610
Radio Control Console

Technical Manual

June 27, 2001 **P.N. 803036-1**

Table of Contents

1 Introduction

The model C-1610 is a unique multi-channel, multi-format, and self-contained desktop radio control console.

The C-1610 sports a Vacuum Florescent LCD display, which provides channel alpha/numeric indication, clock and audio-level meter with a modern membrane keypad. These features allows for a more flexible dispatch environment in which the console may be installed. The dispatcher can easily operate the console while sitting or standing.

The C-1610 is a Digital Signal Processor (DSP) based design, allowing easy field programmability using the DTMF key pad on the front of the console. Unlike other manufacturers' equipment, no additional software is required to program the C-1610 console. Modifications and enhancements can generally be made via a software change only. If the user determines they require a special feature enhancement, please contact the Vega Sales Department for cost and feasibility.

The C-1610's modular design offers selection and control of up to six base stations, along with selection of ten frequencies. The base configuration includes one line card, allowing 2 lines of control. Each line card consists of two independent channels that offer crossmute capability and squelch control feature eliminating the unwanted noise that is generally associated when monitoring a selected or unselected line.

The C-1610 will accommodate a desk microphone (or gooseneck microphone) along with a handset (or headset) as indicated on the side of the C-1610 console. When a PTT occurs from either of the two microphones, the other will mute so as not to pick-up unnecessary ambient noise during transmission. When the handset is taken off hook and a line is Selected, the receive audio from that line is transferred to the earpiece.

The console is normally used in conjunction with up to six functionally matching Vega 223C Series (or equivalent) tone-remote panels located at each base station. The console is compatible with Motorola, ComNet Ericsson/GE, and other tone-remote control systems employing the industry-standard sequential tone-control format.

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

Version 4.5 of the software introduced several new features to the console, including: incoming select call, per line TX disable, per line Unselect audio lock, and the ability to mute unselect audio during PTT. A number of minor issues were fixed as well.

2 Hardware Overview

The C-1610 is a multi-line, multi-mode console designed specifically for medium level system requirements. All functions are housed in a single small modern looking console.

2.1 C-1610 Console

The C-1610 consists of the following sub-assemblies enclosed in the single case: Main Processing Board, Line Interface Cards, Keypad/Display Board, and speaker amplifier.

2.1.1 Main PCB

The Main PCB is mounted to the bottom of the enclosure using 5 #6 screws. It contains the DSP which handles all audio processing and user interface features. Three two channel Digital to Analog Converters (DACs) are utilized to generate audio for transmission, recordings, auxiliary speaker, main speaker, earpiece, and keyboard feedback. One two channel Analog to Digital Converter (ADC) is resident on the main board which digitizes both the microphone inputs and the auxiliary audio inputs. Each line card contains an ADC as well for the two lines of audio supported on the card. Three 30 pin card slots reside on the main board for each optional line card. A 20 pin header is used to interface the keypad to the Main Board. All audio detection, generation, and filtering is performed within the DSP. Two potentiometers are available for adjusting the handset and desk microphone input levels. A three pin header is supplied on the main board which connects to the unselect audio control potentiometer.

2.1.2 Keypad PCB

The Keypad board is interfaced to the main board via a 20 pin ribbon cable. The board contains the circuitry to drive the 39 LEDs, decode the keypad matrix, and interface the DSP to the display. The display itself is mounted to the Keypad PCB by a 14 pin header and three screws with spacers.

2.1.3 Line Card

The Line Card is a radio control card using either the standard tone control format compatible with Motorola and ComNet Ericsson/GE or Local Control relay closure. The line card may be hardware configured for either two-wire or four-wire operation and may be factory modified to accommodate non-industry standard tone control formats if desired. This is usually a software only change. Each card supports two lines. Four potentiometers are mounted on the card supporting tuning of the transmit and transmit monitor levels.

2.1.4 Internal Speaker Amplifier

The internal speaker has a 5 watt amplifier mounted on the backside of the front cover. Which has one volume control input to which the “Select” volume control is connected. A jumper is used for setting a minimum output level, allowing for audio at some level always being present in the internal speaker.

3 Controls and Indicators

3.1 Front Panel

Description of the controls and indicators.

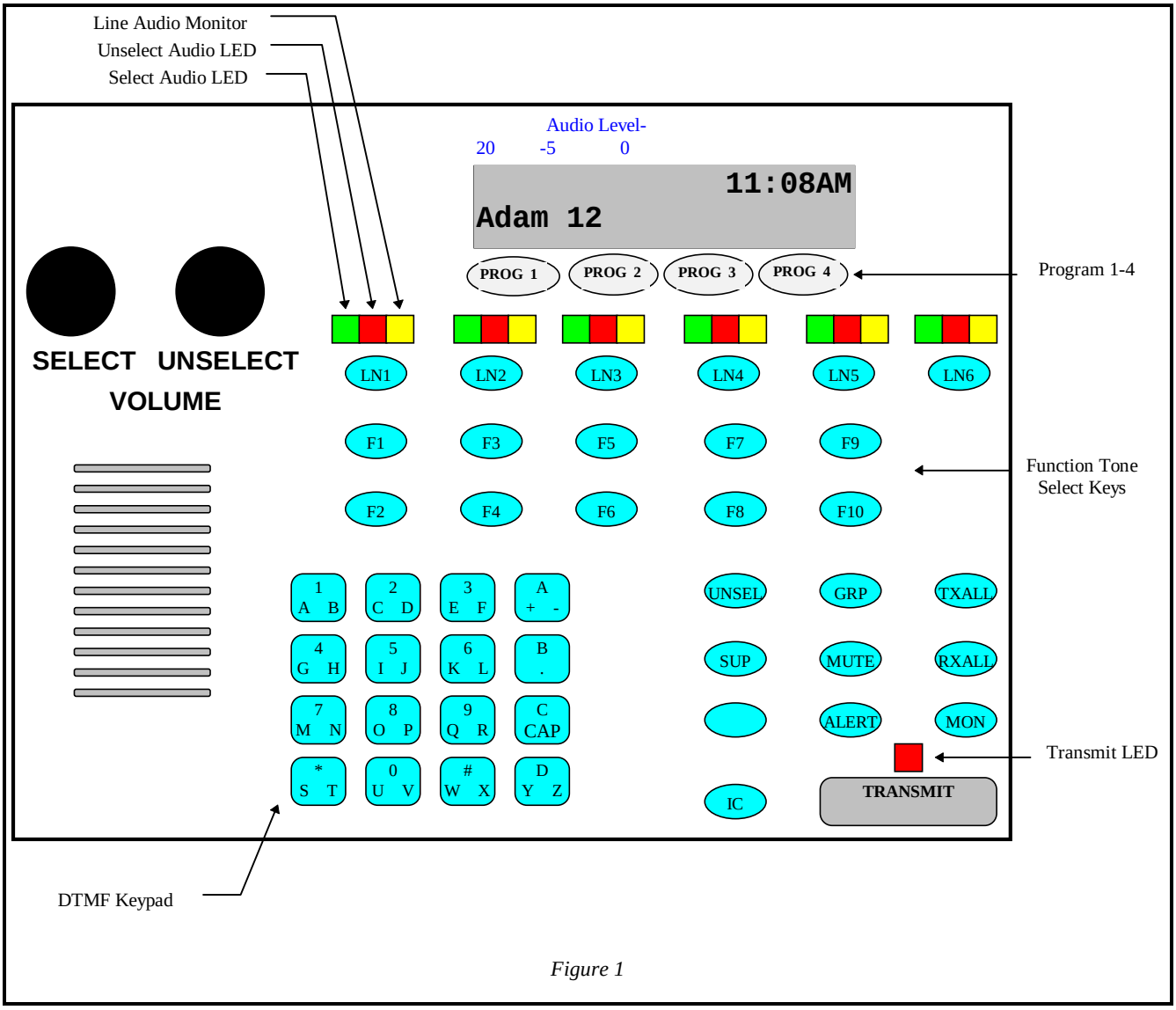


Figure 1

A desk microphone (or gooseneck microphone) may be installed for operation along with a handset (or headset) as indicated on the side of the C-1610. When a PTT occurs from either of the two microphones, the other will mute so as not to pick-up unnecessary ambient noise during transmission. Note that, in dual microphone configurations, the desk microphone is the default microphone. The dedicated PTT button on the handset or headset must be pressed to use the handset/headset.

3.1.1 Common Controls and Indicators

Select Volume Control: Adjusts the summed speaker level of the Selected and Unselect audio's. A minimum volume level can be set on the speaker card so that the console operator can not turn the volume to zero.

Unselect Volume Control: Adjusts the speaker level of the Unselected audio. A minimum volume level is preset on the main PCB so that the console operator can not turn the volume off as long as the master minimum volume is active on the speaker amplifier (JP1). Refer to page 11 for more detailed information.

Optional Handset: When you come off hook the handset receive audio is transferred to the earpiece and the microphone mouthpiece becomes active. Unselect audio that is being routed to the external speaker will not be affected.

VU Meter: Displays Selected receive and Microphone audio bus levels. This meter is shown on the top line of the display and utilizes the first 12 display elements from the upper left.

PTT Pushbutton: When pressed all Selected lines will transmit from the default input device (handset, headset, desk microphone, gooseneck)

DTMF Keypad: The DTMF keypad is used for transmitting DTMF digits, selecting frequencies for tone control in tech mode (section 6), and entering alphanumeric strings for line/function tone combinations.

Function Buttons F1-F10: When a function tone button is pressed, a guard tone and function tone burst is sent out. No hold tone is associated with the changing of the function tone. When one of the function tones is selected it will light to indicate which function tone is chosen A function tone shall remain selected until the operator changes the setting. The console will power up with the last selected line and function tone pair selected. Function tones may also be placed in wildcard groups (section 6.3.3.2), wildcard groups will not effect any function tones in the frequency selection mode.

Line Select Buttons LN1-LN6: Six line select buttons are available. When one of the line buttons is pressed that line enters the Select mode and cancels all other Selected lines (either inactive or Unselected). The '1 of N' mode can be changed by pressing the GRP button on, this allows more than one line to be placed in the Select mode. A line or lines can be placed in the Unselect mode by the pressing the UNSEL button on and then pressing the Select line button. You may have any combination of lines placed in the Unselect mode.

Program 1-4: Are used as "soft" programming buttons when in the tech mode. These buttons will have different functions depending on the action required. The bottom line of the display will show their respective functions.

Select Audio LED: The green LED above each LNx Button indicates if the line is selected for transmit audio.

Unselect Audio LED: The red LED above each LNx Button indicates if the line is unselected for receive audio monitoring.

Line Audio Monitor LED: The yellow LED above each LNx Button indicates receive audio activity on a line.

Transmit LED: This LED lights when any PTT source is depressed keying up the console. It will also blink if a 2175 Hz hold tone is detected on the selected TX audio lines. This would indicate to the operator that another console is currently transmitting on one of the selected channels.

Unselect button: Pressing the line buttons while the UNSEL button is on will place the respective lines in Unselect mode. Pressing a line that is already in the Unselect mode will deselect the line. Pressing a line that is already in the Select mode will have no affect.

Group button: The 1of N reset function of the C-1610 will be suspended while the GRP button is on. This allows the operator to place more than one line in Select mode. The C-1610 allows four preprogrammed groups. These preprogrammed groups will be applied to the console if the 'A', 'B', 'C', or 'D' in the DTMF keypad is pressed while the GRP button is held down. A programming selection allows the technician to apply a preprogrammed function tone or the last used function tone to the group.

TX all button: The TX button allows the operator to place all lines in the Select mode. A programming selection allows the technician to apply a preprogrammed function tone or the last used function tone to the group.

RX all button: The RX button places all cards not in the Select mode in the Unselect mode.

Supervisory button: The SUP button allows one console operator to disable any other console which is connected to the supervised line.

Monitor: When the Monitor button is pressed a Monitor tone burst is sent out. The Monitor tone burst consists of a guard tone and function tone of 2050Hz. An LED indication lights for the duration of the tone burst.

Intercom (IC): When the Intercom button is pressed and held down the C-1610 shall transmit audio without activating the tone generator. Intercom is considered a PTT operation with the tone generator disabled.

3.2 Rear Panel Connections

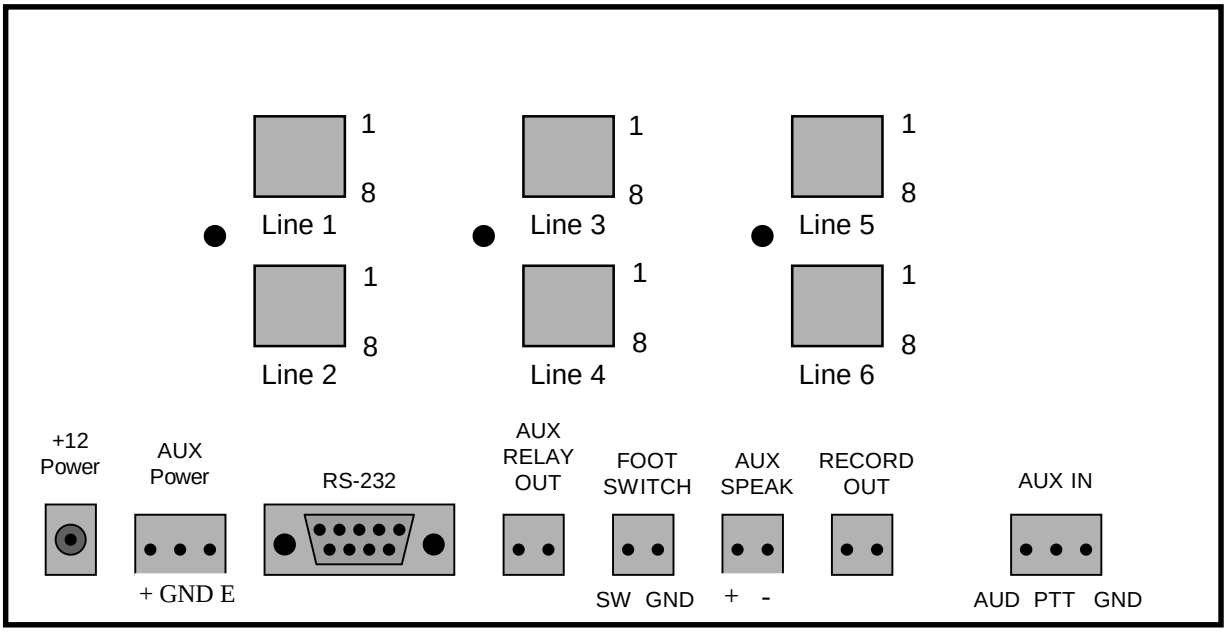


Figure 2

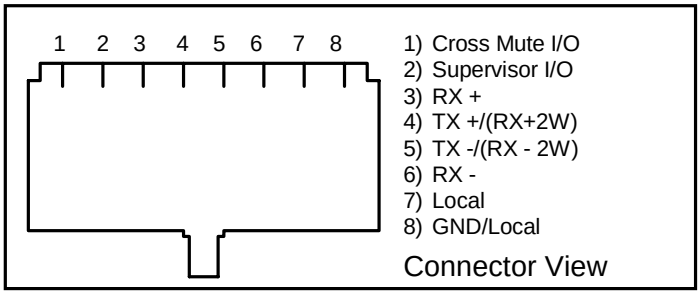


Figure 3

3.2.1 Rear Panel Ports

Line Ports 1-6: The C-1610 can accommodate up to six-lines, in multiples of two. The six-line connectors are available on the rear of the unit. The connectors are standard eight pin RJ-45 connectors. The pinout of the connector appears in Figure 3. The numbering of the pins are shown in Figure 2 for reference.

Auxiliary Audio Input: The external 3 pin terminal block provides Audio Input, PTT, and GND line. Pulling PTT to ground activates the Audio Input line for transmitting. This input is a high impedance capacitance coupled input.

Auxiliary Speaker: Is a capacitance coupled output capable of driving a 600 ohm load at 0dbm.

Footswitch: This input acts as a console PTT when it is shorted to ground

Battery backup: The Auxiliary power input is a diode protected +12V input used for battery backup. Pin (E) is also connected to the chassis allowing for positive grounding of the unit.

Serial port: Allows for communications between consoles. Normally used when cloning other consoles.

Auxiliary Relay Output: Depending on the setting of the AUX button in the tech mode, this output is a relay closure that can be used for whatever purpose is required.

Record Output: Has both unselected and selected notched audio 600 Ohm transformer output for connection to a voice logging recorder.

4 Functional Description

4.1 Grouping Options

4.1.1 Basic Line/Function Tone Operation

The basic operating scenario would be a single line and function tone selected. Lines can be selected individually by pressing any LN1-LN6 and function tone button F1-F10. Upon keying the microphone, a high level guard tone followed the selected function tone is sent out, the low level guard tone is then transmitted along with the microphone audio. Each Line/Function pair is unique and can have its' own alphanumeric characters assigned to it in the programming mode. The default characters have the LnX FY label in the display with X the line number and Y the function number. Function Buttons can have either single or dual functions and is setup in the tech mode.

4.1.2 GRP and TX ALL Buttons

The GRP button is a press ON/OFF button which disables the 1of N functionality of the console. When the GRPSEL button is selected it will illuminated and the operator can set up a Simul-group with as many tone lines desired. As long as the button is illuminated the operator may add or delete lines in the group. The Green LED above each line selection button denotes that the line is selected for transmission and reception. When the operator is finished setting up the Simul-group the operator presses the GRP button again to revert back to the 1of N mode.

The group button is also used to select up to four preprogrammed groups. Within the tech mode, it is possible to set up preprogrammed groups. By assigning certain groupings of lines to the Groups 'A'-'D' a simple two button sequence can be setup to select multiple lines.

Note: Lines that are setup as Local Control cannot be mixed with tone control lines in the same group select mode. Likewise you cannot TX ALL if you have Local control and tone control lines mixed. You will receive an ERROR MESSAGE. They must all be of the same type of control lines tone or local control.

TX ALL (Transmit All): This feature gives the user a convenient means of Selecting all lines for Simul-transmissions without having to group select one at a time.

To initiate Simulcast, momentarily touch the "TX ALL" on the keyboard. The line description will change to "Group", and all available lines will automatically be Selected.

To disengage Simulcast, simply Select a single line in the usual manner, or press TX again to revert to the previous setup.

Note: You cannot TX ALL if you have Local control and tone control lines mixed. You will receive an ERROR MESSAGE. They must all be of the same type of control lines tone or local control.

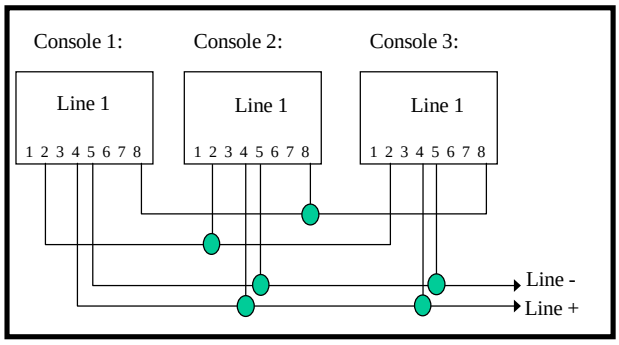
4.1.3 UNSEL and RX ALL Buttons

The UNSEL Button functions the same way as the GRP button. The UNSEL button is a press ON/OFF button. When the GRPSEL button is illuminated the operator is able to set up any combination of lines as desired for monitoring only. As long as the button is illuminated the operator may add or delete lines to the group. The red LED above each line selection button denotes that the line is Unselected for reception. When the operator is finished setting up the group the operator presses the UNSEL button again to turn off the mode.

RX ALL (Receive All): When pressed all lines are put into the unselect receive mode**.** Any line that is in the Select mode will automatically become part of the Unselect group when it is taken out of Select mode.

4.2 Other Control Buttons

4.2.1 Supervisor Button



The SUP Button is used to disable all units on a particular line. Its connection is similar to that of the crossmute function. Tech mode is utilized to determine which consoles will have supervisory capability. It is possible to setup only specific consoles with this feature. If a console has the feature enabled, by pressing the SUP Button, the Button will light and disable all connected paralleled consoles. On the consoles that are being supervised, the SUP Button will blink, if they have selected a line that the supervisor has selected. Figure 4 shows the connection scheme required to utilize this function. Pin 2 of all consoles are connected together. In addition, Pin 8 is also connected together on all consoles, serving as a common ground for all consoles. Assuming that console 1 has supervisory capability, when activated, Line 1 on parallel consoles 2 and 3 would then be inhibited.

4.2.2 MUTE Button

The MUTE Button is used to mute unselect audio. It is programmable in tech mode to be a mute when pressed, or mute for a programmable period of time. As long as MUTE is active, the Button will be lit up.

4.2.3 AUX Button

The AUX Button has up to four functions, selectable in tech mode:

1) DTMF store and transmit	DTMF
2) Second Alert tone	ALERT
3) Toggle relay control	TOGGLE RELAY
4) Momentary relay control	MOM RELAY

Option 1, DTMF store and transmit, allows a programmed string of DTMF characters to be entered and transmitted. In addition, the function will remember the last string sent and can be recalled by pressing a Program Button.

Option 2, ALERT, allows the AUX Button to serve as the Alert 2 Button. In this mode it sends out the programmed Alert 2 tone.

Option 3, Toggle Relay, give the AUX button the ability to control the AUX RELAY output on the back panel. When pressed, the Button will light and the relay will close. The next time the AUX button is pressed, the Button's light will turn off and the relay will open. The relay is rated to handle 500mA at 12VDC or 250mA at 115VAC.

Option 4, Momentary Relay, closes the relay for as long as the AUX button is pressed. The relay is rated to handle 500mA at 12VDC or 250mA at 115VAC.

4.2.4 Alert Button

The Alert Button is used to send the programmed Alert sequence. Tech mode is used to set up the cadence assigned to this Button.

4.2.5 Intercom (IC) Button

When the IC button is pressed and held down the C-1610 transmits audio without activating the tone generator. Intercom is a PTT operation with the tone generator disabled. This is useful for communications between paralleled consoles.

5 Line Card Setup and Description

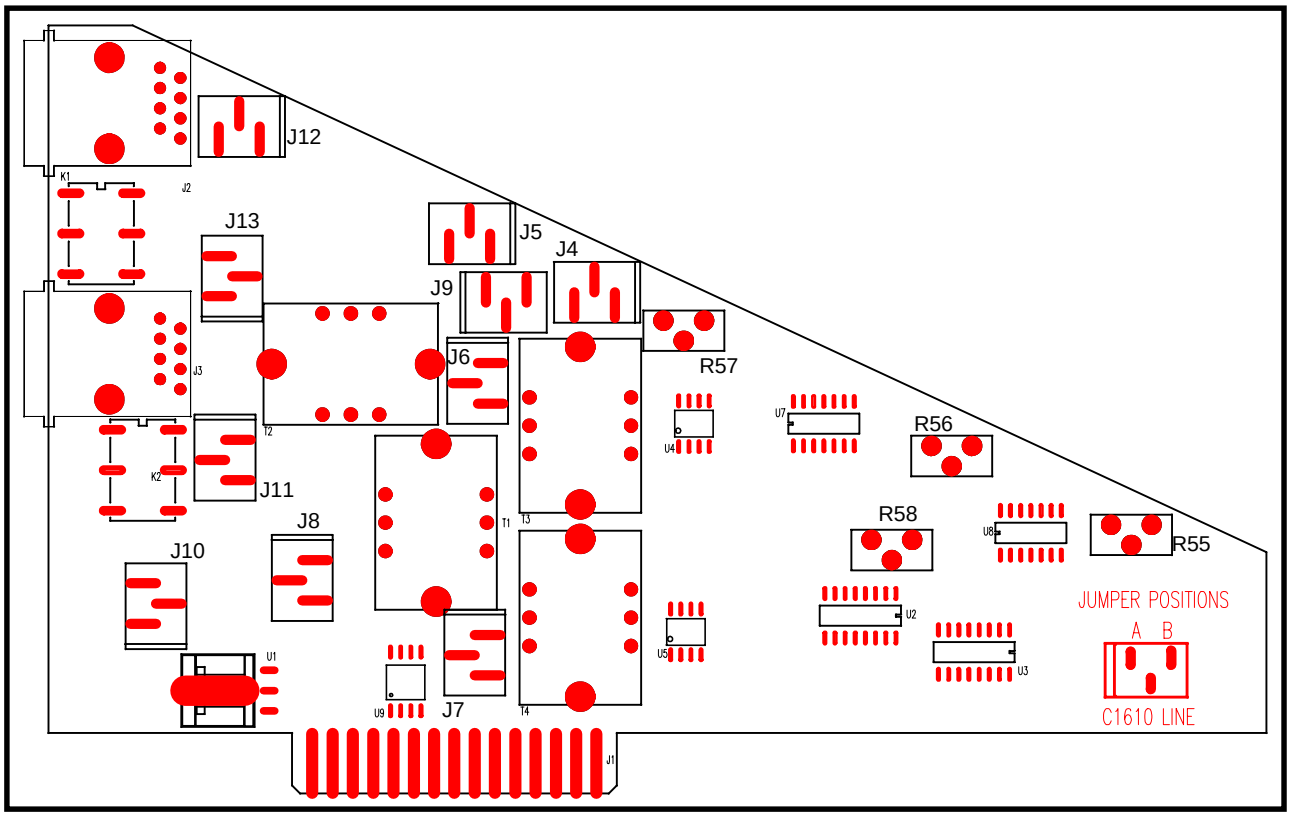


Figure 5 – Rev A Line Card PCB

5.1 INTRODUCTION/DEFAULTS

The Line Card for the C-1610 system provides communication with any standard tone remote system. It is shipped from the factory in the following state:

4 Wire mode
600 ohm output impedance

Note that there are now two versions of this card. The jumper numbers have remained the same as well as their functions. The level setting POTs have changed. They are labeled on the board and noted within this chapter. Figure 5 shows the older Rev A board, and Figure 7 shows the Rev B board.

5.2 INPUT/OUTPUT

Two Line connectors are available for external access. The connectors are standard eight pin RJ-45 connectors. The upper connector on each card is designated as 1 and the lower as 2. The slot that the card is placed in designates line 1&2 or 3&4 or 5&6.

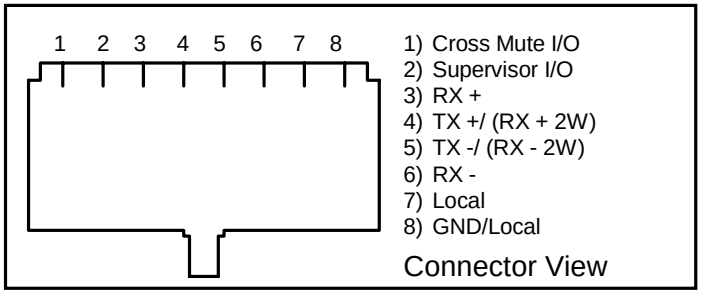


Figure 6

Two six-foot cables are included with each card. The connector pins are assigned as shown in Figure 6.

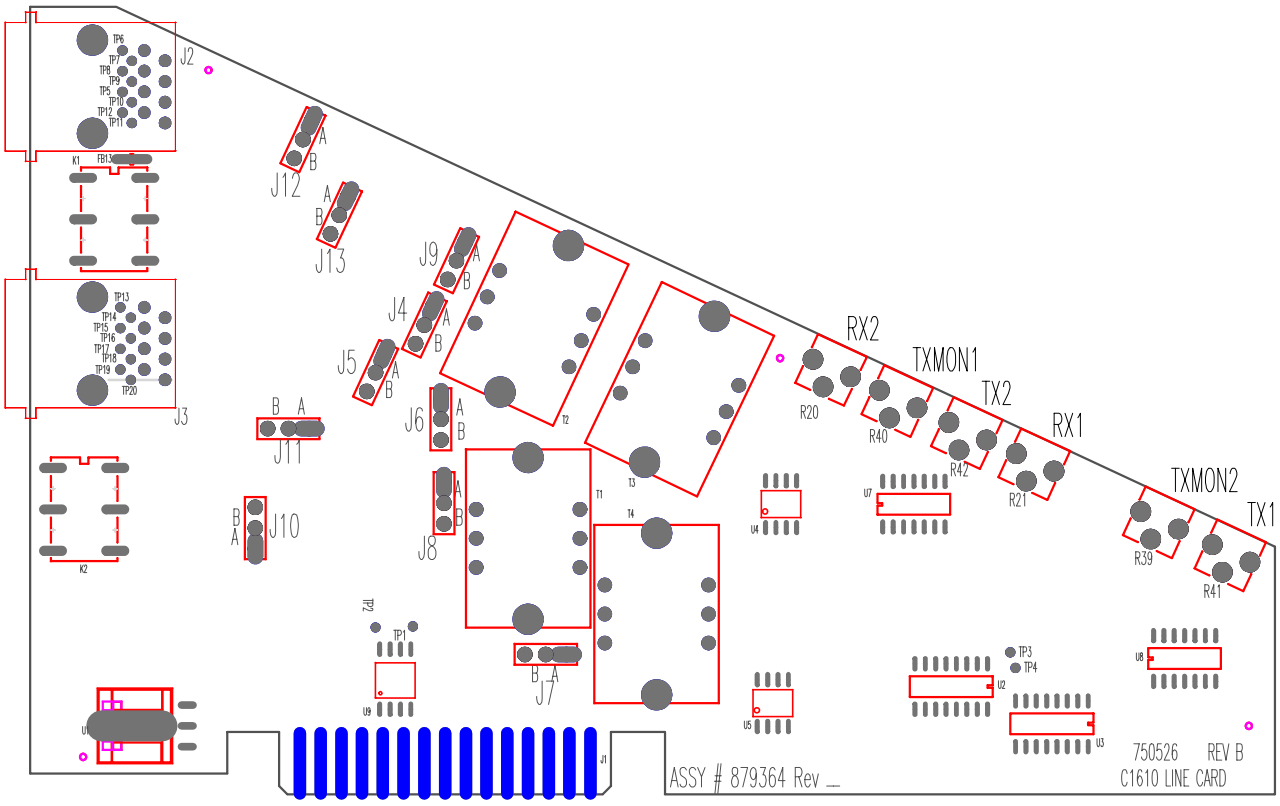


Figure 7 – Rev B Line Card PCB

5.3 FEATURE DESCRIPTION

5.3.1 Crossmute

When a parallel console operator keys a microphone in the same room, the crossmute function mutes the receive audio path of the other parallel consoles. This prevents any unwanted audio loops which would occur causing a loud squeal on the paralleled speakers.

Feedback may be avoided by muting the receive audio of the line card which is in parallel with a transmitting line card. This may be accomplished by connecting pins 1 and 8 of each of the consoles to be crossmuted as shown in Figure 7. Pin 8 must be connected to provide a common ground. Figure 7 illustrates the connections between consoles 1 through 3 that are in the same room and when one transmits, the receive audio on line 1 will be muted. Console 4 is off-site with no possibility of feedback, therefore, it is not being muted. **Note:** The intercom function will not work between crossmuted consoles.

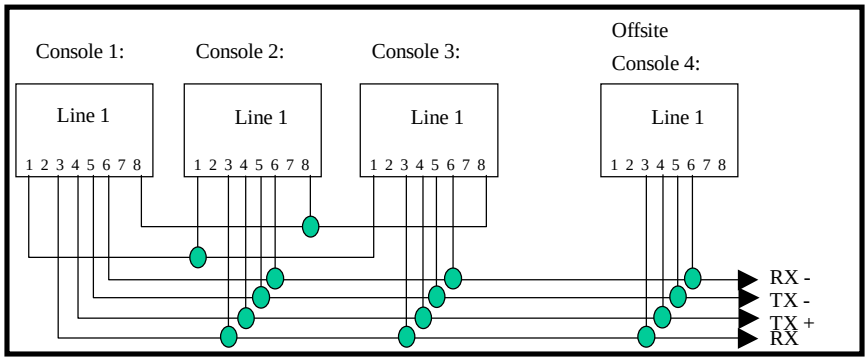


Figure 8

5.3.2 Relay Contact Closure For Local Control

The relay is normally open and provides a dry contact closure during PTT functions between pins 7 and 8 of the line jack. The relay closure can carry 500mA at 12VDC or 250mA at 115VAC. When using the intercom function the

relay is not activated.. If this relay closure is used for local control (or any other case where tone bursts are not used for signaling) disabling the tone generation is recommended by entering the tech mode.

5.3.3 Two-Wire/Four-Wire Mode

Each Line Card comes standard with a jumper selectable two or four-wire option. Note: The Line Cards are shipped in the four-wire mode. Two-wire mode is accomplished by the following jumper positions:

	Line 1, 3, 5:		**Line 2, 4, 6:**	
Two-Wire:	Jumper	Position	Jumper	Position
	JP12	A	JP10	A
	JP13	A	JP11	A
Four-Wire:	Jumper	Position	Jumper	Position
	JP12	B	JP10	B
	JP13	B	JP11	B

The RX pair is now on pins 3 and 6 on the connector and the TX pair is on pins 4 and 5. Once the transmit and receive paths are separated the impedance of each side must be set.

5.3.3.1 RX Side Settings

The RX side is jumper selectable for a 600 ohm impedance or 10k ohm impedance. If only one Line Card is on the line (no parallel consoles) then place J9 (Line 1,3,5) or J8 (Line 2,4,6) in the A position for a 600 ohm line impedance. If more than one Line Card is on one line then place J9 (Line 1,3,5) or J8 (Line 2,4,6) on **ONE** console in the A position and all other consoles in the B position. Each console added to the system will result in line loss. The following chart gives an indication as to how much loss can be expected. The first console in the system is set for an impedance of 600 ohms out (approximately). Each console added to the system thereafter is set for an impedance of 10k ohms. As the chart indicates on the following page , the more consoles bridged on the line, the lower the line impedance and the greater the loss in audio level.

Console added	Position	Impedance	Impedance	Loss (dB)
1	A	604	604	0.0
2	B	10k	569	-0.5
3	B	10k	539	-1.0
4	B	10k	511	-1.5
5	B	10k	486	-1.9
6	B	10k	464	-2.3

Level adjustment can be made to the receive audio by entering the tech mode on a per line basis.

5.3.3.2 TX Side Settings

Two jumpers on the transmit pair allow a degree of control over the output impedance. The following chart lists the jumper positions for each card depending on how many consoles are placed in parallel. All cards should have the same jumper settings.

Consoles in parallel			Individual TLM			Output Impedance (per console)
Line 1,3, 5:	**J4**	**J5**	**Line 2, 4, 6:**	**J6**	**J7**	
1 (one console on line)	A	A		A	A	600 ohms
2	B	A		B	A	1200 ohms
3	A	B		A	B	1800 ohms
4	B	B		B	B	2400 ohms

The TX levels can be set by potentiometer on a per line basis. Refer to section 5.4 level adjustments for setup procedures.

5.3.3.3 Transmit Monitor

In a four-wire system the transmit line may be monitored by the receive circuits by changing a setting in tech mode. Refer to section 5.4.1.2. for the monitor level setup adjustment. The transmit monitor is not needed in two-wire mode as the transmit audio is already on the receive circuit.

5.4 Level Adjustments

Figure 5 and Figure 7, in this secion, shows a top view of the Line Card with the adjustment points labeled. The potentiometers are available without taking the card out of the chassis.

5.4.1 Transmit Side Adjustments

The transmit audio consists of multiple audio sources – microphone audio, AUX input, function tones, and DTMF tones. Each audio sources is summed or generated in the DSP with the analog signal being generated on a single DAC. The following is a list of the potentiometers that affect the transmit path.

Rev A PCB: (see Figure 5)

Line1, 3, 5:

Reference	Description
R55	Line 1 TX Level Adjustment
R57	Line 1 TX Monitor Level Adjustment

Line2. 4, 6:

Reference	Description
R56	Line 2 TX Level Adjustment
R58	Line 2 TX Monitor Level Adjustment

Rev B PCB: (see Figure 7)

Line1, 3, 5:

Reference	Description
R41	Line 1 TX Level Adjustment
R40	Line 1 TX Monitor Level Adjustment
R21	Line 1 RX Level Adjustment

Line2. 4, 6:

Reference	Description
R42	Line 2 TX Level Adjustment
R39	Line 2 TX Monitor Level Adjustment
R20	Line 2 RX Level Adjustment

5.4.1.1 Transmit Level Setup

The transmit level potentiometers are used to adjust the output levels of the transmit audio so that it is calibrated with the onscreen level sets found in the tech mode. Calibration of the Transmit lines will vary depending on system variables as well as the number of consoles found in parallel on the line. The tech mode should be used to generate a test tone at a given amplitude. R55 (R41-Rev B) and /or R56 (R42-Rev B) should then be adjusted with a level meter used to set the actual output level to match the generated value.

5.4.1.2 Transmit Monitor Setup

The transmit monitor provides a portion of the transmit audio of a four-wire circuit to the receive path. This allows the console operator to listen to the transmissions of parallel console operators. To set this level have a parallel console operator select a line and press the intercom button. Adjust R57 (R40-Rev B) and/or R58 (R39-Rev B) on each four-wire circuit until the level is comfortable in the handset/headset earpiece or the speaker.

5.4.1.3 Receive Level Setup (Rev B Line Card only)

The receive side level potentiometers are used to adjust the input levels into a range that is acceptable to the C-1610. Typically, a +10dBm test tone is injected in to the C-1610 as receive audio. The audio level is then measured at TP2 for Line 1 and TP1 for Line 2 with respect to ground. The measurement should be about 3.4 Vpp or 1.2Vrms. However, if receive audio levels are not in the +10dBm range, these pots can be used to bring the audio level up to

the desired receive levels. 3.4Vpp is about the maximum value for the loudest receive audio. Above 3.4Vpp will saturate the ADC input stage and distortion will occur.

5.5. Microphone Level Adjustment

Adjusting handset/headset microphone levels. Make a vocal tone into the handset while adjusting R72 on the Main PCB for 3.5Vp-p at TP2. The sidetone can be adjusted from within the tech mode. Speak into the handset and listen to the earpiece. You should hear a portion of your voice being routed back to the earpiece.

Adjusting desk microphone/gooseneck microphone levels. Make a vocal tone into the desk microphone/gooseneck microphone at the distance you expect the operator to be positioned and adjust R71 on the Main PCB for 3.5Vp-p at TP7.

5.6. Minimum Speaker Level Adjustment

A minimum volume level can be set by moving JP1 to “B” position on the speaker Amplifier PCB, preventing the operator completely turning off the volume of the speaker.

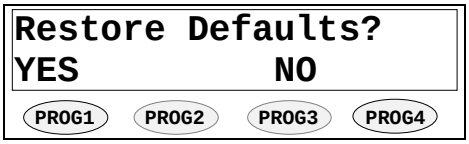
6 Tech Mode

The tech mode allows a technician to program the internal settings of the C-1610 console. The tech mode is entered by pressing **MUTE-F6-*** simultaneously. The technician will be required to enter a PIN number to allow entry. See the section 6.3.4.1 on setting up the PIN number. The Opening Menu is displayed when tech mode is entered. In addition to the information on the display you will visual see the MOM, LN1-LN6, ALERT, AUX, F1-F10, GRP and the MUTE buttons also flash indicating you are in the tech mode of operation. These buttons also provide setup options when pressed, refer to section 6.0.4. for further information.

6.0.1 Erasing all settings

All of the settings in the console can be reset to factory defaults by pressing and holding both "IC" and "*" and then applying power. The screen displayed asks if the user wants to restore defaults or not.

PROG1 - Answer, YES and you will clear all settings to the factory defaults.
PROG3 - Answer, NO and you will enter the user mode.



6.0.2 Resetting the PIN Number

In the event the PIN number is either forgotten or not known, the test jumper J17 on the main board inside the unit can be used to enter a self test mode and reset the PIN. With the power removed from the unit, move J17 to the "B" position on the board. Power up the board. The PIN number is cleared allowing immediate entry into the tech mode. Power down the board and move the J17 back to the "A" position. Close the case and resume normal operations with the C-1610.

6.0.3 Opening Display Menu

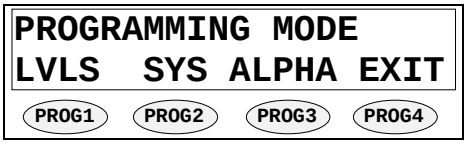
|----------Level menu Screen
| |---------- Line Level Settings (Select LEDS Blink)
| | |---------- RX Input Level
| | |----------Other Line Levels
| | | |---------- LAM Programming
| | | | |---------- LAM duration after release
| | | | |----------Trigger Level
| | | | |----------Select/Unselect Settings
| |----------Main Level Settings
| | |----------Microphones
| | | |---------- Desk microphone preamp gain
| | | |----------Handset preamp gain
| | | |----------Aux input preamp gain
| | |----------Receive Path Levels
| | | |----------Handset Earpiece Level
| | | |----------Auxiliary Speaker Output Level
| | |----------TX Menu
| | | |----------TX Audio Output Level
| | | |----------Tape Output Level Control (v4.5)
|----------System Settings Screen
| |----------Menu 1
| | |----------Clock
| | |----------Dump (RS-232C clone command)
| | | |----------Dump Error Screen
| |----------Menu 2
| | |----------Tone Settings
| | | |---------- DTMF Settings
| | | | |---------- DTMF Output Level
| | | | |----------Tone duration
| | | | |----------Tone Spacing
| | | | |----------Hang Time
| | | | |----------Keypad Enable/Disable (v3.7)
| | | | |----------PTT with DTMF Enable/Disable (v3.7)
| | | | |----------Incoming Select Call Setup (v4.5)
| | | | |----------Select Call Timer Setup (v4.5)
| | | |----------Single Tone Settings
| | | | |----------Guard/Function/Hold Levels
| | | | |----------Guard/Hold Frequencies
| | | | |----------Guard/Hold duration's
| | | |----------Test Settings
| | | | |----------Alert Tone Test
| | | | |----------2175 Test
| | | | |----------Reference Test
| | |----------Wildcard programming
| |----------Menu 3
| | |----------Tech mode PIN Number
| | |----------TX Delay setup
| |----------Menu 4
| | |----------Aux Relay Function
| | |----------Duplex
| |----------Menu 5
| | |----------MicAGC Enable/Disable
| | |----------Handset Connected
|----------Alphanumeric Decision Screen
| |----------Line/FTone Selection screen (Blinking Line Select LED)
| | |----------Line Alphanumeric Selection screen
| | | |---------- Line Alphanumeric Programming Screen

|----------Group Selection Screen (Blinking GRP Button)
|----------Group Alphanumeric Selection screen
|---------- Group Alphanumeric Programming Screen

6.0.4 Button Activated Setup Modes

|----------LN1-LN6 - Per Line Parameters Setup
| |----------Line Enable/Disable
| |----------Tone/Local Setting
| |----------Crossmute Enable/Disable
| |----------Squelch
| |----------TX Monitor Enable/Disable
| |----------AGC
| |----------TX Enable/Disable (v4.5)
| |----------Unselect Normal/Locked (v4.5)
|----------F1-F10 - Function Tone Parameter Screen
| |----------Function Tone Enable/Disable
| |----------Tone Programming Screen
| | |----------Tone A/B Selection
| | |----------Frequency Programming Screen
| | |----------Duration Programming Screen
|----------UNSEL Unselect Audio Setup
| |---------- Audio Routing Selection Internal/External
| |---------- Audio Muting on PTT (v4.5)
|----------GRP - Group Assignments A-D
|----------SUP - Supervisor Function Enable/Disable
|----------MUTE - Mute Button Setup
| |----------Timed/Momentary
| |----------Timed Mute Duration Setup
|----------AUX - AUX Assignment
|----------ALERT - Alert Cadence Programming
| |----------Frequency and Levels
|----------TX ALL - Enable/Disable Parameter Screen
|----------MON - Monitor Programming Screen
|----------Auto/Manual Selection
|----------Monitor Tone Selection
|----------Monitor Frequency
|----------Monitor Duration
|----------Monitor Level

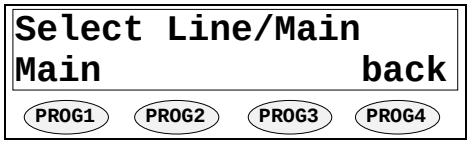
6.1 Opening menu



The following buttons are active during this screen:
PROG1 - Pressing this button enters the Level Menu Screen
PROG2 - Directs the display to the System Settings Screen
PROG3 - Directs the display to the Alpha Settings Screen
PROG4 - Exits the Setup Mode
LN1-LN6 - Directs the display to the Line Tone/Local Screen
F1-F10 - Function Tone Parameter Screen
UNSEL - Controls Unselect Audio routing to internal/external
GRP - Enters the group setup mode
SUP - Enables supervisor mode
MUTE - Set mute functionality
AUX - Directs the display to the AUX Assignment Screen
ALERT - Directs the display to the Alert Cadence Programming Screen
MON - Directs the display to the Monitor Programming Screen
TX ALL - Allows the TX ALL button to be enabled and disabled

6.2 Level Menu Screen

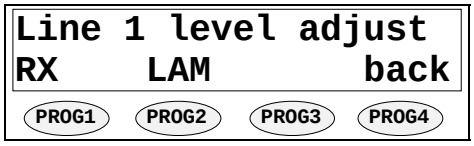
When this screen is displayed the following buttons are active:
PROG1 - Direct display to Main Level Settings Screen
PROG4 - Go back to Opening Menu
Pressing any Line button - Displays the Line Level Setting Screen for that selected line.



6.2.1 Menu 1 - Line Level Settings

This screen is displayed after a line has been selected from the Level Menu Screen. The selected line number is shown on the display and the select LED for that line continues to blink. In this example Line 1 has been selected.

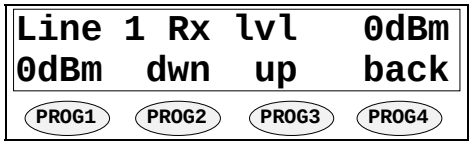
PROG1 - Go to RX Input Level Screen
PROG2 - Go to LAM level setup
PROG3 - Go to Line Levels Screen
PROG4 - Return to Level Menu Screen



6.2.1.1 RX Input Level Screen

The RX output levels serve as a master level adjustment allowing small adjustments in gain. This is a per line adjustment. Typically these are left at 0 dB.

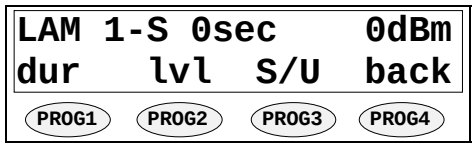
PROG1 - Resets level setting to default of 0dB
PROG2 - Increments the level setting by 1 dBm (max of +30dB)
PROG3 - Decrements the level setting by 1 dBm (min of -50dB)
PROG4 - Saves the current level setting and returns to the Line Level Setting screen



6.2.1.2 LAM Programming Screen

This screen shows the current settings for the Line Activity Monitor for the line number shown. The -U or -S after the channel number denotes whether the settings are for Select or Unselect Audio. Pressing PROG1 or PROG2 will modify the settings for the Select or Unselect characteristics displayed when the button is pressed.

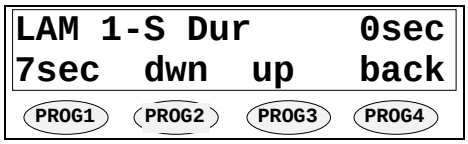
PROG1 - go to LAM Duration After Release screen
PROG2 - go to LAM Trigger Level Screen
PROG3 - Toggle Select or Unselect LAM control
PROG4 - return to Other Line Level Screen



6.2.1.2.1 LAM Duration After Release screen

This parameter determines how long the LAM light will flash after the triggering signal disappears.

PROG1 - Resets duration setting to default of 7 seconds
PROG2 - Increments the time setting by 1 second (maximum of 25sec)
PROG3 - Decrements the time setting by 1 second (minimum of 0sec)
PROG4 - Saves the current duration setting and returns to the LAM Programming Screen



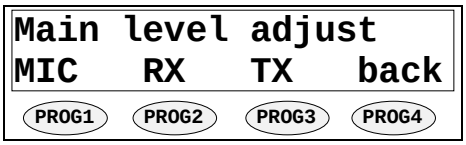
6.2.1.2.2 LAM Trigger Level Screen

This parameters determines the audio level required to trigger the LAM function.

PROG1 - Adjusts level at which the LAM triggers
PROG2 - Increments the level setting by 1 dBm (max of 0dBm)
PROG3 - Decrements the level setting by 1 dBm (min of -30dBm)
PROG4 - Saves the current level setting and returns to the LAM Programming Screen

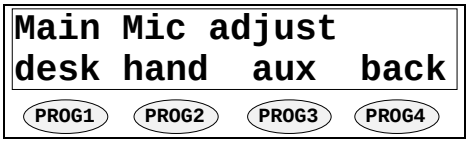
6.2.2 Main Level Settings

PROG1 - Go to Microphones Screen
PROG2 - Go to Receive Path Level Screen
PROG3 - Go to the Transmit Level Screen
PROG4 - Return to Opening Menu



6.2.2.1 Microphones Screen

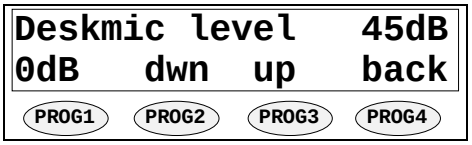
PROG1 - Go to Desk microphone Preamp Gain Screen
PROG2 - Go to Handset Preamp Gain Screen
PROG3 - Go to the aux input levels screen
PROG4 - Return to Main Level Settings screen



6.2.2.1.1 Desk microphone Preamp Gain Screen

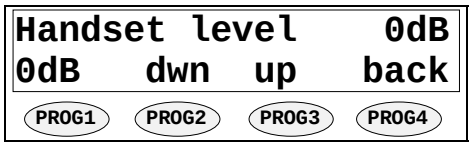
The current setting is shown in the upper right hand corner of the screen. This setting is for the pre-amp level of the deskmic.

PROG1 - Resets level setting to default of +0dB
PROG2 - Increments the level setting by 1 dB (maximum of +10dB)
PROG3 - Decrements the level setting by 1 dB (minimum of -10dB)
PROG4 - Saves the current level setting and returns to the Microphones screen



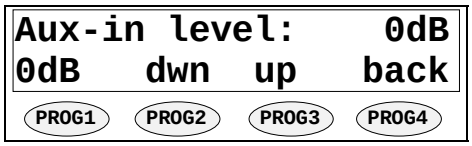
6.2.2.1.2 Handset Preamp Gain Screen

PROG1 - Resets level setting to default of +0dB
PROG2 - Increments the level setting by 1 dB (max of +10dB)
PROG3 - Decrements the level setting by 1 dB (min of -10dB)
PROG4 - Saves the current level setting and returns to the



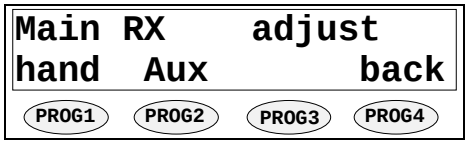
6.2.2.1.3 Aux Preamp Gain Screen

PROG1 - Resets level setting to default of +0dB
PROG2 - Increments the level setting by 1 dB (max of +10dB)
PROG3 - Decrements the level setting by 1 dB (min of -10dB)
PROG4 - Saves the current level setting and returns to the



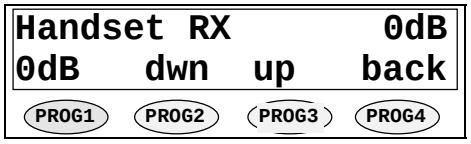
6.2.2.2 Receive Path Levels

PROG1 - Go to Desk microphone Preamp Gain Screen
PROG2 - Go to Handset Preamp Gain Screen
PROG4 - Return to Main Level Settings screen



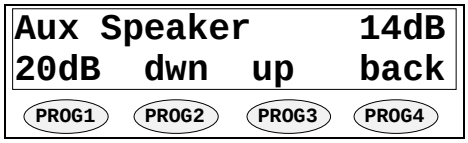
6.2.2.2.1 Handset Earpiece Level

PROG1 - Resets level setting to default of +0dB
PROG2 - Increments the level setting by 1 dB (maximum of +10dB)
PROG3 - Decrements the level setting by 1 dB (minimum of -10dB)
PROG4 - Saves the current level setting and returns to the Receive



6.2.2.2.2 Aux Speaker Output Level

PROG1 - Resets level setting to default of +0dB
PROG2 - Increments the level setting by 1 dB (maximum of +10dB)
PROG3 - Decrements the level setting by 1 dB (minimum of -10dB)
PROG4 - Saves the current level setting and returns to the Receive

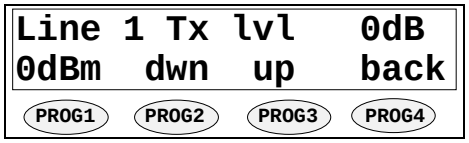


6.2.2.3 Output Level Screens

Entering the TX output level screen allows for setting two options for output levels. The first is for the audio TX level, and the second is for the Tape output level.

6.2.2.3.1 TX Output Level

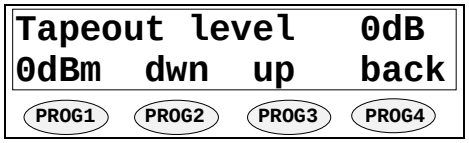
The TX output level is adjusted as shown on the display. This is an overall output gain control for the line. It can be used to make small adjustments to the line level performance. The typical value is 0 dB.



PROG1 - Resets level setting to default of 0dBm
PROG2 - Increments the level setting by 1 dBm (max of +10dBm)
PROG3 - Decrements the level setting by 1 dBm (min of -10dBm)
PROG4 - Saves the current level setting and returns to the Line Level Setting screen

6.2.2.3.2 Tape Output Level (v4.5)

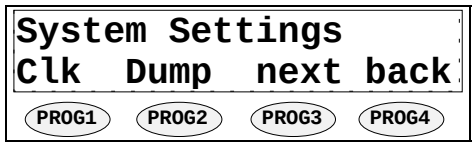
The Tape output level is adjusted as shown on the display. The level will be dependent on the input level required by your recording equipment.



PROG1 - Resets level setting to default of 0dBm
PROG2 - Increments the level setting by 1 dBm (max of +10dBm)
PROG3 - Decrements the level setting by 1 dBm (min of -10dBm)
PROG4 - Saves the current level setting and returns to the Line Level Setting screen

6.3 System Settings Screen

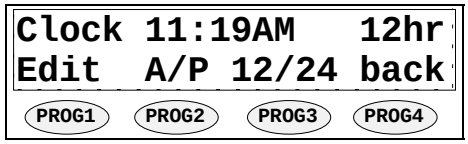
This menu is entered by selecting PROG2 from the PROGRAMMING MODE menu. Once in this mode there are 7 different menus that can be entered. Each is brought up sequentially by pressing the PROG3 button labeled next on the display.



PROG1 - Clock Set Routines
PROG2 - Dump setup memory to another console
PROG3 - Next Menu
PROG4 - Return to Opening Menu

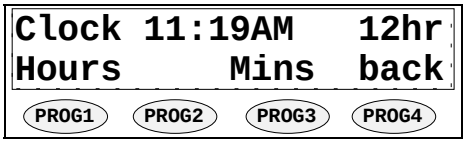
6.3.1 Clock Settings Screen

The top line of the Clock Settings Screen holds the current time and whether the clock is set for 12 or 24 hour display. **Note: The clock can also be accessed by pressing MUTE-F6-C on the keypad. This goes directly to the clock setup screen shown at the right. This bypasses the PIN number entry (if enabled) and allows a user who would normally have no access to the setup mode to access and update the clock (v4.5).**



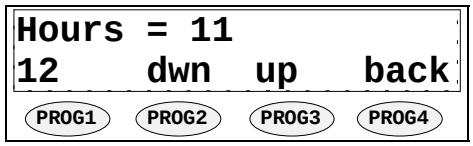
PROG1 - Allows editing the minutes and hours
PROG2 - Selects between AM and PM
PROG3 - Selects between 12 and 24 hr time.
PROG4 - Saves the current settings and returns to the Opening Menu

6.3.1.1 Clock Edit Screen



PROG1 - Go to Hours Settings Screen
PROG3 - Go to Minutes Settings Screen
PROG4 - Return to System Settings Screen

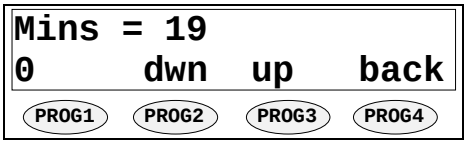
6.3.1.1.1 Clock Hours Screen



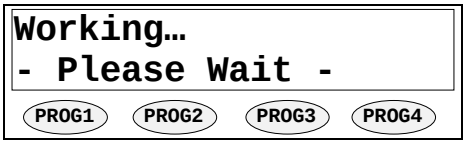
PROG1 - Set Hours to 12
PROG2 - Decrease Hours by 1
PROG3 - Increase Hours by 1
PROG4 - Return to Clock Settings Screen

6.3.1.1.2 Clock Minutes Screen

PROG1 - Set Minutes to 0
PROG2 - Decrease Minutes by 1
PROG3 - Increase Minutes by 1
PROG4 - Return to Clock Settings Screen



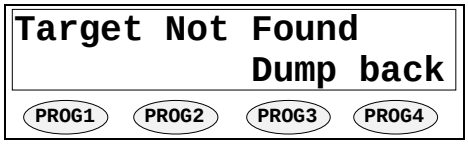
6.3.2 Dump Function



When the dump button on the System Settings Screen is pressed the console assumes the role of the master of the serial bus. A DB9 male to male null modem cable (3 pin RS-232cable) should be used to connect the two consoles. Cross pins 2 and 3 on the cable and connect pin 5 straight through. The master attempts to establish communication with a slave console and begin downloading the contents of the EEPROM resident on the master console. Upon successful connection to a slave console, the status line will appear on the screen. When the download is complete the Master screen returns to the System Settings Screen. If the proper acknowledgments are not received the transmission stops and the Dump Error Screen is displayed.

6.3.2.1 Dump Error Screen

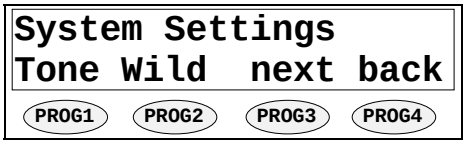
This screen is displayed because an attempt to perform a memory dump was ended unsuccessfully for some reason. This stays up until the memory dump is aborted by pressing the "back" button or is attempted again by pressing the "Dump" button. When the dump is attempted again the display returns to the Dump Screen.



PROG3 - Attempt memory dump again
PROG4 - Return to System Settings Screen

6.3.3 Menu 2 System Setup Screen

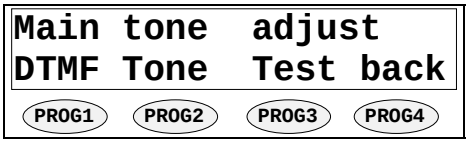
Pressing PROG3 from the system menu yields the following menu.



PROG1 - Enters the Tone Settings Screen
PROG2 - Enters the Wildcard Settings Screen
PROG3 - Next Menu
PROG4 - Returns to the System Setup Menu

6.3.3.1 Tone Settings Screen

PROG1 - Go to DTMF Settings Screen
PROG2 - Go to Single Tone Settings Screen
PROG3 - Go to Test Tone Screen
PROG4 - Return to System Settings Screen



6.3.3.1.1 DTMF Settings

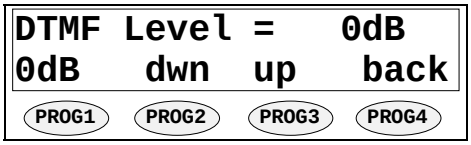
6.3.3.1.1.1 First DTMF Settings Screen

DTMF programmed characteristics are displayed on the top line in two separate screens. The programmed level is first and the hand timer is second

PROG1 - Go to DTMF Output Level Screen
PROG2 - Go to DTMF Hang Time Screen
PROG3 - Go to DTMF Spacing Screen
PROG4 - Return to Tone Settings Screen

6.3.3.1.1.1.1 DTMF Output Level

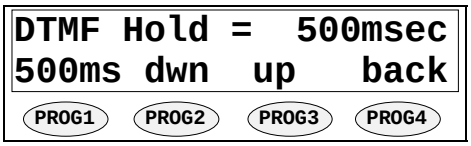
PROG1 - Resets level setting to default of 0dB
PROG2 - Decrements the level setting by 1 dB (minimum of -20dB)
PROG3 - Increments the level setting by 1 dB (maximum of +5dB)



PROG4 - Saves the current level setting and returns to the DTMF Settings screen

6.3.3.1.1.2 DTMF Hold Timer

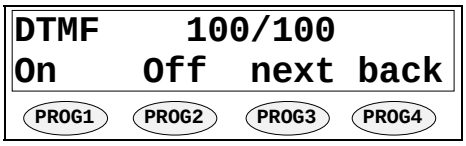
The Hold timer is used to instruct the console in how long to wait for an additional DTMF digit to be pressed before releasing the guard tone. This prevents the console from keying up and down each time a digit is pressed.



PROG1 - Resets level setting to default of 500 ms
PROG2 - Decrements the level setting by 10 ms
PROG3 - Increments the level setting by 10 ms
PROG4 - Saves the current level setting and returns to the DTMF Settings screen

6.3.3.1.1.2 Second DTMF Settings Screen

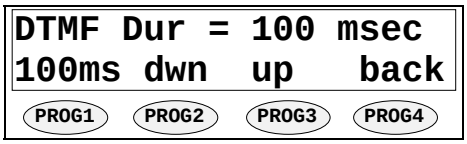
The 100/100 stands for 100ms DTMF tone and 100ms spacing before the next DTMF tone is transmitted. These settings are used primarily when the console is sending a pre-programmed string of digits.



PROG1 - Go to DTMF On time digit setting screen
PROG2 - Go to DTMF Inter digit setting screen
PROG3 - Go to DTMF second screen
PROG4 - Return to Tone Settings Screen

6.3.3.1.1.2.1 DTMF Tone Duration

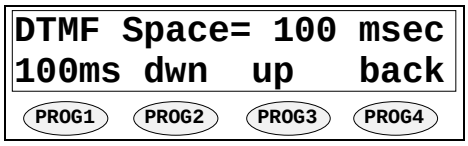
This parameter determines how many milliseconds the DTMF tone of a prestored digit will last. The first number in the 100/100 represents the number of "on" milliseconds.



PROG1 - Resets duration setting to default of 100ms
PROG2 - Decrements the duration setting by 10ms (min of 10ms)
PROG3 - Increments the duration setting by 10ms (max of 500ms)
PROG4 - Saves the duration and returns to the DTMF Settings screen

6.3.3.1.1.2.2 DTMF Tone Spacing

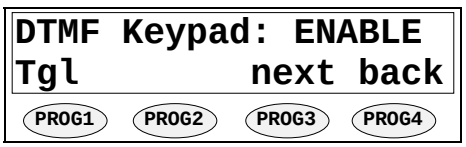
This parameter determines how many milliseconds after the last DTMF tone is finished before the next DTMF tone of a prestored string will start. The second number in the 100/100 represents the number of spacing milliseconds.



PROG1 - Resets duration setting to default of 100ms
PROG2 - Decrements the duration setting by 10ms (min of 10ms)
PROG3 - Increments the duration setting by 10ms (max of 500ms)
PROG4 - Saves the current duration setting and returns to the DTMF Settings screen

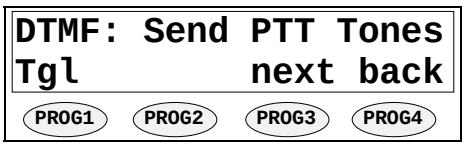
6.3.3.1.1.3 DTMF Keypad Enable/Disable (v3.7)

This screen allows the DTMF keypad to be disabled completely during operation of the unit. This would only be set to DISABLE for systems that have no requirement for DTMF operation.



PROG1 – Toggle DTMF Enabled or Disabled
PROG3 - Go to the forth DTMF screen
PROG4 - Return to Tone Settings Screen

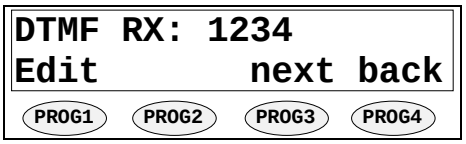
6.3.3.1.1.4 Enable/Disable PTT tones with DTMF (v3.7)



This setting governs whether PTT functions are generated when the DTMF keypad is used without the IC or PTT key. If this option is set to "Send PTT Tones" the unit will check the line(s) that are selected and see if they are set to be tone or local relay control. When the DTMF digit is pressed, depending on the selected lines configuration a PTT tone burst or local relay closure will occur before the DTMF digit starts transmission. If this option is set to "No PTT Tones", no PTT function will be sent and the DTMF audio will be placed onto the selected lines.

PROG1 – Toggle DTMF PTT function on or off
PROG3 - Go to the fifth DTMF screen
PROG4 - Return to Tone Settings Screen

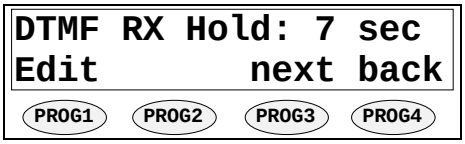
6.3.3.1.1.5 Incoming Select Call DTMF String Setup (v4.5)



The C-1610 has the capability of recognizing a DTMF string incoming on any line, monitored or not. When this programmable string is decoded, the unit will Unselect the line for a programmable period of time to allow the remote user the opportunity to make a short transmission which the console operator can monitor. After the programmable period of unselect time has expired, the Unselect LED (Red led) for the line on which the DTMF string was decoded begins to flash and continues to flash until a PTT operation is completed on that line. This blinking light serves as a reminder to the console operator that a call came in and needs to be responded to. Editing the incoming DTMF sequence is completed from the screen pictured above. The digits are entered with the DTMF keypad and the programmable keys.

PROG1 – Enter the Edit Screen
PROG3 - Go to the sixth DTMF screen
PROG4 - Return to Tone Settings Screen

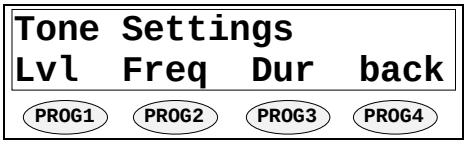
6.3.3.1.1.6 Select Call Timer Duration Setup (v4.5)



The Unselect duration for incoming select call (see previous section for string and overall function setup information) is set in this screen. The default value is 7 seconds. This is the period of time for which the line will be unselected when the DTMF string is received. After this period of time, the line is no longer unselected, but will blink until the console operator performs a PTT operation on the line. The value for this duration is setup using the Edit key (Prog1). The edit screen allows the value to be increased and decreased in increments on one.

PROG1 – Enter the Edit Screen
PROG3 - Go to the first DTMF screen
PROG4 - Return to Tone Settings Screen

6.3.3.1.2 Single Tone Settings



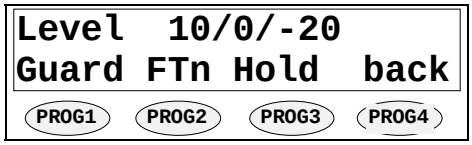
PROG1 - Go to Guard/Function/Hold Level Settings
PROG2 - Go to Guard/Hold Frequencies
PROG3 - Go to Guard/Hold Duration's
PROG4 - Return to Tone Settings Screen

6.3.3.1.2.1 Guard/Function/Hold Level Settings

The top line of this screen has a three number list representing the level of each tone components of a tone burst. In the default example, +10/+00/-20, +10 is the guard tone level, +00 is the function tone level, and -20 is the hold tone level.

On this screen the technician is able to use the PROG buttons to select which tone level to modify. If PROG1 is pressed, for example, the display cursor shall jump to the Guard tone setting (in this case, the "+10" text. The technician shall enter a new setting by way of the DTMF keypad. Magnitude limits apply. The acceptable range for the tone levels is -30dB to +10dB in 1 dB increments.

PROG1 - Adjust Guard tone level
PROG2 - Adjust Function tone level
PROG3 - Adjust Hold tone level
PROG4 - Return to Single Tone Settings Screen
DTMF keypad (numbers only) - modify the settings

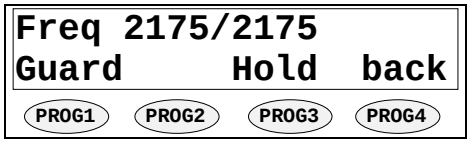


6.3.3.1.2.2 Guard/Hold Frequencies

The top line of this screen shows two numbers representing the frequency of each of the tone components of a tone burst. In the default example, 2175/2175, the first 2175 is the guard tone level, and the second 2175 is the hold tone level.

On this screen the technician is able to use the PROG buttons to select which tone frequency to modify. If PROG1 is pressed, for example, the display cursor shall jump to the Guard tone setting (in this case, the first "2175" text. Only two values are available for the Guard and Hold frequencies. When the Guard or Hold tone frequencies are selected to be changed, a toggle option will allow them to be set to either 2175 or 2300 Hz. The notch filter is automatically changed to match the Hold tone.

PROG1 - Adjust Guard tone frequency
PROG3 - Adjust Hold tone frequency
DTMF keypad (numbers only) - modify the settings

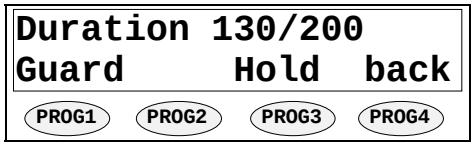


6.3.3.1.2.3 Guard/Hold Duration's

The top line of this screen has two numbers representing the duration of each of the tone components of a tone burst. In the default example, 130/200, 130 is the length in milliseconds that the guard tone is transmitted. 200 is the number of milliseconds that the console shall remain in the PTT condition after the PTT signal has been removed. This provides a debounce function for the tone burst.

On this screen the technician is able to use the PROG buttons to select which tone duration to modify. If PROG1 is pressed, for example, the display cursor shall jump to the Guard tone setting. The technician can then enter a new setting by way of the DTMF keypad. Magnitude limits apply. The acceptable range for the tones is 40 to 500 milliseconds in 10ms increments.

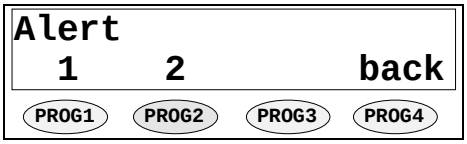
PROG1 - Adjust Guard tone duration
PROG3 - Adjust Hold tone duration
PROG4 - return to the Single Tone Settings Screen
DTMF keypad (numbers only) - modify the settings



6.3.3.1.3 Test Tone Screen

This screen allows the technician to control the tone generators on the console to facilitate testing. Pressing the PROG1 or PROG2 button activates the associated alert tones. This tone is transmitted out the line immediately upon the key being pressed and will stop of the button is pressed again or change to the other alert tone by pressing the other button. This procedure is different from the normal tone function as there is no tone burst or hold tone associated with the alert tone. The actual alert tones can be programmed by altering the programming of the Alert key.

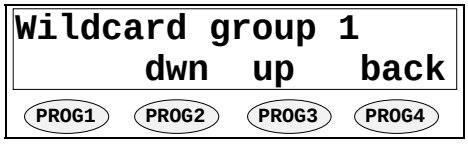
PROG1 - Pressed on/off alert tone 1
PROG2 - Pressed on/off alert tone 2
PROG4 - return to the Test Tone Screen



6.3.3.2 Wildcard Programming

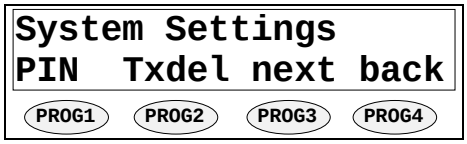
This screen facilitates the programming of the wildcard groups. There are four available wildcard groups. The screen defaults to group 1. All the function tones that are part of group 1 will light their LED. While the text "group 1" shows on the screen, function tones maybe selected in and out of the group. If the Up or Down or Back buttons are pressed the last configuration of function tones are saved as group 1. Pressing the Up button increases the group number while Down decreases the group number. The maximum group number is 4. Function tones 1 and 2 are not allowed in a wildcard group and a function tone may not be part of more than one group.

PROG2 - Decrement group counter (minimum value of 1)
PROG3 - Increment group counter (maximum value of 4)
PROG4 - return to the System Settings Screen
F3 through F10 Buttons - Toggle in and out of the displayed group



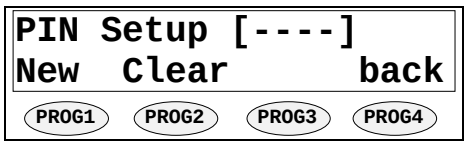
6.3.4 Menu 3 System Setup Screen

PROG1 - setup the console PIN number
PROG2 - setup the Tx delay time
PROG3 - Next Menu
PROG4 - Returns to the System Setup Menu

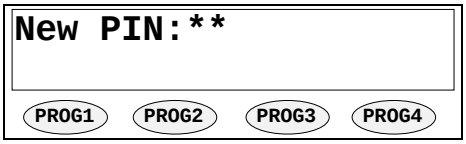


6.3.4.1 PIN Number Entry

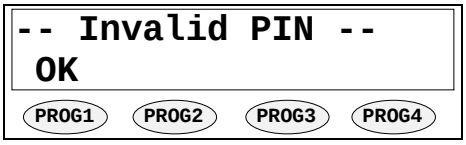
Entering a PIN number, will cause the C-1610, when entering tech mode, to prompt for the PIN number. If the correct PIN number is entered tech mode is entered. If it is not, operating mode is resumed. This will keep unauthorized modifications from occurring.



PROG1 - Begin accepting new PIN
PROG2 - Clear existing PIN such that none is required
PROG4 - Return to Menu 3

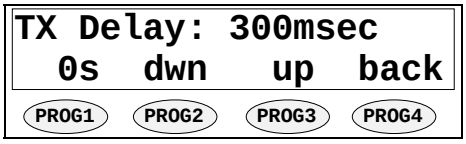


Pressing New will change the screen to prompt for a PIN number to be entered. Only the Buttons 0-9 and A-D are valid for this operation. The PIN is a 4 digit code. '*' will be echoed for each keystroke. Entry ends immediately upon the entry of the fourth digit. Once the PIN has been entered the first time, the system will prompt for it to be re-entered to verify proper entry. If the first and second PIN entries match, the user will be returned to the PIN Setup screen. If the entries do not match an error will be put on the screen and the PIN number will be cleared.



6.3.4.2 TX Delay Setup

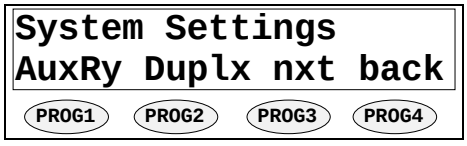
The C-1610 has the ability to delay transmit audio by up to 1 second. This allows an operator to begin speaking as soon as the microphone is keyed up. The radio system will have certain delays built in that under normal circumstances would not allow speech to be transmitted for a short period of time. By turning on this delay, this limitation is overcome.



PROG1 - Set the delay to 0 seconds (off)
PROG2 - Decrease the delay by 0.1 seconds
PROG3 - Increase the delay by 0.1 seconds
PROG4 - Returns to Menu 4 and saves the current delay

6.3.5 Menu 4 System Setup Screen

PROG1 - setup the auxiliary relay function
PROG2 - setup the Duplex function
PROG3 - Next Menu (Menu 1)
PROG4 - Returns to the System Setup Menu



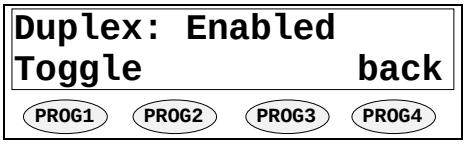
6.3.5.1 Auxiliary Relay Function

This allows the closure of the AUX relay C closure when PTT is pressed.

PROG2 - Set the relay to not close during PTT
PROG3 - Set the relay to close during PTT
PROG4 - Return to Menu 4

6.3.5.2 Duplex Enable

The Duplex mode allows the console operator to hear receive audio while transmitting.



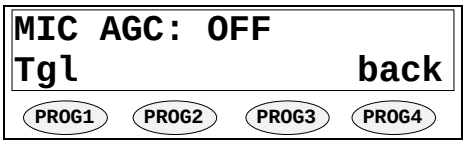
PROG1 - Toggle Duplex Mode Enabled/Disabled
PROG4 - Return to Menu 4

6.3.6 Menu 5 System Setup Screen

PROG1 - setup the MicAGC Function
PROG3 - Next Menu (Menu 1)
PROG4 - Returns to the System Setup Menu

6.3.6.1 MicAGC Function

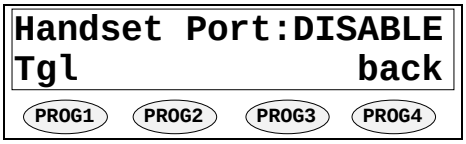
This enables and disables Automatic Gain Control on the Mic Input.



PROG1 - Toggle the MicAGC function on and off
PROG4 - Return to Menu 5

6.3.6.2 Handset installed

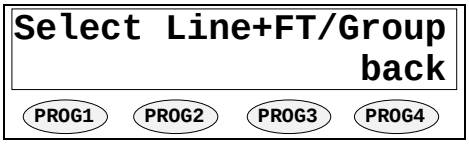
If a handset or headset is to be used with the unit, it must be programmed as such in this location. It is required for RX audio routing.



PROG1 - Toggle the Handset Yes/No
PROG4 - Return to Menu 5

6.4 Alphanumeric Function-Line Setup

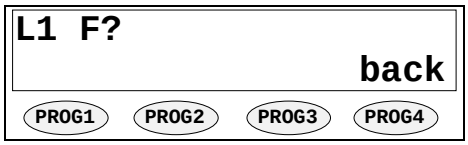
This screen asks for the operator to choose a Line/Function tone combination or a Group to have an alphanumeric assignment or group alphanumeric assignment. While this screen is displayed, the keyboard blinks LN1-LN6, F1-F10, and GRP to remind the operator what buttons are used in this mode for programming.

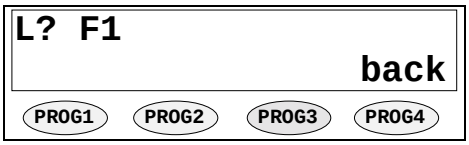


PROG4 - Return to the Opening Menu
Line button - Go to Line/FTone Selection Screen
Function tone button - Go to Line/FTone Selection Screen
GRP button - Go to Group selection screen

6.4.1 Line/FTone Selection Screen

This screen displays the line or function tone number selected from the Alphanumeric Decision Screen. It waits for the other piece of information (line or function tone number) and then proceeds to the Line Alphanumeric Selection Screen. If the function tone has been selected first, as in the example on the right, the screen waits for the line



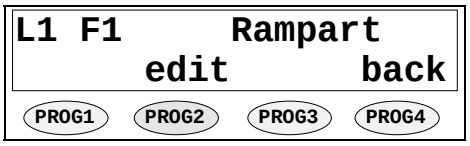


number to be selected. If the technician selects another function tone number before selecting a line number the screen shall update to accommodate the new function tone number. The same procedure is used if the line number is the first to be selected (left example.)

PROG4 - Return to the Alphanumeric Decision Screen
Line button - selects the line number to be programmed with alphanumeric
Function tone button - selects the function tone number to be programmed

6.4.1.1 Line Alphanumeric Selection Screen

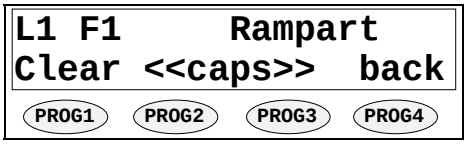
Once both the line and function tone have been selected the following screen is displayed. The top line displays the line and function tone number as well as the 8 digit alphanumeric that is displayed whenever the line/function tone number combination is brought up in the operational mode. The example figure below shows the current alphanumeric. Once at this screen the technician is able to enter alphanumeric via the DTMF pad



PROG2 - Enters the string editing mode
PROG4 - Returns to the Alphanumeric Decision Screen

6.4.1.1.1 Line Alphanumeric Programming Screen

Entering the edit mode yields the screen below.

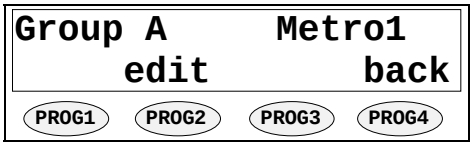


PROG1 - Clears the current string
PROG2 - Moves the blinking cursor one position to the left
PROG3 - Moves the blinking cursor one position to the right
PROG4 - Saves the string and returns to the edit screen

When a button that is part of the DTMF keypad is pressed the characters on that button are placed in the location of the blinking cursor. The technician can cycle through the available characters of each button by pressing the button repeatedly. For example, pressing "1" on the DTMF keypad will place a "1" in the location of the cursor, pressing "1" again displays "A", and pressing "1" a third time displays a "B". The "C" button acts as a "caps lock" button. The current status of the caps lock button can be viewed in the middle bottom of the display. When the C button is pressed the display selects the case of the letters.

6.4.1.2.1 Group Alphanumeric Selection Screen

Once the group has been selected the following screen is displayed. The top line displays the group number and the 8 digit alphanumeric that is displayed when the preprogrammed group is brought up in the operational mode.



PROG2 - Enters the edit mode
PROG4 - Returns to the Alphanumeric Decision Screen

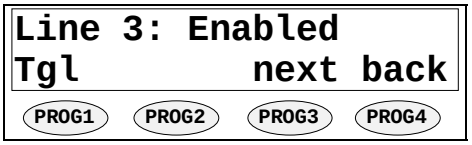
6.4.1.2.2 Group Alphanumeric Programming Screen

Editing the name of the group occurs exactly as it did for the Line/Function Tone combinations. See section 6.4.1.1.1 for specific information on this procedure.

6.5 Line Tone/Local Screen

The Line setup menus allows for the parameters unique to each line to be setup on a per line basis. Parameters that can be adjusted by pressing the LN1-LN6 keys from the top level menu include: Enable/Disabling of the line, Tone or Local control, Cross Mute, Squelch, TX Monitor, AGC, TX Enabled, and Unselect Audio Forced. The LN1-LN6 keys are active at all times in the menu; for example, to disable AGC on all lines, AGC could be selected on LN1, setup, then LN2-LN6 could immediately be pressed from within the AGC menu, eliminating going back and then back through the menus for each line.

6.5.1 Enable/Disable the Line

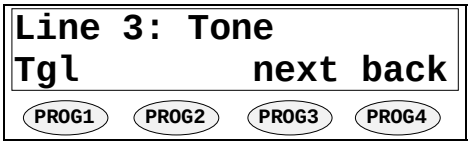


Disabling a line sets the line so that a user cannot either select or unselect its audio. No LED indicators will show if the line is disabled. In addition, it would generally be desired to set a line to be disabled if no card is present for that line. If no card is installed, and the line is selected, an error message will be shown saying that the line is not available and requiring the user to press the PROG1 button to continue. If the line is disabled from this menu, then the console just ignores the key.

PROG1 - Toggles the line from Enabled to Disabled
PROG3 - Moves to the next menu
PROG4 - returns to the Opening Menu Screen

6.5.2 Tone or Local Control

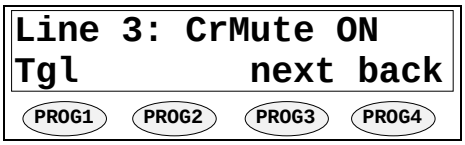
This screen allows the technician to determine if a line is tone control or local control. If a line is tone control then a tone burst is transmitted before voice is allowed to drive the line and a hold tone is sent out with the voice to provide a positive key for the remote adapter. If a line is a local control line then the tone generator is not activated and voice drives the line when the PTT button is pressed. The line number of the selected line appears in the top line of the display. The example shows that line 3 has been selected. The text at the right side of the top line shows which mode the line is programmed with.



PROG1 - Toggles the line from Tone to Local
PROG3 - Moves to the next menu
PROG4 - returns to the Opening Menu Screen

6.5.3 Crossmute Setup

The crossmute function allows consoles located within the same room to mute the other consoles RX audio while transmitting to prevent feedback. See Section 5 on how to connect this feature on the line cards. This feature can be turned on and off on a per line basis. Disabling crossmute does not disable the input. If the crossmute pin is connected, and the line is pulled low, the console will mute the line. The crossmute enable/disable function only controls the ability of the console to output crossmute. Note: Intercom will not work on lines with crossmute enabled.



PROG1 - Toggle the Cross Mute function ON and OFF
PROG3 - Move to the next menu
PROG4 - returns to the opening Menu Screen

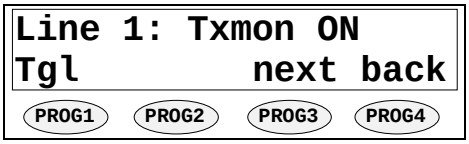
6.5.4 Squelch Setup

The Squelch function can be turned on a per line basis. It is tied to the level setup by the LAM function. If the LAM LED is blinking, squelch will not be active. If the audio present on the line is below that required to generate a LAM indication and squelch is enabled, no audio will be heard.

PROG1 - Toggle the Squelch function ON and OFF
PROG3 - Move to the next menu
PROG4 - returns to the opening Menu Screen

6.5.5 TX Monitor Enable/Disable

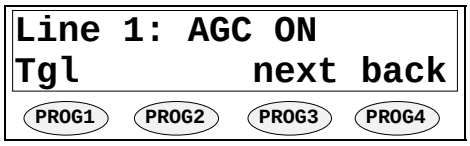
The TX monitor allows the operator to listen to what is currently being transmitted. In a 4 wire mode, this allows one console operator to monitor what is being said by another console operator. The other operator could be in the same room or a greater distance away.



PROG1 - Toggles TXmon on and off
PROG3 - Move to the next menu
PROG4 - Saves the setting and returns to the Line Level screen

6.5.6 Automatic Gain Control (AGC) Enable/Disable

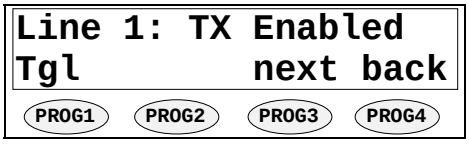
The Line Automatic Gain Control helps to equalize receive audio for all incoming levels.



PROG1 - Toggles AGC on and off
PROG3 - Move to the next menu
PROG4 - Saves the setting and returns to the Line Level screen

6.5.7 TX Enable/Disable per Line (v4.5)

TX can be enabled and disabled on a per line basis. This allows the some lines to be setup that can be used for monitoring purposes only, but cannot be selected for transmission.

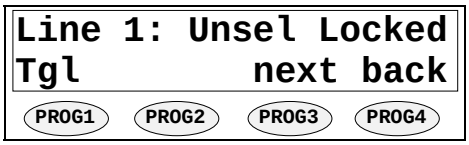


PROG1 - Toggles TX between Enabled and Disabled
PROG3 - Move to the next menu
PROG4 - Saves the setting and returns to the Line Level screen

6.5.8 Forced Unselect of a Line (v4.5)

This option is used to lock a channel into unselect mode. Once locked, the console operator can select the channel for transmission, but there will be no way to stop monitoring the channel once locked into unselect mode. The Unsel LED (Red) will always be illuminated when the line is not selected.

PROG1 - Toggles Unselect between Normal and Locked
PROG3 - Move to the next menu
PROG4 - Saves the setting and returns to the Line Level screen

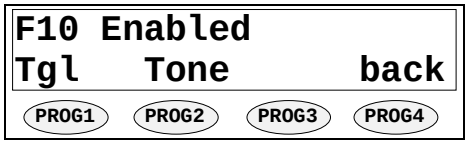


6.6 Function Tone Parameter Screen

6.6.1 Function Tone Enabled/Disable

The function tone parameter screen is entered by pressing F1-F10 from the main setup screen. The examples below appear if F10 is pressed.

PROG1 - Toggle between the Enabled and Disabled
PROG2 - Go to the Frequency programming screen
PROG4 - return to Opening Menu Screen



6.6.2 Function Tone Setup

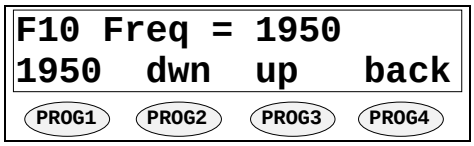
The top line of the display shows the function number, and whether the tone displayed is the A or B tone. Each function button can have up to two tones assigned to it which are sent out sequentially. The next item is the actual frequency of the function tone, followed by the duration of the tone in milliseconds.

PROG1 - Selects the settings for Function Tone A or B
PROG2 - Allows editing of the Frequency of the Function Tone
PROG3 - Allows editing of the Duration of the Function Tone
PROG4 - Returns to the previous menu

6.6.3 Frequency Programming Screen

The frequency programming screen will allow the user to change the value of the displayed function tone. If A is selected, A will be edited and the same holds true for B.

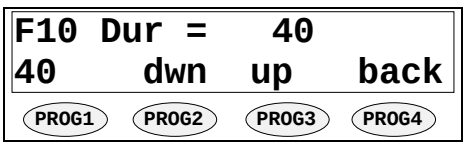
PROG1 - Sets the value back to the default of 1950 Hz
PROG2 - Decreases the frequency by 1 Hz
PROG3 - Increases the frequency by 1 Hz
PROG4 - returns to the function tone setup menu



6.6.4 Duration Display Screen

The Duration Display Screen shows the duration of the select function tone and displays it on the top line of the display for editing.

PROG1 - Sets the value back to the default of 40ms
PROG2 - Decreases the frequency by 1 ms
PROG3 - Increases the frequency by 1 ms
PROG4 - returns to the function tone setup menu



6.7 Unselect Setup Options

6.7.1 Unselect Audio Routing

The Unselect Audio can be routed to either the main internal speaker where it is mixed with the select audio, or it can be routed to the Auxiliary Speaker connector on the rear of the unit. When routed to the external location, it allows for unselect audio to be separated to an externally amplified speaker. This is useful when the console operator needs to separate audio being monitored from audio on the selected channel.

PROG1 - Changes the option between Internal and External routing
PROG3 - Moves to the next menu for Unselect audio setup
PROG4 - Return to top level menus

6.7.2 Unselect Audio Mute (v4.5)

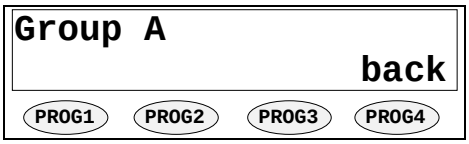
This option is used to Mute all Unselect audio during a PTT operation.

PROG1 - Changes the option between Enabled and Disabled
PROG3 - Moves to the first menu for Unselect audio setup
PROG4 - Return to top level menus

6.8 Group Selection Screen

This screen awaits the selection of A, B, C, or D from the DTMF pad. It is entered by pressing the GRP button when flashing.

PROG4 - return to top level menus
DTMF keypad - Only A, B, C, and D are valid buttons for this screen

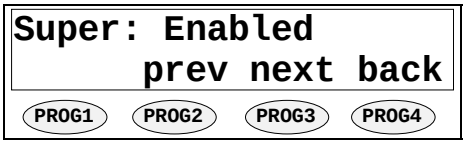


After the selection of the Group letter (A-D) Ln1-6 can be pressed to toggle those lines to be part of the selected group.

6.9 Supervisor Enable

The supervisor function works in a manner similar to crossmute. It allows a single console to take control of all selected lines by disabling transmit on all other attached consoles. See section 5 for information on the wiring required to support this function. This function should only be enabled on consoles on which a supervisory function is appropriate.

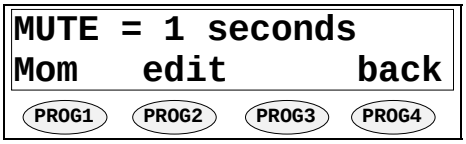
PROG2 - Disables Supervisory Capability
PROG3 - Enables Supervisory Capability
PROG4 - Return to top level menus



6.10 Mute Button Setup

The mute button has two separate modes of operation. One is the momentary mode where all Unselect audio is muted for as long as the button is held down. The second mode is the timed mute function in which the Unselect audio is muted for a preset amount of time. Note that the mute button can be pressed a second time during a timed mute to end the mute function prematurely.

PROG1 - Sets the Mute function to Momentary mode and eliminates the options to set the duration.
PROG2 - Allows the duration of the mute function to be changed.
PROG4 - Return to top level menus

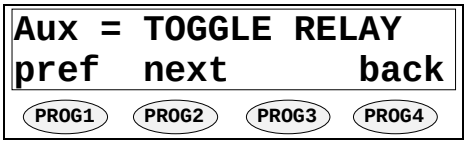


6.11 AUX Assignment

The AUX button is included to allow easy updates and customization to the console. As a standard unit, the AUX button may be assigned one of the following tasks:

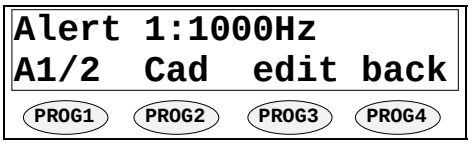
Task	Label
DTMF store and transmit	DTMF
Second Alert tone	ALERT
Toggle relay control	TOGGLE RELAY
Momentary relay control	MOM RELAY

The label is displayed after the "AUX =" text on the top line of the display. Pressing the "scroll" button will change the task assigned to the AUX button. The new mode is displayed on the screen.



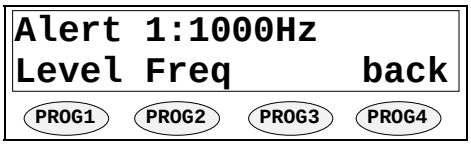
PROG1 - scroll forward through the assigned tasks
PROG2 - scroll backwards through the assigned tasks
PROG4 - save the setting and return to the main menu

6.12 Alert Cadence Programming



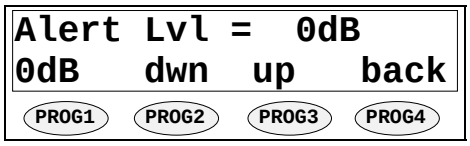
The following appears if the ALERT button is pressed while the Opening Menu Screen is showing. This screen allows the technician to change the cadence of the alert tones. PROG1 selects between the two alert options. Alert 1 dictates which tone cadence will go out with the ALERT button. Alert 2 dictates which cadence will go out with the AUX button if it is configured as a second alert tone. The PROG2 button scrolls through the available cadences. Initially, only two cadences are possible, though provisions have been made for four.

PROG1 - Selects between Alert 1 and Alert 2
PROG2 - scrolls through the different cadences
PROG3 - Allows editing of the level or the level and frequency for the constant alert tone
PROG4 - return to the Opening Menu Screen



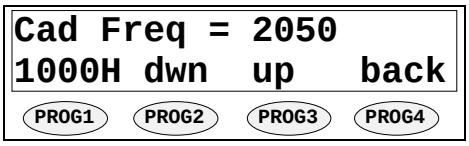
Cadence 1 is a steady programmable frequency
Cadence 2 is a Hi-Lo Warble sound

6.12.1.1 Cadence Level Selection



PROG1 - resets the level to the default of 0dBm
PROG2 - decrements the level by 1 dBm
PROG3 - increments the level by 1 dBm
PROG4 - return to the Alert setup menu

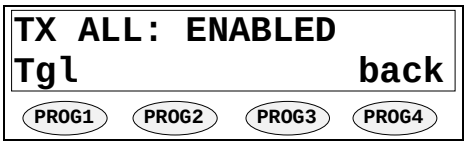
6.12.1.2 Cadence Frequency Selection



PROG1 - resets the frequency to the default value of 1000Hz
PROG2 - decrements the frequency by 1Hz (min freq of 0Hz)
PROG3 - increments the frequency by 1Hz (max freq of 3500Hz)
PROG4 - return to Alert Tone setup screen
DTMF keypad - may be used to program the frequency

6.13 TX ALL Programming Screen

The TX ALL function availability can be enabled or disabled based on the preference of the system administrator. Press TX ALL from the main tech mode menu allows this setup.

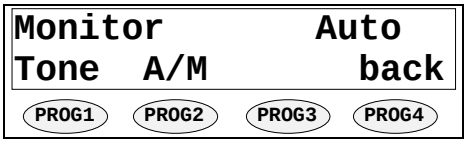


PROG1 - Toggles the TX ALL function ENABLED/DISABLED
PROG4 - Return to Opening Menu Screen

6.14 Monitor Programming Screen

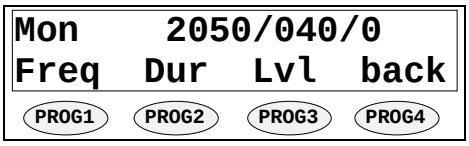
The Monitor Programming Screen is displayed when the MON button is pressed while the display is on the Opening Menu screen.

This screen allows the tone characteristics and whether a monitor tone burst shall automatically go out at the beginning of every offhook condition to be configured. "Auto" is the default and means that a monitor tone burst will go out every time the handset is taken off-hook. "Manual" means that a monitor tone burst will not go out with every off-hook signal.



PROG1 - Go to Monitor Tone Characteristic Selection
PROG2 - Selects between Auto and Manual mode
PROG4 - Return to Opening Menu Screen

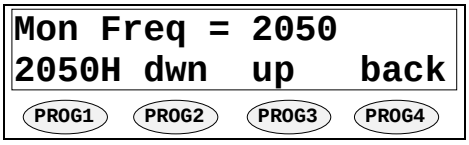
6.14.1 Monitor Characteristic Selection



PROG1 - go to Monitor Frequency Screen
PROG2 - go to Monitor Duration Screen
PROG3 - go to Monitor Level Screen
PROG4 - Return to Monitor Programming Screen

6.14.1.1 Monitor Frequency

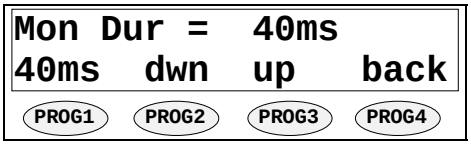
The Monitor burst normally consists of a 130ms guard tone and is followed by a 40ms monitor tone. In this screen the frequency of the monitor function tone is set. The programmed frequency is displayed as the first of three numbers. The default value is 2050Hz. The Up and Down buttons may be used to increment or decrement the frequency in 1Hz increments. The DTMF keypad may also be used.



PROG1 - resets the frequency to the default value of 2050Hz
PROG2 - decrements the frequency by 1Hz (min freq of 0Hz)
PROG3 - increments the frequency by 1Hz (max freq of 3500Hz)
PROG4 - return to Monitor Characteristic Screen
DTMF keypad - may be used to program the frequency

6.14.1.2 Monitor Duration

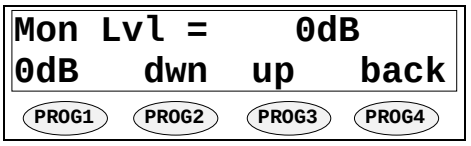
The Monitor burst normally consists of a 130ms guard tone and is followed by a 40ms monitor tone. In this screen the duration of the monitor function tone is set. The programmed duration is displayed in milliseconds as the second of three numbers. The default value is 40ms. The Up and Down buttons may be used to increment or decrement the duration in 10ms increments.



PROG1 - resets the duration to the default value of 40ms
PROG2 - decrements the duration by 10ms (minimum of 40ms)
PROG3 - increments the duration by 10ms (maximum of 500ms)
PROG4 - return to Monitor Characteristic Screen

6.14.1.3 Monitor Level

The Monitor burst normally consists of a 130ms guard tone at +10dB and is followed by a 40ms monitor tone at 0dB. In this screen the level of the monitor function tone is set. The programmed level is displayed in dB as the third of three numbers. The default value is 0dB. The Up and Down buttons may be used to increment or decrement the level in 1dB increments. The displayed level shall change to reflect the new programming.



PROG1 - resets the level to the default value of 0dB
PROG2 - decrements the duration by 1dB (minimum of -20dB)
PROG3 - increments the duration by 1dB (maximum of 10dB)
PROG4 - return to Monitor Characteristic Screen

7 Sample Setup Procedure

The following example sets up the audio levels on both the transmit and receive sides.

7.1 Transmit Path:

The transmit path begins at the microphone of your choice and ends with the transmit line card jack.

7.1.1 Microphone adjustments

There are two microphone inputs to the C-1610. Both inputs are accessible from the side of the unit. One is a four-wire connector and the other is a six-wire connector. The four-wire connector will accept either a handset or headset. The six-wire connector will accept either a desk microphone or a gooseneck microphone. Both connectors may be used at the same time. The six-wire connector has priority. Transmit audio from the six-wire connector is blocked only when the PTT of the four-wire connector is active.

Both the handset/headset and the desk/gooseneck microphone inputs go through dedicated preamplifier stages and are then brought into a cmos switch that selects the port to be connected to the ADC of the DSP by the PTT source. In setting the microphone levels the goal is to adjust the preamps so that nominal voice levels through both microphones (if two are being used simultaneously) are of equal level at the input of the ADC. The following procedures will guide you through the tuning process:

7.1.2 Adjusting handset/headset microphone levels

Make a vocal tone into the handset while adjusting R72 on the Main PCB for 3.5Vp-p at TP2. The sidetone level can be adjusted from within the tech mode. Speak into the handset and listen to the earpiece. You should hear a portion of your voice being routed back to the earpiece.

7.1.3 Adjusting desk microphone/gooseneck microphone levels

Make a vocal tone into the desk microphone/gooseneck microphone at the distance you expect the operator to be positioned and adjust R71 on the Main PCB for 3.5Vp-p at TP7.

7.2 Alert tone adjustments

The Alert tone button on the keypad produces a 1000Hz tone on the transmit audio. If no cards are in the transmit condition the console will key up the Selected cards and transmit the Alert tone. If the Selected cards are already in the transmit mode when the Alert button is pressed then the C-1610 will just add 1khz to the transmit audio path.

7.2.1 Alert tone frequency

The alert tone frequency is adjusted in the tech mode. See section 6 for more information. The alert tone can be adjusted in 1Hz increments to any desired value.

7.2.2 Alert tone level

The alert tone level is set in the tech mode. See section 6 for more information. The alert tone level can be adjusted in 1dBm increments.

7.3 Line Card Transmit Path Adjustment

Once the microphone audio has been digitized, the DSP will first route it through a 2175Hz notch filter to remove 2175Hz components from the voice. This is done to make sure that no component of the microphone audio will interfere with the 2175Hz hold tone. At the output of the notch filter the microphone audio is summed together with the last of the signaling components. From this point the total transmit audio mix is sent to the DAC and then to the individual output drivers of the Line Cards.

7.3.1 Transmit Level Adjustment

The transmit level setup potentiometers are used to adjust the levels of the transmit audio so that it’s calibrated with the onscreen level sets found in the tech mode. Calibration of the TX lines will vary depending on system variables

as well as the number of consoles found in parallel on the line. The tech mode should be used to generate a test tone of given amplitude. R55 and /or R56 should then be adjusted with a level meter used to set the actual output level to match the generated value.

7.3.2 Transmit Monitor

The four-wire transmit monitor provides a portion of the transmit audio to the receive path. This allows the console operator to listen to the transmissions of parallel consoles. To set this level have a parallel console operator intercom on the line to be set. Adjust R57 and/or R58 until the level is comfortable in the handset/headset earpiece or the speaker.

7.4 Receive Path

The Receive path begins at the input to the line card and ends with a speaker or earpiece. There are very few adjustment that need to be made to the receive path. The DSP will detect and compensate for most variations in audio levels.

7.4.1 Four-Wire or Two-Wire?

If the circuit is a four-wire circuit then J12 and J13 (Line 1,3,5) and/or J10 and J11 (Line 2,4,6) are in the B position. The RX impedance for the four-wire mode is generally 600 ohms. If this card is the only card on the line or if it is a terminating card for a group of cards hooked in parallel then the impedance of the RX side should be 600 ohms. This is accomplished by changing J9 (Line 1,3,5) or J8 (Line 2,4,6) to the A position. If a high impedance (10k) is required then place J9 (Line 1,3,5) or J8 (Line 2,4,6) in the B position.

If the circuit is a two-wire circuit then J12 and J13 (Line 1,3,5) and/or J10 and J11 are in the A position. The 600 ohm line impedance is provided by the TX side so RX impedance should be high. Move J9 (Line 1,3,5) and/or J8 (Line 2,4,6) to the B position for a 10k ohm RX impedance.

7.4.2 Receive Level Setup (Rev B Line Card only)

The receive side level potentiometers are used to adjust the input levels into a range that is acceptable to the C-1610. Typically, a +10dBm test tone is injected in to the C-1610 as receive audio. The audio level is then measured at TP2 for Line 1 and TP1 for Line 2 with respect to ground. The measurement should be about 3.4 Vpp or 1.2Vrms. However, if receive audio levels are not in the +10dBm range, these pots can be used to bring the audio level up to the desired receive levels. 3.4Vpp is about the maximum value for the loudest receive audio. Above 3.4Vpp will saturate the ADC input stage and distortion will occur.

7.4.3 Line Activity Monitor (LAM) / Squelch Control

The yellow LED in the above each Line button (LN1-LN6) is the LAM. It will blink when activity is on the line. The default level for the C-1610 console to trigger the LAM is -10 dBm. The trigger point can be changed within the tech mode. Note that the LAM can be used as a squelch circuit. The Select and Unselect audio paths may be independently controlled by the LAM. Both options can be configured in tech mode.

7.4.4 Recorder Output

A 600 ohm balanced notched audio output provides a summing of the transmit and receive audio's for the use of an external recorder. The actual audio sent to this output is the select and unselected audio. The output level can be controlled from within the tech mode.

7.4.5 Auxiliary Speaker Output

The auxiliary speaker output can be used to drive the unselect audio to an external amplified speaker, thereby eliminating it from the built in speaker. This can be useful if the console operator needs to be able to differentiate between the two audio sources. This outputs amplitude can be controlled from within the tech mode.

7.4.6 Earth Ground

While Telex-Vega recommends that the unit be tied to earth ground though the AUX power connector on the back of the unit, JP21 exist in the unit to allow the chassis ground to be tied to the signal ground of the unit. It is imperative that chassis ground to tied to some fixed reference for proper operation of the unit. The line filtering is dependent on a solid ground to function correctly.

8 Theory of Operation

The C-1610 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 generators and decoders, notch filters, tone generators and decoders, and all of the audio summing. A great deal 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 C-1610 that can be tested using a common oscilloscope and voltage meter by a qualified service technician.

8.1 Audio Input Paths

Audio can be input from three locations, not counting the line interfaces, including the desk microphone jack (J6, RJ-11 modular), handset jack (J5, RJ-12 modular) and the auxiliary connector on the rear of the unit. For each of these inputs, a single inverting Op-Amp gain stage exists to bring the level of the audio up to approximately 3.8Vp-p. This is the optimum level for the analog to digital converters (ADC). The desk microphone and handset share one half of the ADC (U23) with a CMOS switch (U22) being used to connect audio from the appropriate source to the actual input pin of the ADC. The trim potentiometers R71 and R72 set the audio levels from the handset and desk microphone jacks.

The auxiliary input (J4) is used to include an additional audio source into the transmit path. It has an integrated PTT input that when pulled low will select audio from this source for transmission. This input also utilizes a single inverting Op-Amp stage to set the input gain. The factory default setting is a gain of 1. If an external source or audio is to be used, its output level should be on the order of 3.5 Vp-p.

8.2 Audio Output Paths

All output audio is generated in the DSP and sent to the various Digital to Analog Converters (DACs) for export from the C-1610. The three DACs are U13, U14, and U15. Each of these is a dual channel DAC allowing for 6 different audio sources. Each is used for different purposes.

Starting with U13, the left output is used for the handset sidetone. It is sent through a unity gain Op-Amp stage and fed directly to the Desk microphone interface. Since the handset level can be controlled within the software of the C-1610 techmode, no gain set control is required for this circuit. The right channel of U13 is not used at this time.

U14's left channel is the TX audio source. This is the source of all the audio that gets transmitted. This includes control tones, DTMF, and voice. All audio for this output is generated in the DSP and generated in the analog domain from this DAC. The signal is fed through a single unity gain Op-Amp stage and then distributed to each of the line cards where it is further amplified and coupled out of the unit. The right channel of U14 is the Select Audio source. It utilizes a unity gain Op-Amp stage for buffering and then is sent to the speaker amp.

U15 is used for the unselect audio source and the tape jack output. The unselect audio is the left channel. It has a single Op-Amp stage in it. In addition, a connection is made to the unselect audio level knob on the front panel. From the output of the Op-Amp, a CMOS switch (U22) is used to determine the routing of the audio. A low input on Pin 10 of U22 causes audio to be routed to J3, the external speaker jack. A high input routes the audio to the internal speaker where it is summed with the select audio. The right channel of U15 is the tape jack output. A single Op-Amp is used to buffer the output of the DAC to a transformer which is used to set the 600 Ohm output.

8.3 Line Card Paths

The line card has two primary functions. First, the transmit audio is generated on the left channel of U14. From there is sent in parallel to all three card slots. Once the audio is on the card, it is fed to CMOS switches U2 and U3, which are used for mute control for each line. A gain set Op-Amp (U7 and U8) is used next with a trim pot (R55 and R56) to set the levels to compensate for line impedance's. Finally, the audio is sent through a pair of unity gain Op-Amps set to generate differential audio in the TX transformers (T3 and T4). The output of the transformers are then passed through a sequence of parts designed to protect the unit for RFI and other externally generated noise.
The receive path enters through RFI protection circuits into transformers T1 and T2. A single gain stage is used to set the levels of the incoming audio. The outputs of these are sent to the ADC (U9) that is resident on the card. For

this reason, the receive audio only exists for a short run on the line cards themselves before being converted to the digital format. Individual receive audio will not be found on the main board in analog form.

The receive path also has a tie in to the transmit path. One of the taps on the TX transformers (T3 and T4) is fed to an Op-Amp stage that is then summed into the receive path Op-Amp. Gain set Potentiometers (R57 and R58) can be adjusted to change the relative TX Monitor levels.

8.4 Keypad/Display Board

The Keypad board is a purely digital board with no user-serviceable parts. It consists of a 7 x 8 keyboard matrix, 39 LED drivers, and a driver for the 20x2 vacuum florescent display. TX and RX audio are not present on this board.

9 Line Card Installation

Installing and removing line cards can be completed in the field by qualified personnel. The steps for this process are listed below.

1) Remove power from the console.

2) Remove the four flathead screws holding the top of the case one. Two on each side. A phillips screw driver will be required.

3) The case top should be removed in a vertical direction until the finger on the left side of the case clears the tops of the handset and desk microphone jacks. At this point, move the case somewhat forward as the cable for the speaker amp will be right under the lip of the rear of the case. Once the case top is clear of the bottom, set the top on its sides to the left of the case. Sufficient cable length is available for this without disconnection of cables.

4) Remove the hole cover for the line card position you wish to install. The screw for this is located on the back panel.

5) Insert the card into the slot making sure that that two RJ-45 jacks are flush with the back of the C-1610.

6) Place the card hold down bracket in position and tighten the screw from the back side of the case. This locks the card into position.

7) Place the top back on by first making sure that the speaker amp RJ-45 cable is under the lip of the rear of the case.

8) Replace the four screws removed in the first step.

An exploded view of the case can be found with the schematics and parts placement drawings.

10 Programming Chart

Section	Parameter	Default	Programmed
6.3.4.1	PIN Number		
5.3.3	Line 1 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 1 RX Impedance	600 ohms	
5.3.3.2	Line 1 TX Impedance	600 ohms	
6.2.1.1	Line 1 RX Input Level	0dbm	
6.2.1.2.1	Line 1 LAM-S Release	7 seconds	
6.2.1.2.2	Line 1 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 1 LAM-U Release	7 seconds	
6.2.1.2.2	Line 1 LAM-U Trigger Level	-10dbm	
5.3.3	Line 2 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 2 RX Impedance	600 ohms	
5.3.3.2	Line 2 TX Impedance	600 ohms	
6.2.1.1	Line 2 RX Input Level	0dbm	
6.2.1.2.1	Line 2 LAM-S Release	7 seconds	
6.2.1.2.2	Line 2 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 2 LAM-U Release	7 seconds	
6.2.1.2.2	Line 2 LAM-U Trigger Level	-10dbm	
5.3.3	Line 3 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 3 RX Impedance	600 ohms	
5.3.3.2	Line 3 TX Impedance	600 ohms	
6.2.1.1	Line 3 RX Input Level	0dbm	
6.2.1.2.1	Line 3 LAM-S Release	7 seconds	
6.2.1.2.2	Line 3 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 3 LAM-U Release	7 seconds	
6.2.1.2.2	Line 3 LAM-U Trigger Level	-10dbm	
5.3.3	Line 4 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 4 RX Impedance	600 ohms	
5.3.3.2	Line 4 TX Impedance	600 ohms	
6.2.1.1	Line 4 RX Input Level	0dbm	
6.2.1.2.1	Line 4 LAM-S Release	7 seconds	
6.2.1.2.2	Line 4 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 4 LAM-U Release	7 seconds	
6.2.1.2.2	Line 4 LAM-U Trigger Level	-10dbm	
5.3.3	Line 5 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 5 RX Impedance	600 ohms	
5.3.3.2	Line 5 TX Impedance	600 ohms	
6.2.1.1	Line 5 RX Input Level	0dbm	
6.2.1.2.1	Line 5 LAM-S Release	7 seconds	
6.2.1.2.2	Line 5 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 5 LAM-U Release	7 seconds	
6.2.1.2.2	Line 5 LAM-U Trigger Level	-10dbm	
5.3.3	Line 6 2 or 4 Wire mode	4 wire	
5.3.3.1	Line 6 RX Impedance	600 ohms	

Section	Parameter	Default	Programmed
5.3.3.2	Line 6 TX Impedance	600 ohms	
6.2.1.1	Line 6 RX Input Level	0dbm	
6.2.1.2.1	Line 6 LAM-S Release	7 seconds	
6.2.1.2.2	Line 6 LAM-S Trigger Level	-10dbm	
6.2.1.2.1	Line 6 LAM-U Release	7 seconds	
6.2.1.2.2	Line 6 LAM-U Trigger Level	-10dbm	
6.2.2.1.1	Desk Mic Gain	0dbm	
6.2.2.1.2	Handset Mic Gain	0dbm	
6.2.2.1.3	AUX input Gain	0dbm	
6.2.2.2.1	Handset earpiece level	0dbm	
6.2.2.2.2	AUX SPKR level	0dbm	
6.2.2.3.1	TX Audio output level	0dbm	
6.2.2.3.2	Tape Output Level	0dbm	
6.3.3.1.1.1.1	DTMF output Level	0dbm	
6.3.3.1.1.1.2	DTMF Hold timer	500 msec	
6.3.3.1.1.2.1	DTMF ON Duration	100 msec	
6.3.3.1.1.2.2	DTMF OFF Duration	100 msec	
6.3.3.1.1.3	DTMF Keypad Enable	Enabled	
6.3.3.1.1.4	DTMF Generates PTT	Enabled	
6.3.3.1.1.5	DTMF Incoming Select Call	Empty	
6.3.3.1.1.6	DTMF Select Call Timer	7 sec	
6.3.3.1.2.1	Guard/Func/Hold Levels	10/0/-20	
6.3.3.1.2.2	Guard/Hold Frequency	2175HZ	
6.3.3.1.2.3	Guard Duration	130msec	
6.3.3.1.2.3	Hold Duration	200msec	
6.3.3.2	Wildcard group 1		
6.3.3.2	Wildcard group 2		
6.3.3.2	Wildcard group 3		
6.3.3.2	Wildcard group 4		
6.3.4.2	TX Delay	0msec	
6.3.5.1	AUX Relay w/PTT	OFF	
6.3.5.2	Duplex	Disabled	
6.3.6.1	Mic AGC	ON	
6.3.6.2	Handset Port	Disabled	
6.4.1.1.1	Alphanumeric L1-F1		
6.4.1.1.1	Alphanumeric L1-F2		
6.4.1.1.1	Alphanumeric L1-F3		
6.4.1.1.1	Alphanumeric L1-F4		
6.4.1.1.1	Alphanumeric L1-F5		
6.4.1.1.1	Alphanumeric L1-F6		
6.4.1.1.1	Alphanumeric L1-F7		
6.4.1.1.1	Alphanumeric L1-F8		
6.4.1.1.1	Alphanumeric L1-F9		
6.4.1.1.1	Alphanumeric L1-F10		
6.4.1.1.1	Alphanumeric L2-F1		
6.4.1.1.1	Alphanumeric L2-F2		

Section	Parameter	Default	Programmed
6.4.1.1.1	Alphanumeric L2-F3		
6.4.1.1.1	Alphanumeric L2-F4		
6.4.1.1.1	Alphanumeric L2-F5		
6.4.1.1.1	Alphanumeric L2-F6		
6.4.1.1.1	Alphanumeric L2-F7		
6.4.1.1.1	Alphanumeric L2-F8		
6.4.1.1.1	Alphanumeric L2-F9		
6.4.1.1.1	Alphanumeric L2-F10		
6.4.1.1.1	Alphanumeric L3-F1		
6.4.1.1.1	Alphanumeric L3-F2		
6.4.1.1.1	Alphanumeric L3-F3		
6.4.1.1.1	Alphanumeric L3-F4		
6.4.1.1.1	Alphanumeric L3-F5		
6.4.1.1.1	Alphanumeric L3-F6		
6.4.1.1.1	Alphanumeric L3-F7		
6.4.1.1.1	Alphanumeric L3-F8		
6.4.1.1.1	Alphanumeric L3-F9		
6.4.1.1.1	Alphanumeric L3-F10		
6.4.1.1.1	Alphanumeric L4-F1		
6.4.1.1.1	Alphanumeric L4-F2		
6.4.1.1.1	Alphanumeric L4-F3		
6.4.1.1.1	Alphanumeric L4-F4		
6.4.1.1.1	Alphanumeric L4-F5		
6.4.1.1.1	Alphanumeric L4-F6		
6.4.1.1.1	Alphanumeric L4-F7		
6.4.1.1.1	Alphanumeric L4-F8		
6.4.1.1.1	Alphanumeric L4-F9		
6.4.1.1.1	Alphanumeric L4-F10		
6.4.1.1.1	Alphanumeric L5-F1		
6.4.1.1.1	Alphanumeric L5-F2		
6.4.1.1.1	Alphanumeric L5-F3		
6.4.1.1.1	Alphanumeric L5-F4		
6.4.1.1.1	Alphanumeric L5-F5		
6.4.1.1.1	Alphanumeric L5-F6		
6.4.1.1.1	Alphanumeric L5-F7		
6.4.1.1.1	Alphanumeric L5-F8		
6.4.1.1.1	Alphanumeric L5-F9		
6.4.1.1.1	Alphanumeric L5-F10		
6.4.1.1.1	Alphanumeric L6-F1		
6.4.1.1.1	Alphanumeric L6-F2		
6.4.1.1.1	Alphanumeric L6-F3		
6.4.1.1.1	Alphanumeric L6-F4		
6.4.1.1.1	Alphanumeric L6-F5		
6.4.1.1.1	Alphanumeric L6-F6		
6.4.1.1.1	Alphanumeric L6-F7		
6.4.1.1.1	Alphanumeric L6-F8		

Section	Parameter	Default	Programmed
6.4.1.1.1	Alphanumeric L6-F9		
6.4.1.1.1	Alphanumeric L6-F10		
6.4.1.2.1	Alphanumeric Group 1		
6.4.1.2.1	Alphanumeric Group 2		
6.4.1.2.1	Alphanumeric Group 3		
6.4.1.2.1	Alphanumeric Group 4		
6.5.1	Line 1 Enable/Disable	Enable	
6.5.2	Line 1 Tone/Local	Tone	
6.5.3	Line 1 Crossmute	ON	
6.5.4	Line 1 Squelch	OFF	
6.5.5	Line 1 TX Monitor	OFF	
6.5.6	Line 1 RX AGC	ON	
6.5.7	Line 1 TX Enable	Enabled	
6.5.8	Line 1 Unselect Lock	Unlocked	
6.5.1	Line 2 Enable/Disable	Enable	
6.5.2	Line 2 Tone/Local	Tone	
6.5.3	Line 2 Crossmute	ON	
6.5.4	Line 2 Squelch	OFF	
6.5.5	Line 2 TX Monitor	OFF	
6.5.6	Line 2 RX AGC	ON	
6.5.7	Line 2 TX Enable	Enabled	
6.5.8	Line 2 Unselect Lock	Unlocked	
6.5.1	Line 3 Enable/Disable	Enable	
6.5.2	Line 3 Tone/Local	Tone	
6.5.3	Line 3 Crossmute	ON	
6.5.4	Line 3 Squelch	OFF	
6.5.5	Line 3 TX Monitor	OFF	
6.5.6	Line 3 RX AGC	ON	
6.5.7	Line 3 TX Enable	Enabled	
6.5.8	Line 3 Unselect Lock	Unlocked	
6.5.1	Line 4 Enable/Disable	Enable	
6.5.2	Line 4 Tone/Local	Tone	
6.5.3	Line 4 Crossmute	ON	
6.5.4	Line 4 Squelch	OFF	
6.5.5	Line 4 TX Monitor	OFF	
6.5.6	Line 4 RX AGC	ON	
6.5.7	Line 4 TX Enable	Enabled	
6.5.8	Line 4 Unselect Lock	Unlocked	
6.5.1	Line 5 Enable/Disable	Enable	
6.5.2	Line 5 Tone/Local	Tone	
6.5.3	Line 5 Crossmute	ON	
6.5.4	Line 5 Squelch	OFF	
6.5.5	Line 5 TX Monitor	OFF	
6.5.6	Line 5 RX AGC	ON	
6.5.7	Line 5 TX Enable	Enabled	
6.5.8	Line 5 Unselect Lock	Unlocked	

Section	Parameter	Default	Programmed
6.5.1	Line 6 Enable/Disable	Enable	
6.5.2	Line 6 Tone/Local	Tone	
6.5.3	Line 6 Crossmute	ON	
6.5.4	Line 6 Squelch	OFF	
6.5.5	Line 6 TX Monitor	OFF	
6.5.6	Line 6 RX AGC	ON	
6.5.7	Line 6 TX Enable	Enabled	
6.5.8	Line 6 Unselect Lock	Unlocked	
6.6.1	F1 Enable/Disable	Enable	
6.6.3	F1-A Frequency	1950HZ	
6.6.4	F1-A Duration	40 msec	
6.6.3	F1-B Frequency	0HZ	
6.6.4	F1-B Duration	40 msec	
6.6.1	F2 Enable/Disable	Enable	
6.6.3	F2-A Frequency	1850HZ	
6.6.4	F2-A Duration	40 msec	
6.6.3	F2-B Frequency	0HZ	
6.6.4	F2-B Duration	40 msec	
6.6.1	F3 Enable/Disable	Enable	
6.6.3	F3-A Frequency	1750HZ	
6.6.4	F3-A Duration	40 msec	
6.6.3	F3-B Frequency	0HZ	
6.6.4	F3-B Duration	40 msec	
6.6.1	F4 Enable/Disable	Enable	
6.6.3	F4-A Frequency	1650HZ	
6.6.4	F4-A Duration	40 msec	
6.6.3	F4-B Frequency	0HZ	
6.6.4	F4-B Duration	40 msec	
6.6.1	F5 Enable/Disable	Enable	
6.6.3	F5-A Frequency	1550HZ	
6.6.4	F5-A Duration	40 msec	
6.6.3	F5-B Frequency	0HZ	
6.6.4	F5-B Duration	40 msec	
6.6.1	F6 Enable/Disable	Enable	
6.6.3	F6-A Frequency	1450HZ	
6.6.4	F6-A Duration	40 msec	
6.6.3	F6-B Frequency	0HZ	
6.6.4	F6-B Duration	40 msec	
6.6.1	F7 Enable/Disable	Enable	
6.6.3	F7-A Frequency	1350HZ	
6.6.4	F7-A Duration	40 msec	
6.6.3	F7-B Frequency	0HZ	
6.6.4	F7-B Duration	40 msec	
6.6.1	F8 Enable/Disable	Enable	
6.6.3	F8-A Frequency	1250HZ	
6.6.4	F8-A Duration	40 msec	

Section	Parameter	Default	Programmed
6.6.3	F8-B Frequency	0HZ	
6.6.4	F8-B Duration	40 msec	
6.6.1	F9 Enable/Disable	Enable	
6.6.3	F9-A Frequency	1150HZ	
6.6.4	F9-A Duration	40 msec	
6.6.3	F9-B Frequency	0HZ	
6.6.4	F9-B Duration	40 msec	
6.6.1	F10 Enable/Disable	Enable	
6.6.3	F10-A Frequency	1050HZ	
6.6.4	F10-A Duration	40 msec	
6.6.3	F10-B Frequency	0HZ	
6.6.4	F10-B Duration	40 msec	
6.7.1	Unselect Audio Route	Internal	
6.7.2	Unselect Audio Mute on PTT	Not Muted	
6.8	Group A		Lines 1 2 3 4 5 6
6.8	Group B		Lines 1 2 3 4 5 6
6.8	Group C		Lines 1 2 3 4 5 6
6.8	Group D		Lines 1 2 3 4 5 6
6.9	Supervisor Enable	Disabled	
6.10	Mute Button MON/TIMED	Momentary	Momentary/Timed____Sec
6.11	AUX Button	DTMF	
6.12	Alert Tone 1 Frequency	1000HZ	
6.12.1	Alert Tone 1 Level	0dbm	
6.12	Alert Tone 2 Frequency	1000HZ	
6.12.1	Alert Tone 2 Level	0dbm	
6.13	TX ALL Button	Enabled	
6.14	Monitor Tone Auto/Manual	Manual	
6.14.1.1	Monitor Frequency	2050HZ	
6.14.1.2	Monitor Duration	40 msec	
6.14.1.3	Monitor Level	0dbm	
5.6	Minimum SPKR Level	JP1-A	

11 Schematics, Parts Placements, and Bills of Material

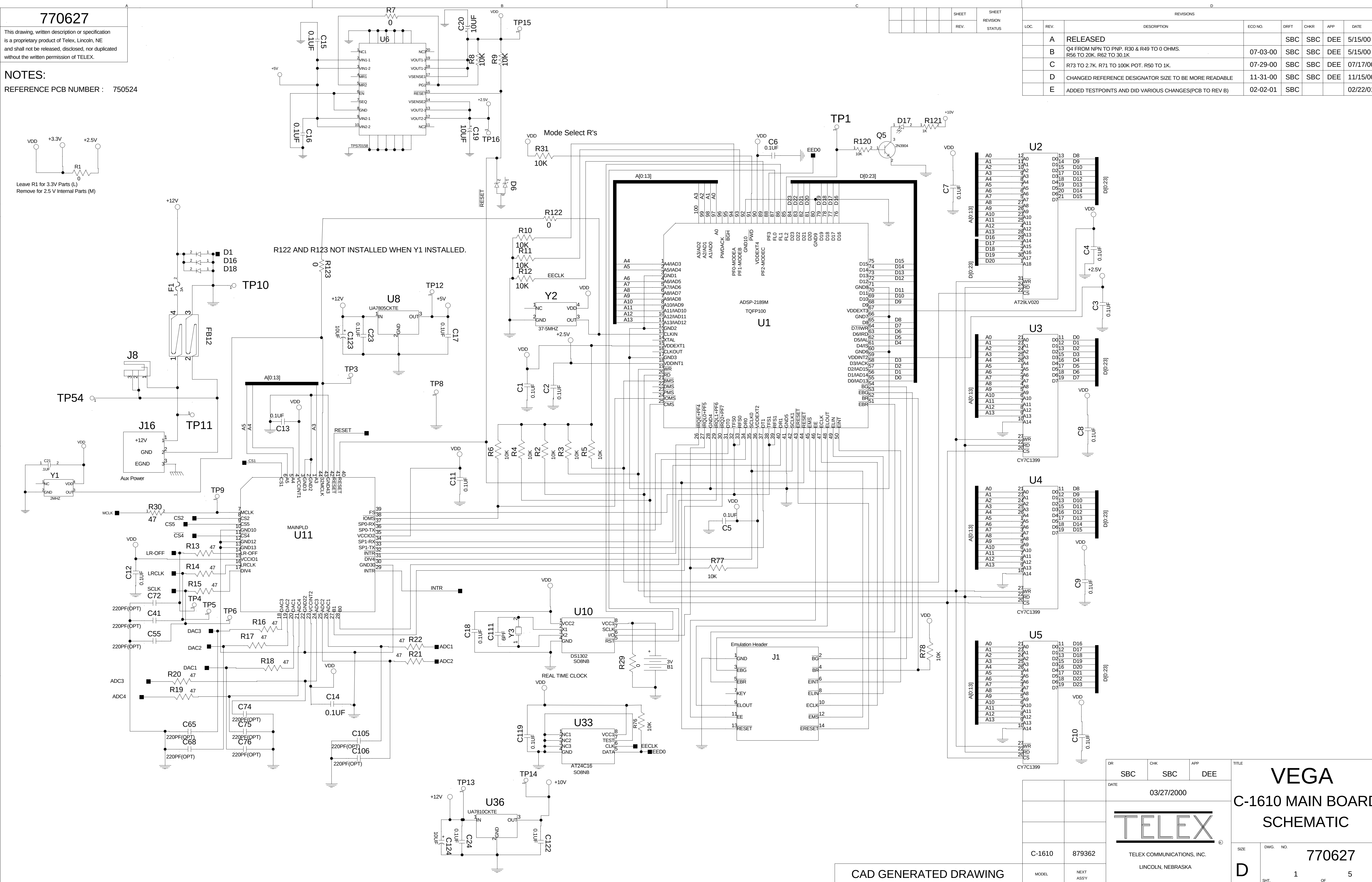
770627

NOTES:

REFERENCE PCB NUMBER : 750524

Leave R1 for 3.3V Parts (L)
Remove for 2.5 V Internal Parts (M)

R122 AND R123 NOT INSTALLED WHEN Y1 INSTALLED.



LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00
	B	Q4 FROM NPN TO PNP. R30 & R49 TO 0 OHMS. R56 TO 20K. R62 TO 30.1K	07-03-00	SBC	SBC	DEE	5/15/00
	C	R73 TO 2.7K. R71 TO 100K POT. R50 TO 1K.	07-29-00	SBC	SBC	DEE	07/17/00
	D	CHANGED REFERENCE DESIGNATOR SIZE TO BE MORE READABLE	11-31-00	SBC	SBC	DEE	11/15/00
	E	ADDED TESTPOINTS AND DID VARIOUS CHANGES(PCB TO REV B)	02-02-01	SBC			02/22/01

DR	CHK	APP
SBC	SBC	DEE

DATE 03/27/2000

TITLE: VEGA C-1610 MAIN BOARD SCHEMATIC

TELEX

TELEX COMMUNICATIONS, INC.
LINCOLN, NEBRASKA

MODEL	NEXT ASSY
C-1610	879362

SIZE D — DWG. NO. 770627 — SHT. 1 OF 5

CAD GENERATED DRAWING

770627

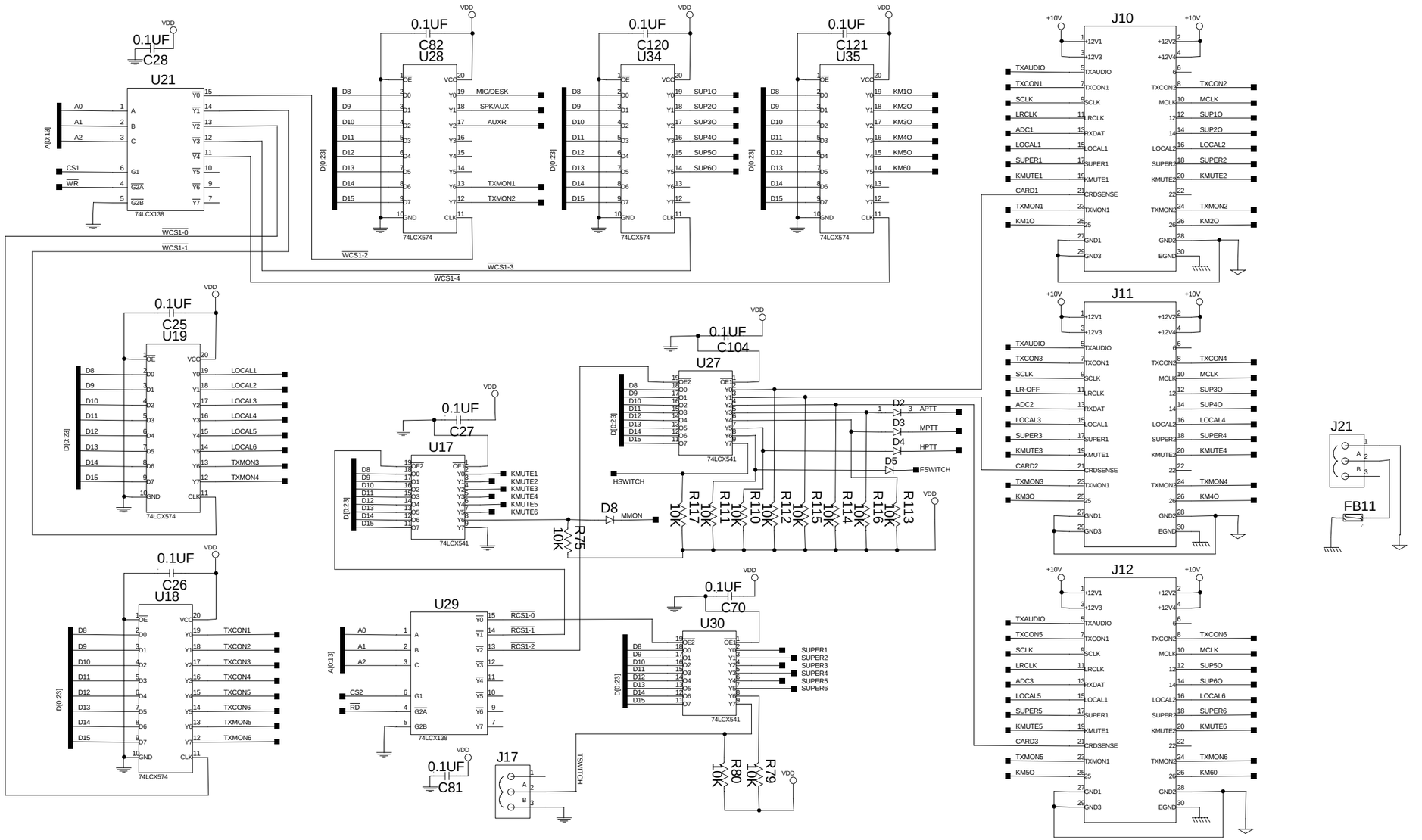
NOTES:

REFERENCE PCB NUMBER : 750524

SHEET REV.	SHEET REVISION STATUS

REVISIONS

LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00



CAD GENERATED DRAWING

DR	CHK	APP
SBC	SBC	DEE

DATE 4/27/2000

TELEX

TELEX COMMUNICATIONS, INC.

LINCOLN, NEBRASKA

TITLE

VEGA

C-1610 MAIN BOARD SCHEMATIC

SIZE	DWG. NO.	REV
D	770627	

SHT. 2 OF 5

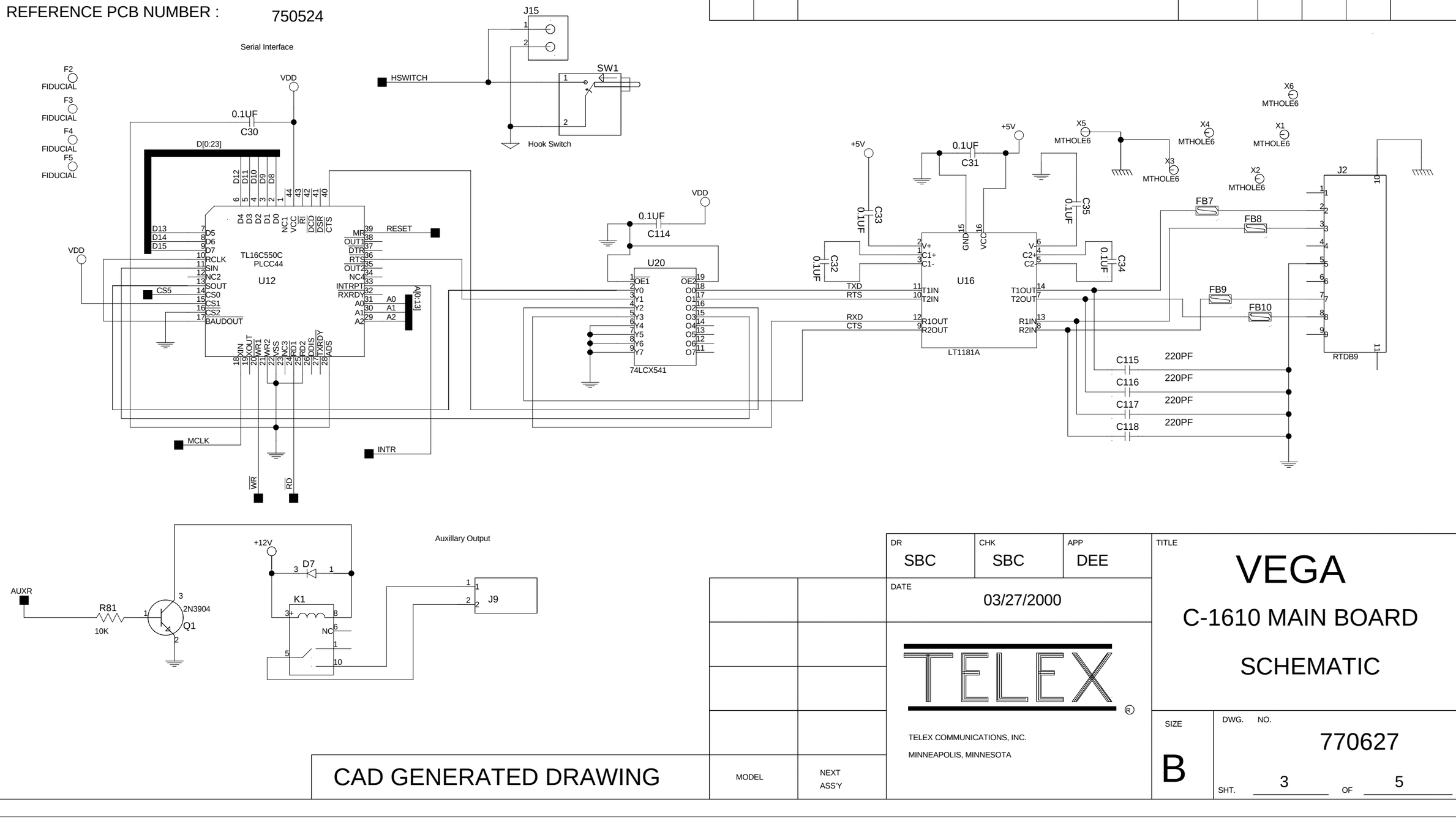
770627

SHEET	SHEET REVISION STATUS
REV.	

REVISIONS							
LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00

NOTES:

REFERENCE PCB NUMBER : 750524



CAD GENERATED DRAWING

DR	CHK	APP
SBC	SBC	DEE

DATE 03/27/2000

MODEL

NEXT ASS'Y

TELEX COMMUNICATIONS, INC.
MINNEAPOLIS, MINNESOTA

TITLE

VEGA

C-1610 MAIN BOARD

SCHEMATIC

SIZE B

DWG. NO. 770627

SHT. 3 OF 5

770627

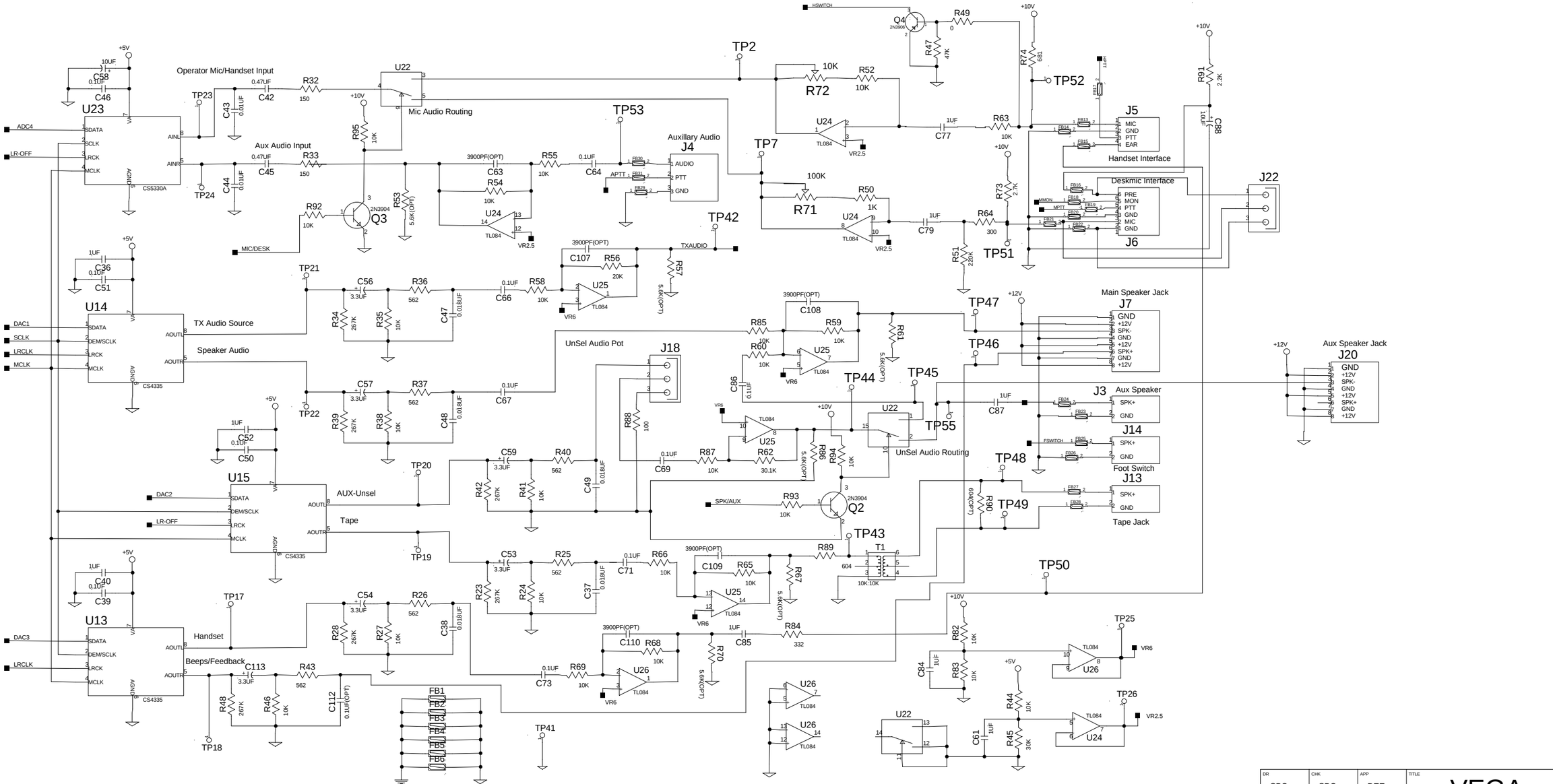
NOTES:

REFERENCE PCB NUMBER : 750524

SHEET REV.	SHEET REVISION STATUS

REVISIONS

LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00



CAD GENERATED DRAWING

DR	CHK	APP
SBC	SBC	DEE

DATE 03/27/2000

TELEX

TELEX COMMUNICATIONS, INC.

LINCOLN, NEBRASKA

TITLE

VEGA

C-1610 MAIN BOARD SCHEMATIC

SIZE	DWG. NO.	REV
D	770627	

SHT. 4 OF 5

770627

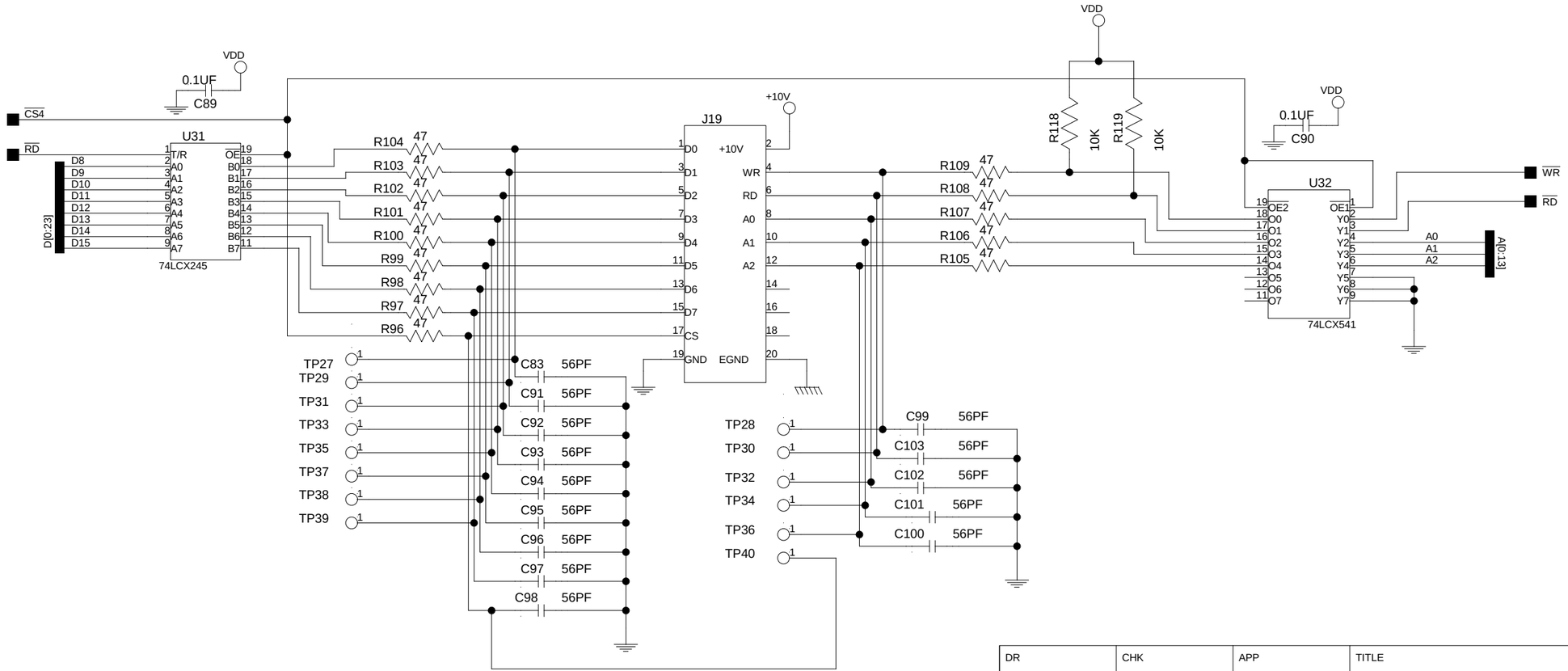
					SHEET	SHEET REVISION STATUS
					REV.	

REVISIONS

LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00

NOTES:

REFERENCE PCB NUMBER : 750524



DR	CHK	APP
SBC	SBC	DEE

DATE 03/27/2000

TITLE

VEGA

C-1610 MAIN BOARD

SCHEMATIC

TELEX COMMUNICATIONS, INC.
MINNEAPOLIS, MINNESOTA

SIZE B

DWG. NO. 770627

SHT. 5 OF 5

CAD GENERATED DRAWING

MODEL

NEXT ASS'Y

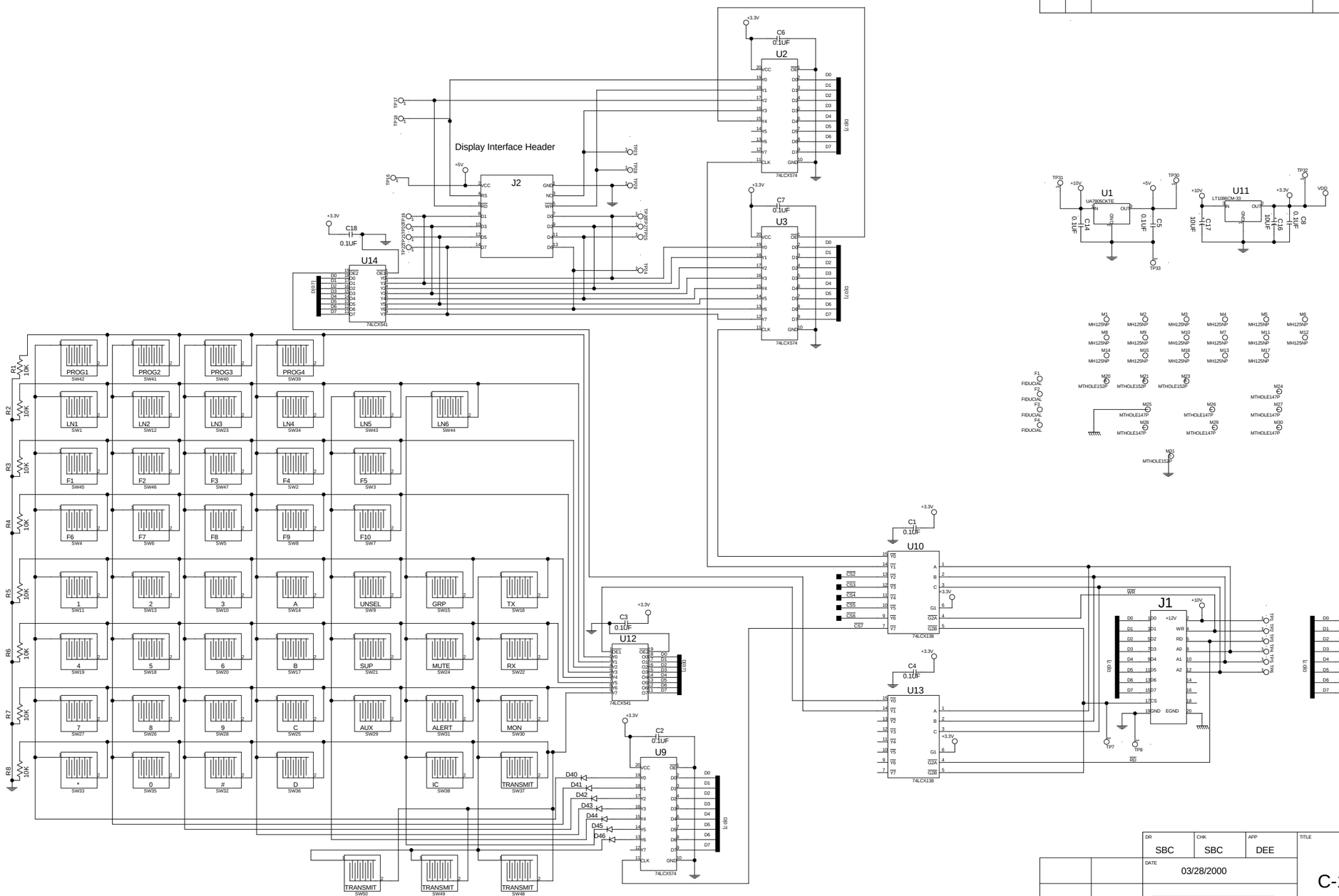
770628

NOTES:

REFERENCE PCB NUMBER : 750525

SHEET	SHEET
REV.	REVISION
	STATUS

REVISIONS							
LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00
	B	J2 CHANGED TO THRU HOLE PART	02-19-01	SBC	SBC	DEE	02/13/01



CAD GENERATED DRAWING

DR	CHK	APP
SBC	SBC	DEE

DATE: 03/28/2000

TELEX

TELEX COMMUNICATIONS, INC.

LINCOLN, NEBRASKA

MODEL

NEXT ASS'Y

TITLE: VEGA
C-1610 KEYPAD
SCHEMATIC

SIZE: D

DWG. NO. 770628

SHT. 1 OF 2

770628

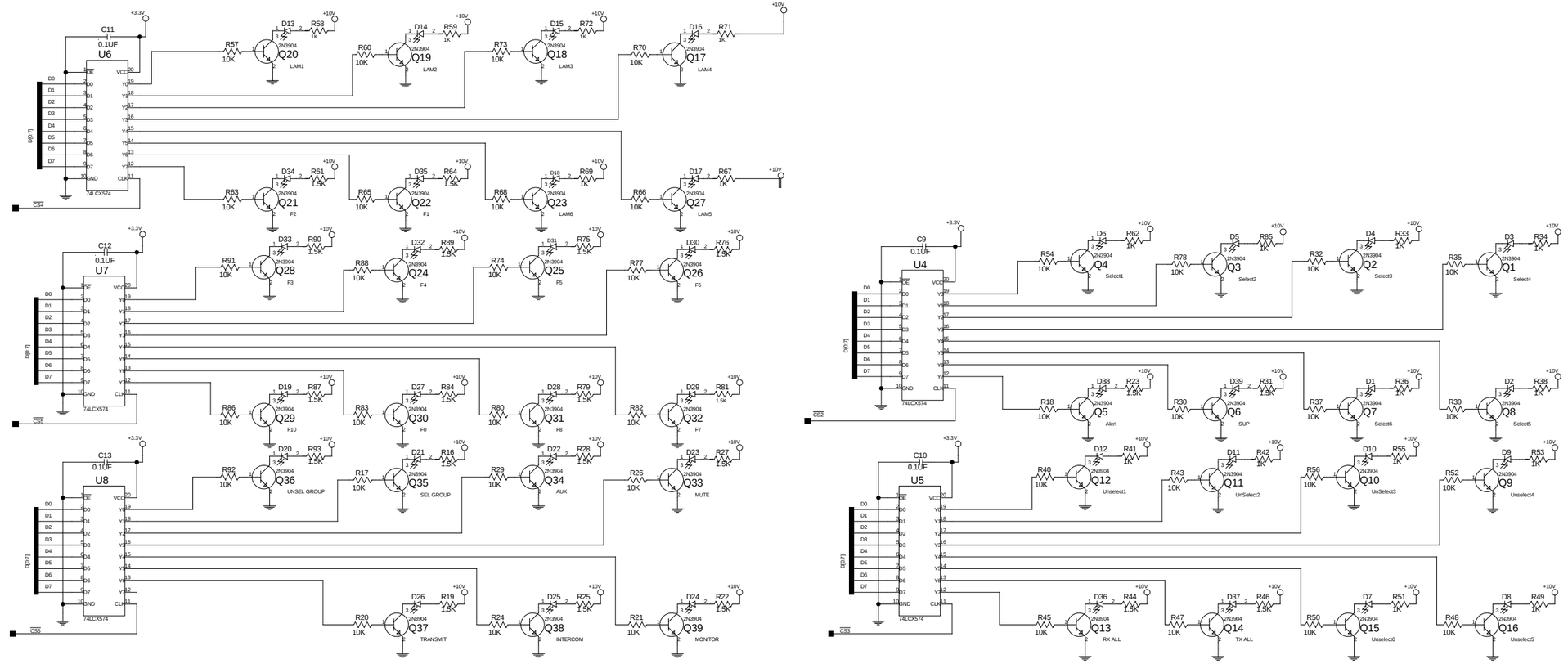
NOTES:

REFERENCE PCB NUMBER : 750525

SHEET	SHEET
REV.	REVISION
	STATUS

REVISIONS

LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00



CAD GENERATED DRAWING

MODEL	NEXT ASS'Y

DR	CHK	APP
SBC	SBC	DEE

DATE 03/28/2000

TELEX COMMUNICATIONS, INC.
LINCOLN, NEBRASKA

TITLE

VEGA
C-1610 KEYPAD SCHEMATIC

SIZE D

DWG. NO. 770628

SHT. 2 OF 2

770629

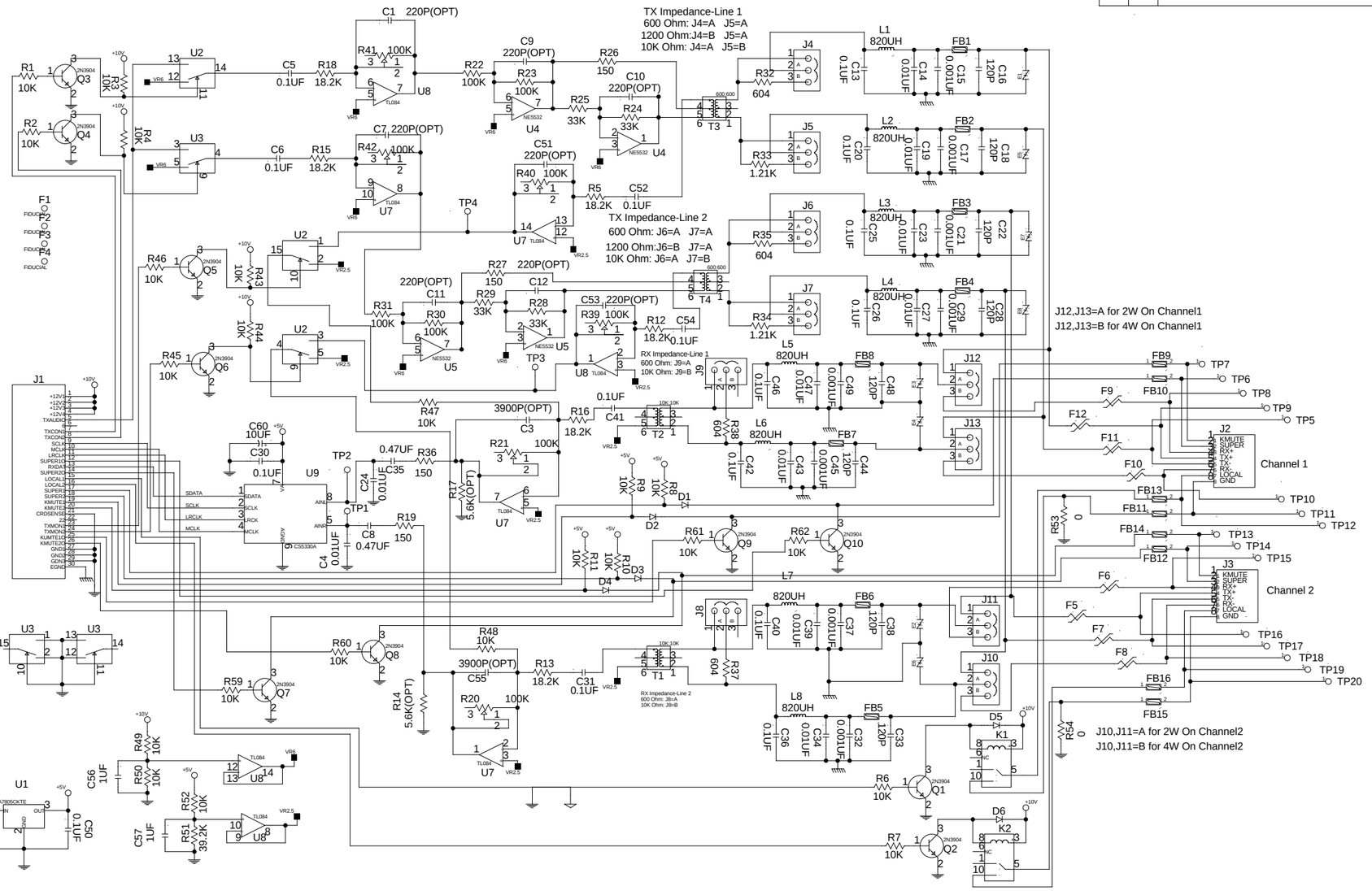
NOTES:

REFERENCE PCB NUMBER : 770629

SHEET REV.	SHEET REVISION STATUS

REVISIONS

LOC.	REV.	DESCRIPTION	ECO NO.	DRFT	CHKR	APP	DATE
	A	RELEASED		SBC	SBC	DEE	5/15/00
	B	R13,R16,R51 WERE 10K. R13,R16=18.2K; R51=39.2K	05-86-00	SBC	SBC	DEE	05/31/00
	C	R33 AND R34 TO 1.21K	08-78-00	SBC	SBC	DEE	08/29/00
	D	ADDED FERRITES,POLYSWITCHES,THYRISTORS. AND REARRANGED POTS.	03-09-01	SBC	SBC	DEE	03/05/01



CAD GENERATED DRAWING

DR	CHK	APP
SBC	SBC	DEE

DATE 03/28/2000

TELEX COMMUNICATIONS, INC.
LINCOLN, NEBRASKA

MODEL | NEXT ASSY

TITLE
VEGA
C-1610 LINE CARD SCHEMATIC

SIZE D | DWG. NO. 770629 | SHT. 1 OF 1

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879362**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	G
	DATE: 02/10/00	DATE:5/19/00	DATE:5/19/00	DATE:___		

TITLE: # PCB ASSY, C-1610 MAIN BOARD-BE

REVISIONS

REV	DESCRIPTION	ECO NO	DATE	APPD
PA	Pre-Release		02/10/00	DEE
PB	SEE BOLD ITEMS		3/08/00	SBC
PC	SW1 CHANGED PART NUMBER FROM 700172 TO 700174		3/22/00	SBC
PD	ADDED PARTS SEE BOLD ITEMS		3/28/00	SBC
PH	ADD/CHANGED PARTS SEE BOLD ITEMS		5/15/00	SBC
A	RELEASED		5/19/00	SBC
B	ADD Q4, R120, R121. REMOVE C105, C106. R89 FROM 0 OHM TO 604 OHM.	05-84-00	5/30/00	SBC
	ADDED ORIENTATION TO D1, D16 AND D18.			
C	ADD JUMPER CAP FOR J17. ADD LED FOR D17. REMOVE D9,D10,D11,D12,D13,D14,D15.	07-03-00	7/10/00	SBC
	CHANGE Q4 TO 2N3906. R30 AND R49 TO 0 OHMS. R56 TO 20K. R62 TO 30.1K			
D	R73 TO 2.7K 2010. R71 TO 100K POT. R50 TO 1K	07-29-00	7/17/00	SBC
E	REMOVE C98,C100,C101,C102 FROM BILL	07-54-00	7/27/00	SBC
F	CHANGE FB1,FB2,FB3,FB4,FB5 AND FB6 TO 0 OHMS	01-78-01	1/16/01	SBC
G	PCB TO REV B - AND SOME COMPONENT CHANGES	02-02-01	2/02/01	SBC

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879362**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	**G**
	DATE: 02/10/00	DATE:5/19/00	DATE:5/19/00	DATE:___		

TITLE: **PCB ASSY, C-1610 MAIN BOARD-BE**

ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
1		1	BATT	3V COIN LEADED	724023	B1
2		**50**	CAP	0.1UF 0805	102881186T	C1,C2,C3,C4,C5,C6,C7,C11,C12,C13,C14,C15,
						C16,C17,C18,**C21**,C23,C24,C25,C26,C27,C28,C30,
						C31,C32,C33,C34,C35,C39,C46,C50,C51,C64,
						C66,C67,C69,C70,C71,C73,C81,C82,C86,C89,
						C90,C104,C114,C119,C120,C121,C122
3		5	CAP	0.018UF 0805	102881126T	C37,C38,C47,C48,C49
4		**6**	**CAP**	**10UF ST B**	**102877065T**	**C19,C20,C58,C88,C123,C124**
5		4	CAP	220PF 0805	102881103T	C115,C116,C117,C118
6		10	CAP	56PF 0805	72341122T	C83,C91,C92,C93,C94,C95,C96,C97,C99,C103
7		**9**	CAP	1UF 0805	102881875T	C36,C40,C52,C61,C84,C85,**C77,C79,C87**
8		2	CAP	0.47UF 1210	102881445T	C42,C45
9		2	CAP	0.01UF 0805	102881150T	C43,C44
10		6	CAP	3.3UF ST B	102877021T	C53,C54,C56,C57,C59,C113
11						
12		1	CAP	6PF 0603	102879805T	C111
13		3	DIODE	SMD4004	16016481SMT	D1,D16,D18
14		6	DIODE	MMBD914	58711000T	D2,D3,D4,D5,D7,D8
15		1	DIODE	MMBZ5V6ALT1	508046000T	D6
16		1	FUSE	3A SMT FUSE	710105T	F1
17		**24**	FERRITE	FERRITE 0805	723511T	FB7,FB8,FB9,FB10,**FB11,FB13,FB14,FB15,FB16,**
						FB17,FB18,FB19,FB20,FB21,FB22,FB23,FB24,
						FB25,FB26,FB27,FB28,FB29,FB30,FB31
18		1	CONN	DB9 RT ANG LEADED	59926016	J2
19		4	CONN	2 PIN RT ANG LEADED	2862049	J3,J9,J13,J14
20		2	CONN	3 PIN RT ANG LEADED	2862050	J4,J16
21		1	CONN	RJ-4 PIN CONN LEADED	640123	J5
22		1	CONN	RJ-6 PIN CONN LEADED	59946000	J6
23		**2**	CONN	RJ-8 PIN CONN LEADED	539059030	J7,**J20**
24		1	CONN	2.5MM LEADED	59697000	J8
25		3	CONN	30 PIN EDGE LEADED	640127	J10,J11,J12
26		**2**	HEADER	3 PIN SMT	640124T	J17,**J21**
27		**2**	HEADER	MOLEX 3PIN KEYED	2861870	J18,**J22**
28		1	HEADER	20 PIN SMT	640126T	J19
29		1	RELAY	SPDT SMT	730142T	K1
30		4	TRAN	2N3904	54671200T	Q1,Q2,Q3,Q5
31		**54**	RES	10K 0805	102515300T	R2,R3,R4,R5,R6,R10,R11,R12,R24,R27,R31,R35,R38,R41,R44,
						R46,R52,R54,R55,R58,R59,R60,R63,R66,R68,
						R69,R75,R76,R77,R78,R79,R80,R81,R82,R83,R85,R87,R92,
						R93,R94,R95,R110,R111,R112,R113,R114,R115,R116,R117,
						R118,R119,R120,**R8,R9**
32		**25**	RES	47 0805	102515065T	R13,R14,R15,R16,R17,R18,R19,R20,R21,R22,**R30,**
						R96,R97,R98,R99,R100,R101,R102,R103,R104,
						R105,R106,R107,R108,R109
33		6	RES	267K 0805	102515441T	R23,R28,R34,R39,R42,R48
34		6	RES	562 085	102515172T	R25,R26,R36,R37,R40,R43
35		2	RES	150 0805	102515117T	R32,R33
36		8	RES	0 OHMS 0805	102506000T	R49,FB1,FB2,FB3,FB4,FB5,FB6,**R7**
37						

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879362**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	G
	DATE: 02/10/00	DATE:5/19/00	DATE:5/19/00	DATE:___		

TITLE: **PCB ASSY, C-1610 MAIN BOARD-BE**

ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
38		1	RES	47K 0805	102515365T	R47
39		1	RES	300 0805	102515146T	R64
40		1	RES	221K 0805	102515433T	R51
41		2	RES	30.1K 0805	102515346T	R45,R62
42		1	RES	100 0805	102515100T	R88
43		1	POT	10K **THRU HOLE**	**57148406**	R72
44		1	RES	680 2010	102405681T	R74
45		1	RES	2.7K 2010	102405272T	R73
46		1	RES	332 0805	102515150T	R84
47		1	RES	604 OHM 0805	102515175T	R89
48		1	RES	2.21K 0805	102515233T	R91
49		1	SWITCH	MICRO SWITCH	700174T	SW1
50		1	TRANSFRM	600-600 THRU-HOLE	**3180259**	T1
51		1	IC	ADDS-2189 TQFP100	760252T	U1
52		1	SOCKET PLCC	32 PIN PLCC SOCKET	539030032T	U2 (SOCKET FOR 760253)
53		1	IC	AT27LV020 32PLCC	760253-1PS	U2
54						
55						
56		1	IC	UA7805CKTE SMT	760260T	U8
57						
58		1	IC	DS1302 SO8	760266T	U10
59		1	IC	EPM7032AE PLCC44	760267S	U11
60		1	SOCKET PLCC	44 PIN PLCC SOCKET	539030044	U11 (SOCKET FOR 760267S)
61		1	IC	TL16C550C PLCC44	760262T	U12
62		3	IC	CS4335 SO8	760263T	U13,U14,U15
63		1	IC	LT1181A SOIC16	760261T	U16
64		5	IC	74LCX541 SO20	760256T	U17,U27,U30,U32,U20
65		5	IC	74LCX574 SO20	760257T	U18,U19,U28,U34,U35
66		2	IC	74LCX138 SO16	760258T	U21,U29
67		1	IC	CD4053B SO16	53266123T	U22
68		1	IC	CS5330A SO8WB	760264T	U23
69		3	IC	TL084 SO14	4300047	U24,U25,U26
70		1	IC	74LCX245 SO20	760255T	U31
71		1	IC	AT24C16N SO8	511336000T	U33
72		1	IC	UA7810CKTE SMT	760275T	U36
73		1	OSC	2.0480 MHZ SMT	780178T	Y1
74		1	OSC	32.0000 MHZ SMT	780179T	Y2
75		1	MC405-32768K	MC405-32768K SMT	780181T	Y3
76		A/R		SOLDER PASTE	BE738	
77		1	PRINTED CIRCUIT BOARD		750524	
78		2	FEMALE SCREWLOCK		58421000	FOR J2
79		2	SCREW		51845038	FOR J2
80		2	NUT		50033022	FOR J2
81		2	RES	1K 0805	102515200T	R50,R121
82		1	RES	20K 0805	102515329T	R56
83		1	LED	RED	58680000	D17
84		1	JMPR	JUMPER CAP	2861766	FOR J17
85		1	TRANSISTOR	2N3906 SOT-23	54716200	Q4
86		1	POT	100K **THRU HOLE**	**723097**	R71

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879362**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	G
	DATE: 02/10/00	DATE:5/19/00	DATE:5/19/00	DATE:___		

TITLE: **PCB ASSY, C-1610 MAIN BOARD-BE**

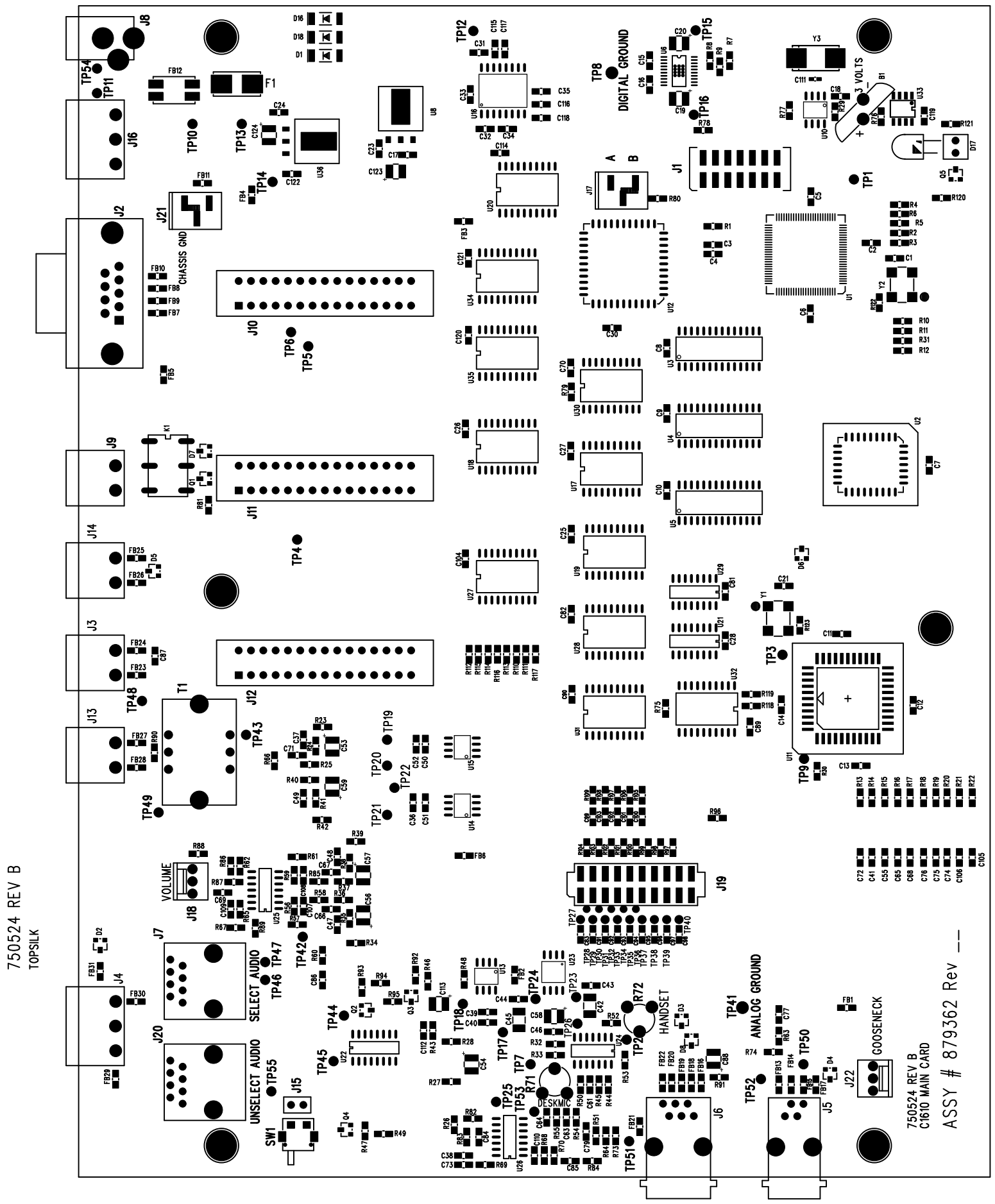
ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
87	X	1	FERRITE	COMMON MODE	724039	FB12
88		0.056	HEADER	2 PIN	2861772	J15
89		1	IC	TPS70158	760306	U6
90		2	TERMINAL	TEST POINT	2017001400	TP8,TP41
91		1	RES	40.2K	102515358T	R65

Telex Communications Inc.	PART NO: 879362
Lincoln, Nebraska USA	

APPROVALS	DR BY: SBC	CHKD BY: SBC	APPD BY: DEE	PROD:	REV LEVEL:	G
	DATE: 03/06/2000	DATE: 03/06/00	DATE: 05/19/00	DATE:		

TITLE: VEGA C-1610 MAIN BOARD TOP ASSEMBLY

Note:
The following parts are not installed:
C8,C9,C10,C41,C55,C63,C65,C68,C72,C74,C75,C76,C98,C100,C101,C102,C105,C106,C107,C108,C109,C110,C112
J1
R1,R29,R53,R57,R61,R67,R70,R86,R90,R122,R123
U3,U4,U5



	Telex Communications INC.			PART NO:	
	Lincoln, Nebraska USA			**879363**	
APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL: **D**
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___	

TITLE: **VEGA PCB ASSY, C-1610 KEYPAD BOARD - BE**

REVISIONS

REV	DESCRIPTION	ECO NO	DATE	APPD
PA	Pre-Release		02/10/00	DEE
PB	SEE BOLD TEXT		03/01/00	SBC
A	RELEASED		05/17/00	SBC
B	J1 FROM VERTICAL TO HORIZONTAL CONNECTOR		06/27/00	SBC
C	ITEM 6 FROM 760269T TO NEW PART 760317	01-96-01	01/22/01	SBC
D	J2 CHANGED TO THRU HOLE PART 640141	02-19-01	02/13/01	SBC

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879363**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	D
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___		

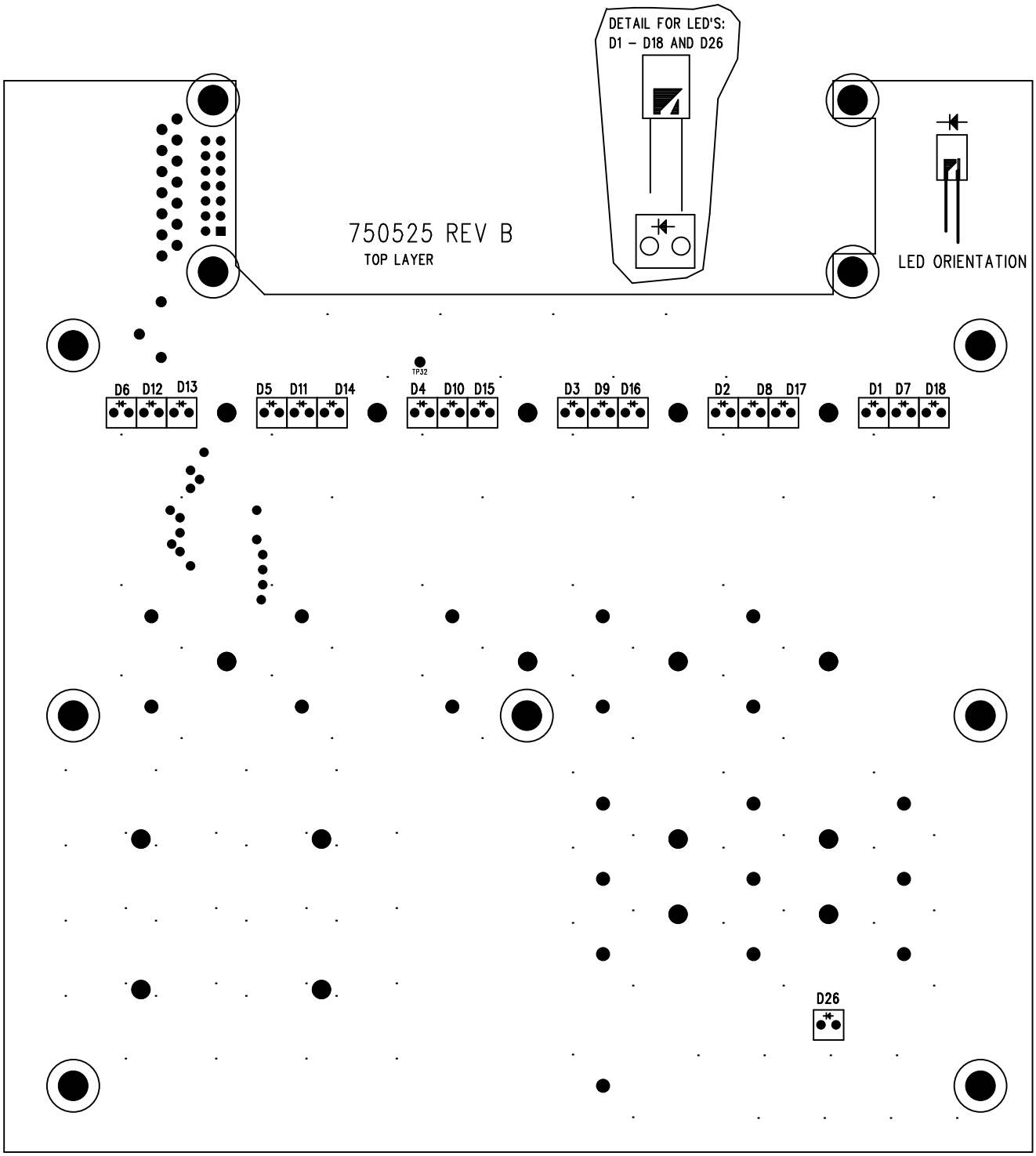
TITLE: **VEGA PCB ASSY, C-1610 KEYPAD BOARD - BE**

ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
1		15	CAP	0.1UF 0805	102881186T	C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,
						C11,C12,C13,C14,C18
2		2	CAP	10UF ST D	102877054T	C16,C17
3		6	LED	GRN 5MM LEADED	760270-1	D1,D2,D3,D4,D5,D6
4		7	LED	RED 5MM LEADED	760270-2	D7,D8,D9,D10,D11,D12,D26
5		6	LED	YEL 5MM LEADED	760270-3	D13,D14,D15,D16,D17,D18
6		20	LED	RED 1206	760317	D19,D20,D21,D22,D23,D24,D25,D27,
						D28,D29,D30,D31,D32,D33,D34,D35,
						D36,D37,D38,D39
7		7	DIODE	MMBD914	58711000T	D40,D41,D42,D43,D44,D45,D46
8		1	HEADER	20 PIN SMT	640131T	J1
9	X	1	HEADER	14 PIN **THRU HOLE**	**640141**	J2
10		39	TRAN	2N3904	54671200T	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10,
						Q11,Q12,Q13,Q14,Q15,Q16,Q17,Q18,
						Q19,Q20,Q21,Q22,Q23,Q24,Q25,Q26,
						Q27,Q28,Q29,Q30,Q31,Q32,Q33,Q34,
						Q35,Q36,Q37,Q38,Q39
11		47	RES	10K 0805	102515300T	R1,R2,R3,R4,R5,R6,R7,R8,R17,R18,
						R20,R21,R24,R26,R29,R30,R32,R35,
						R37,R39,R40,R43,R45,R47,R48,R50,
						R52,R54,R56,R57,R60,R63,R65,R66,
						R68,R70,R73,R74,R77,R78,R80,R82,
						R83,R86,R88,R91,R92
12		19	RES	1K 0805	102515200T	R28,R33,R34,R36,R38,R41,R42
						R49,R51,R53,R55,R58,R59,R62,
						R67,R69,R71,R72,R85
13		20	RES	1.5K 0805	102515217T	R16,R19,R22,R23,R25,R27,R31,R44,
						R46,R61,R64,R75,R76,R79,R81,R84
						R87,R89,R90,R93
14		1	IC	UA7805CKTE	760260T	U1
15		8	IC	74LCX574 SO20	760257T	U2,U3,U4,U5,U6,U7,U8,U9
16		2	IC	74LCX138 SO16	760258T	U10,U13
17		1	IC	LT1086CM-3.3V REG SMT	511155000S	U11
18		2	IC	74LCX541 SO20	760256T	U12,U14
19		A/R		SOLDER PASTE	BE738	
20		1	PRINTED CIRCUIT BOARD		750525	

Telex Communications Inc.	PART NO: 879363
Lincoln, Nebraska USA	

APPROVALS	DR BY: SBC	CHKD BY: SBC	APPD BY: DEE	PROD:	REV LEVEL:	D
	DATE: 03/06/2000	DATE: 3/06/00	DATE: 05/19/00	DATE:		

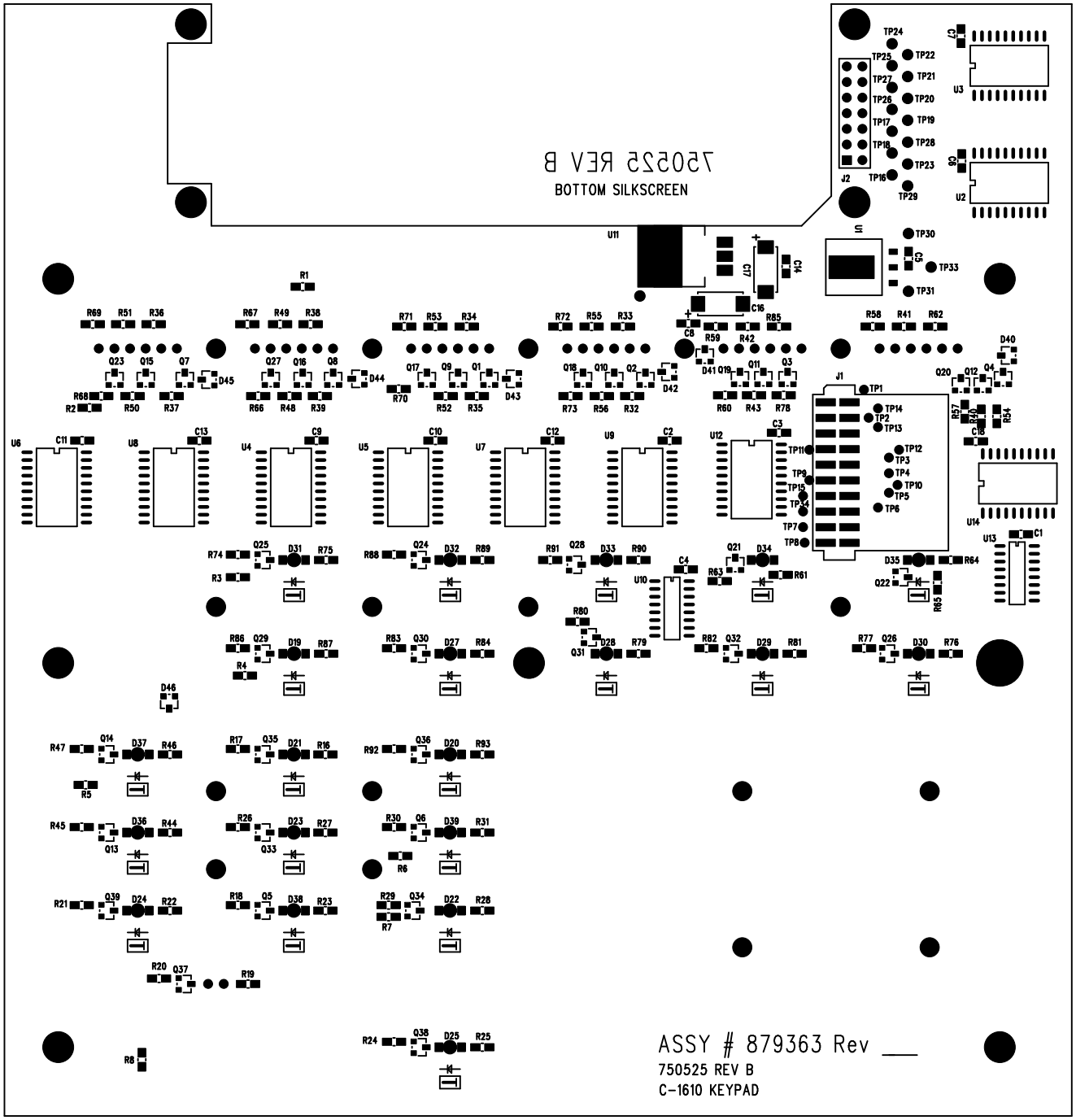
TITLE: VEGA C-1610 KEYPAD PCB TOP ASSEMBLY



Telex Communications Inc.	PART NO: 879363
Lincoln, Nebraska USA	

APPROVALS	DR BY: SBC	CHKD BY: SBC	APPD BY: DEE	PROD:	REV LEVEL:	D
	DATE: 03/07/2000	DATE: 03/07/2000	DATE: 05/19/00	DATE:		

TITLE: VEGA C-1610 KEYPAD PCB BOTTOM ASSEMBLY



Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879364**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	C
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___		

TITLE: # VEGA PCB ASSY, C-1610 LINE CARD - BE

REVISIONS

REV	DESCRIPTION	ECO NO	DATE	APPD
PA	Pre-Release		02/10/00	DEE
PB	SEE BOLD ITEMS		02/28/00	SBC
PC	SEE BOLD ITEMS		04/07/00	SBC
PD	SEE BOLD ITEMS			DEE
PE	REMOVE C1, C7. R5 AND R21 NOW 432K(WERE 100K)		05/08/00	SBC
	ADD JUMPER CAPS; R55,R56,R57,R58 TO THRU HOLE PARTS			
A	RELEASED		05/18/00	SBC
B	R13,R16,R51 WERE 10K. R13,R16 TO BE 18.2K. R51 TO BE 39.2K	05-86-00	05/31/00	SBC
C	R33, R34 TO 1.21K	08-78-00	08/29/00	SBC

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879364**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	C
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___		

TITLE: **VEGA PCB ASSY, C-1610 LINE CARD - BE**

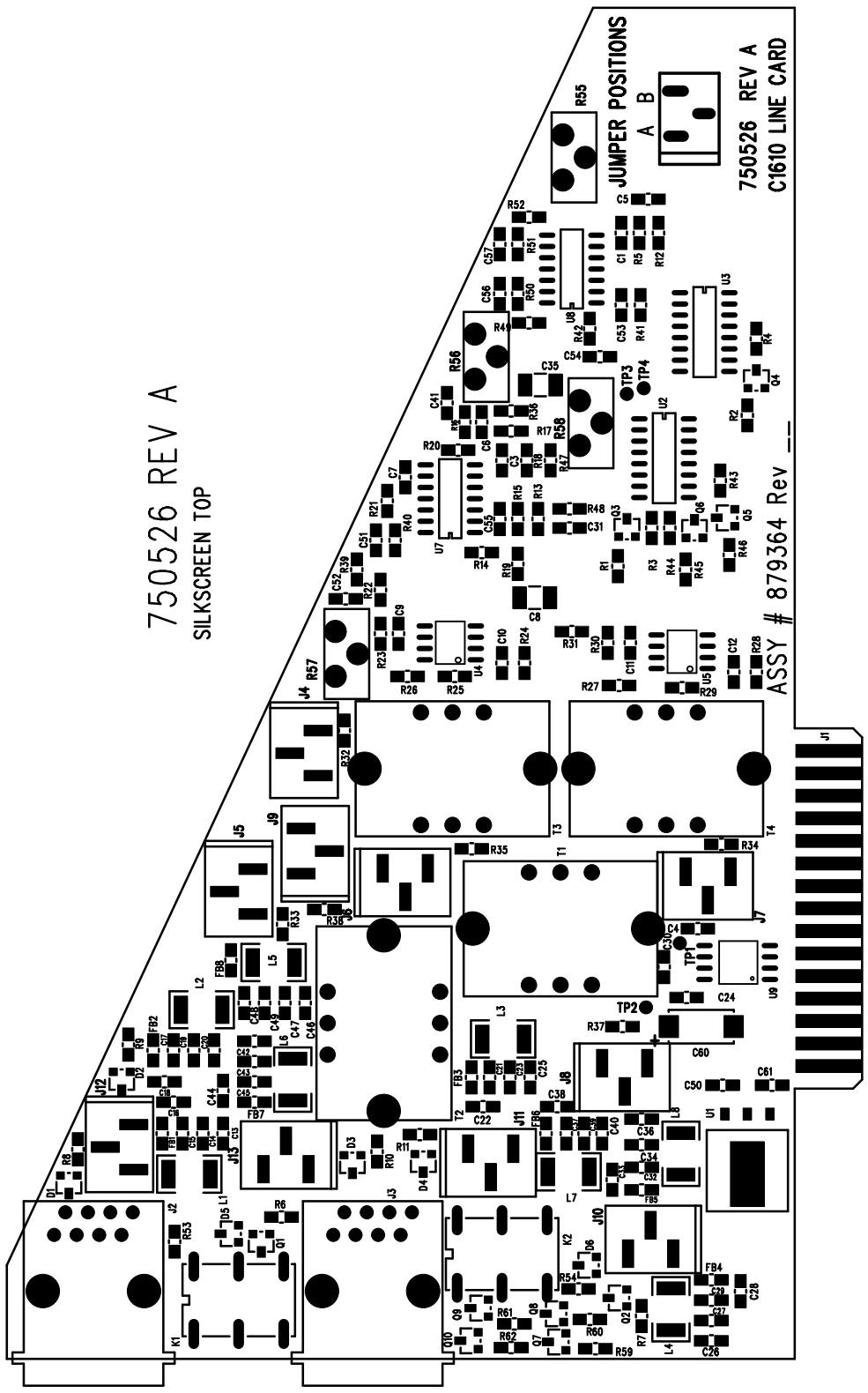
ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
1		6	CAP	220PF 0805	102881103T	C9,C10,C11,C12,C51,C53
2		2	CAP	3900PF 0805	102881118T	C3,C55
3		10	CAP	0.01UF 0805	102881150T	C4,C14,C19,C23,C24,C27,C34,C39,
						C43,C47
4		17	CAP	0.1UF 0805	102881186T	C5,C6,C13,C20,C25,C26,C30,C31,C36,
						C40,C41,C42,C46,C50,C52,C54,C61
5		2	CAP	0.47UF 0805	102881445T	C8,C35
6		8	CAP	0.001UF 0805	102881138T	C15,C17,C21,C29,C32,C37,C45,C49
7		8	CAP	120PF 0805	102881100T	C16,C18,C22,C28,C33,C38,C44,C48
8		2	CAP	1UF 0805	102881875T	C56,C57
9		1	CAP	10UF ST D	102877054T	C60
10		6	DIODE	MMBD914 SOT23	58711000T	D1,D2,D3,D4,D5,D6
11		8	FERRITE BEAD	0805	723511T	FB1,FB2,FB3,FB4,FB5,FB6,FB7,FB8
13		2	CONN	RJ-8 PIN CONN LEADED	2862013	J2,J3
14		10	CONN	3 PIN JUMPER	640124T	J4,J5,J6,J7,J8,J9,J10,J11,J12,J13
15		2	RELAY	SPDT	730142T	K1,K2
16		8	IND	820UH 1812	723510T	L1,L2,L3,L4,L5,L6,L7,L8
17		10	TRAN	MMBT3904 SOT23	54671200T	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10
18		25	RES	10K 0805	102515300T	R1,R2,R3,R4,R6,R7,R8,R9,R10,R11,R15,
						R18,R43,R44,R45,R46,R47,R48,
						R49,R50,R52,R59,R60,R61,R62
19		10	RES	100K 0805	102515400T	R12,R20,R22,R23,R30,R31,R39,R40,R41,R42
20		2	RES	5.62K 0805	102515272T	R14,R17
21		4	RES	150 0805	102515117T	R19,R26,R27,R36
22		4	RES	33.2K 0805	102515350T	R24,R25,R28,R29
23		4	RES	604 0805	102515175T	R32,R35,R37,R38
24		2	RES	0 OHM 0805	102506000T	R53,R54
25		4	POT	10K THRU HOLE	723097-5	R55,R56,R57,R58
26		2	TRANSFRM	10K-10K THRU-HOLE	3180246	T1,T2
27		2	TRANSFRM	600-600 THRU-HOLE	3180259	T3,T4
28		1	REG	UA7805CKTE SMT	760260T	U1
29		2	IC	CD4053B SO16	53266123T	U2,U3
30		2	IC	NE5532 SO8	760268T	U4,U5
31		2	IC	TL084 SO14	4300047	U7,U8
32		1	IC	CS5330A SO8WB	760264T	U9
33		10	JUMPER	JUMPER CAP	2861766	FOR J4-J13
34		A/R		SOLDER PASTE	BE738	
35		1	PRINTED CIRCUIT BOARD		750526	
36		2	RES	432K	102515461T	R5, R21
37		2	RES	18.2K 0805	102515325T	R13,R16
38		1	RES	39.2K 0805	102515357T	R51
39		2	RES	1.21K 0805	102515208T	R33,R34

Telex Communications Inc.
Lincoln, Nebraska USA

PART NO: 879364

APPROVALS	DR BY: SBC	CHKD BY: SBC	APPD BY: DEE	PROD:	REV LEVEL:	C
	DATE: 03/06/2000	DATE: 03/06/2000	DATE: 05/19/00	DATE:		

TITLE: VEGA C1610 LINE CARD TOP ASSEMBLY DRAWING



Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879364**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	D
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___		

TITLE: # VEGA PCB ASSY, C-1610 LINE CARD - BE

REVISIONS

REV	DESCRIPTION	ECO NO	DATE	APPD
PA	Pre-Release		02/10/00	DEE
PB	SEE BOLD ITEMS		02/28/00	SBC
PC	SEE BOLD ITEMS		04/07/00	SBC
PD	SEE BOLD ITEMS			DEE
PE	REMOVE C1, C7. R5 AND R21 NOW 432K(WERE 100K)		05/08/00	SBC
	ADD JUMPER CAPS; R55,R56,R57,R58 TO THRU HOLE PARTS			
A	RELEASED		05/18/00	SBC
B	R13,R16,R51 WERE 10K. R13,R16 TO BE 18.2K. R51 TO BE 39.2K	05-86-00	05/31/00	SBC
C	R33, R34 TO 1.21K	08-78-00	08/29/00	SBC
D	ADDED FERRITES,POLYSWITCHES,THYRISTORS,CHANGED	03-09-01	03/06/01	SBC
	TO THRU HOLE HEADERS, POTS TO 100K			

Telex Communications INC.

Lincoln, Nebraska USA

PART NO: **879364**

APPROVALS:	DR BY: DEE	CHKD BY:SBC	APPD BY:DEE	PROD:___	REV LEVEL:	D
	DATE: 02/10/00	DATE:05/19/00	DATE:05/19/00	DATE:___		

TITLE: **VEGA PCB ASSY, C-1610 LINE CARD - BE**

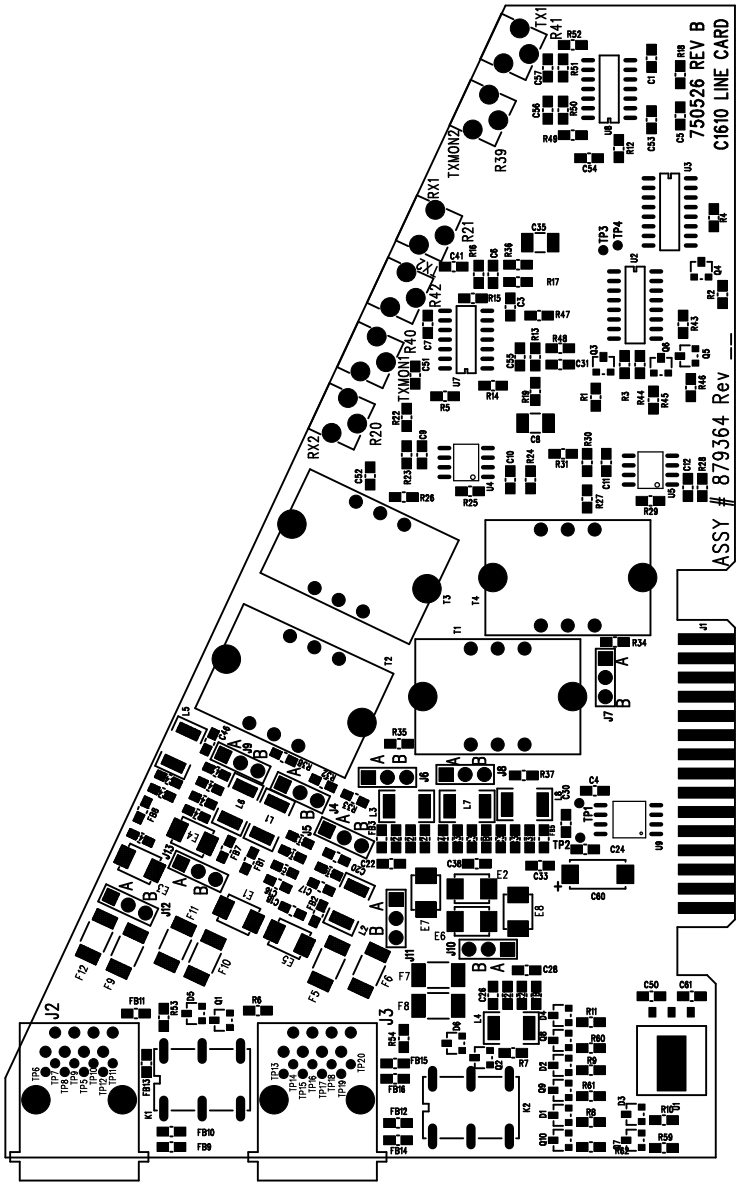
ITEM	NEW	QTY	TYPE	DESCRIPTION	PART NO.	DESIGNATOR
1		6	CAP	220PF 0805	102881103T	C9,C10,C11,C12,C51,C53
2		2	CAP	3900PF 0805	102881118T	C3,C55
3		10	CAP	0.01UF 0805	102881150T	C4,C14,C19,C23,C24,C27,C34,C39,
						C43,C47
4		17	CAP	0.1UF 0805	102881186T	C5,C6,C13,C20,C25,C26,C30,C31,C36,
						C40,C41,C42,C46,C50,C52,C54,C61
5		2	CAP	0.47UF 0805	102881445T	C8,C35
6		8	CAP	0.001UF 0805	102881138T	C15,C17,C21,C29,C32,C37,C45,C49
7		8	CAP	120PF 0805	102881100T	C16,C18,C22,C28,C33,C38,C44,C48
8		2	CAP	1UF 0805	102881875T	C56,C57
9		1	CAP	10UF ST D	102877054T	C60
10		6	DIODE	MMBD914 SOT23	58711000T	D1,D2,D3,D4,D5,D6
11		**16**	FERRITE BEAD	0805	723511T	FB1,FB2,FB3,FB4,FB5,FB6,FB7,FB8**,FB9,FB10,**
						FB11,FB12,FB13,FB14,FB15,FB16
13		2	CONN	RJ-8 PIN CONN LEADED	2862013	J2,J3
14		**0.83**	**CONN**	**3 PIN HEADER THRU/H**	**2861772**	**J4,J5,J6,J7,J8,J9,J10,J11,J12,J13**
15		2	RELAY	SPDT	730142T	K1,K2
16		8	IND	820UH 1812	723510T	L1,L2,L3,L4,L5,L6,L7,L8
17		10	TRAN	MMBT3904 SOT23	54671200T	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10
18		**23**	RES	10K 0805	102515300T	R1,R2,R3,R4,R6,R7,R8,R9,R10,R11,
						R43,R44,R45,R46,R47,R48,
						R49,R50,R52,R59,R60,R61,R62
19		**4**	RES	100K 0805	102515400T	R22,R23,R30,R31
20		2	RES	5.62K 0805	102515272T	R14,R17
21		4	RES	150 0805	102515117T	R19,R26,R27,R36
22		4	RES	33.2K 0805	102515350T	R24,R25,R28,R29
23		4	RES	604 0805	102515175T	R32,R35,R37,R38
24		2	RES	0 OHM 0805	102506000T	R53,R54
25		**6**	POT	**100K** THRU HOLE	**723097-3**	**R20,R21,R39,R40,R41,R42**
26		2	TRANSFRM	10K-10K THRU-HOLE	3180246	T1,T2
27		2	TRANSFRM	600-600 THRU-HOLE	3180259	T3,T4
28		1	REG	UA7805CKTE SMT	760260T	U1
29		2	IC	CD4053B SO16	53266123T	U2,U3
30		2	IC	NE5532 SO8	760268T	U4,U5
31		2	IC	TL084 SO14	4300047	U7,U8
32		1	IC	CS5330A SO8WB	760264T	U9
33		10	JUMPER	JUMPER CAP	2861766	FOR J4-J13
34		A/R		SOLDER PASTE	BE738	
35		1	PRINTED CIRCUIT BOARD		750526	
36						
37		**6**	RES	18.2K 0805	102515325T	R13,R16,**R5,R12,R15,R18**
38		1	RES	39.2K 0805	102515357T	R51
39		2	RES	1.21K 0805	102515208T	R33,R34

Telex Communications Inc.
Lincoln, Nebraska USA

PART NO: 879364

APPROVALS	DR BY: SBC	CHKD BY: SBC	APPD BY: DEE	PROD:	REV LEVEL: D
	DATE: 03/06/2000	DATE: 03/06/2000	DATE: 05/19/00	DATE:	

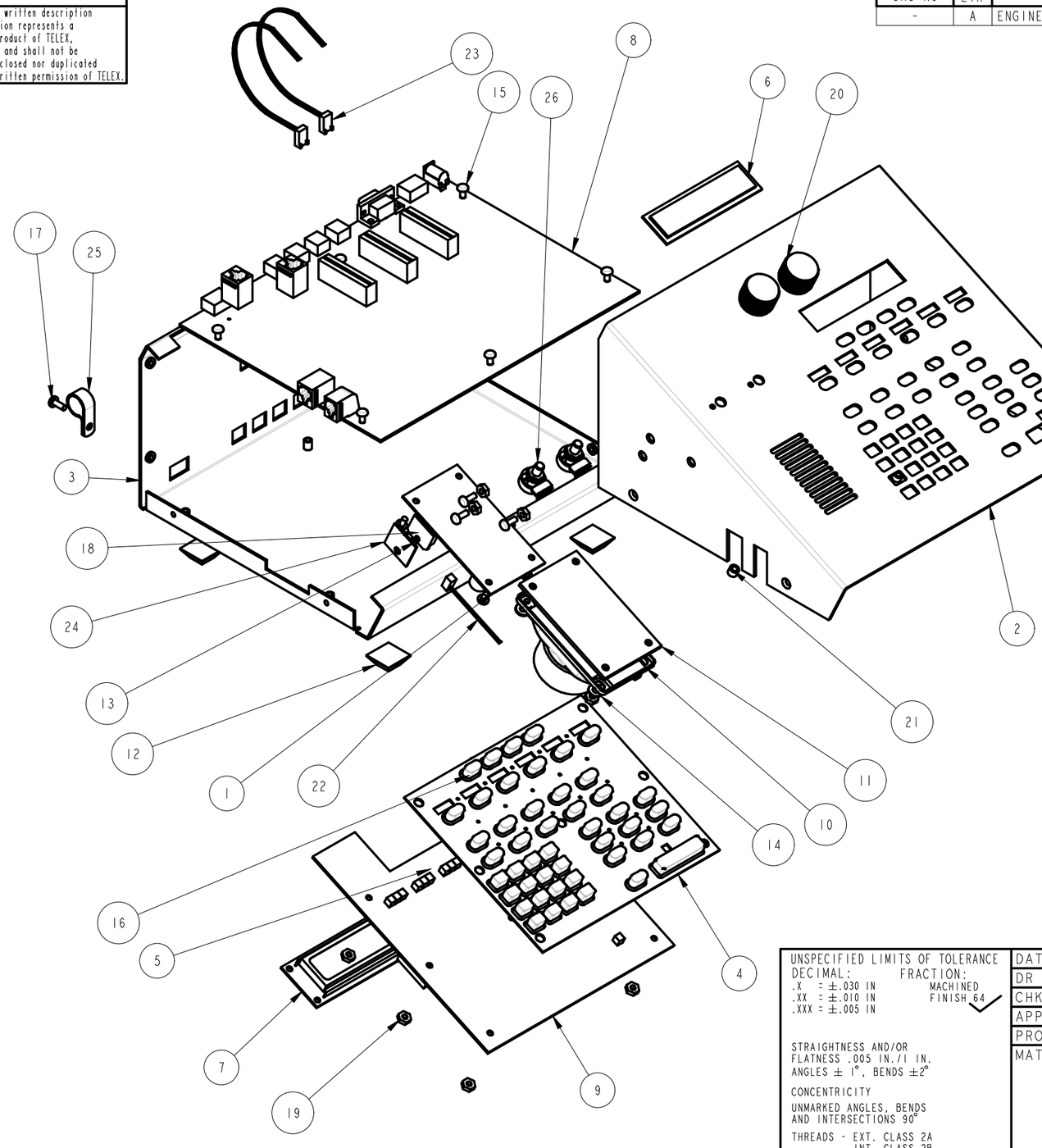
TITLE: VEGA C1610 LINE CARD TOP ASSEMBLY DRAWING



750526 REV B
TOPSILK

879365

REVISIONS				
CHG NO	LTR	DESCRIPTION	DATE	APPD
-	A	ENGINEERING RELEASE	05/15/00	



ITEM	DESCRIPTION	PART NO.	QTY
1	SPEAKER AMP PCB ASY	0120115	1
2	CASE TOP	0216894	1
3	CASE BOTTOM	0216895	1
4	KEYPAD C-1610	0240045	1
5	SPACER, #6 ID X 1/4 OD X 1/4	450378	2
6	DISPLAY WINDOW COVER	470263	1
7	DISPLAY, VF 20 X 2	790014	1
8	MAIN BOARD ASY.	872362	1
9	KEYPAD BOARD ASY	879363	1
10	SPEAKER	2490218	1
11	MOISTURE SCREEN	2490224	1
12	RUBBER FOOT	4600317	4
13	BUSHING, INSULATOR	4840123	1
14	#6 FLAT WASHER	5179201	4
15	SCREW, #6-32 X .25 PH	5280022	15
16	SCREW, #6-32 X .625 PH	5280027	2
17	SCREW, #6-32 X 3/8 PH BLK	5280271	5
18	NUT, 4-40 KEPS	5380075	1
19	NUT, #6-32 KEPS	5380076	16
20	KNOB, .937 OD	5500302	2
21	SPACER, #6 ID X .25 OD X .188	5610639	7
22	CABLE, SPEAKER	6750062	1
23	CABLE, VOLUME	6750064	2
24	PAD THERMAL CONDUCTIVE	8250003	1
25	CABLE CLAMP	8800176632	2
26	POT, 10K	1300781-1	2
NS	PLUG, RJ-45	2862060	2
NS	CABLE, 8 CONDUCTOR FLAT	6720020	.75

UNSPECIFIED LIMITS OF TOLERANCE
DECIMAL: FRACTION:
.X = ±.030 IN MACHINED
.XX = ±.010 IN FINISH 64
.XXX = ±.005 IN

STRAIGHTNESS AND/OR FLATNESS .005 IN./1 IN.
ANGLES ± 1°, BENDS ±2°

CONCENTRICITY

UNMARKED ANGLES, BENDS AND INTERSECTIONS 90°

THREADS - EXT. CLASS 2A
INT. CLASS 2B

DATE	05/15/00
DR BY	S K LLOYD
CHK BY	
APPR'D	
PROD	
MAT'L	SEE TABLE

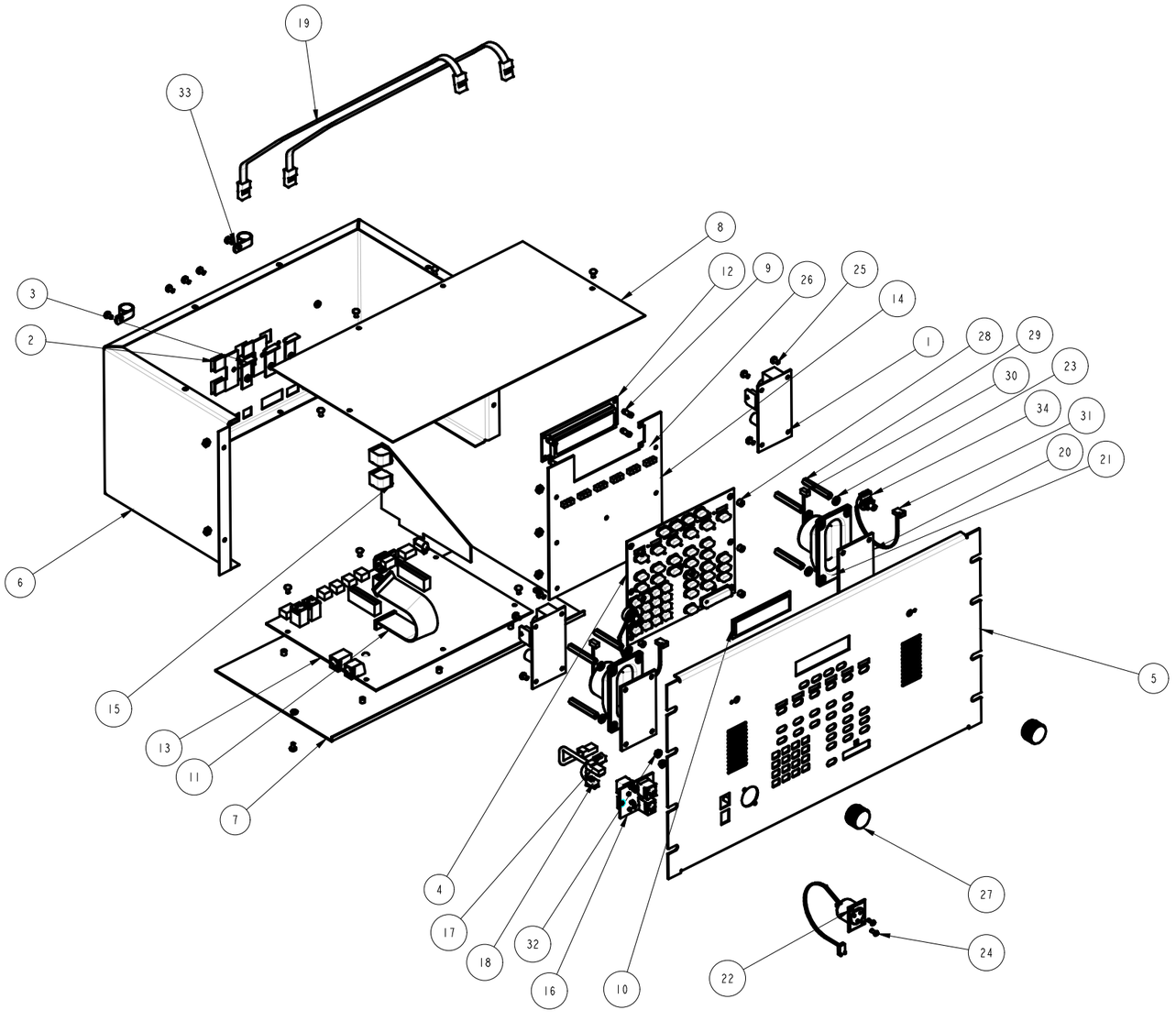
Telex®
TELEX COMMUNICATIONS INC.
Lincoln Nebraska U.S.A.

TITLE **C-1610 FINAL ASSEMBLY**

SIZE	CODE IDENT	DWG. No.
C	57010	879365
SCALE: 1/2		SHEET: 1 OF 1

879484

REVISIONS				
CHG NO	LTR	DESCRIPTION	DATE	APPD
-	A	RELEASE FOR PRODUCTION	03/08/01	



QTY	DESCRIPTION	ITEM	PART NUMBER	SPECIFICATION
2	POT, 10K	34	1300781-1	
2	CABLE CLAMP	33	8800176632	
2	NUT, 4-40 KEPS	32	51745000	
3	CABLE, VOLUME	31	6750064	
2	CABLE, SPEAKER	30	6750062	
8	STANDOFF, 6-32 X 1 5/8	29	5610703	
7	SPACER, #6 ID X .25 OD X .188	28	5610639	
2	KNOB, .937 OD	27	5500302	
11	NUT, #6-32 KEPS	26	5380076	
27	SCREW, #6-32 X .25 PH	25	5280022	
2	SCREW, 4-40 X 3/8 OVAL	24	5270134	
8	#6 FLAT WASHER	23	5179201	
1	RECTL XLR 3 PIN FEMALE	22	4070119	
2	SPEAKER	21	2490249	
2	MOISTURE SCREEN	20	2490224	
2	AMP INTERFACE CABLE ASSEMBLY	19	879483	
1	4 POSITION INTERFACE CABLE ASSEMBLY	18	879482	
1	6 POSITION INTERFACE CABLE ASSEMBLY	17	879481	
1	RJ INTERFACE PCB ASSMEBLY	16	879476	
3	LINE CARD, C-1610	15	879364	
1	KEYPAD BOARD ASY	14	879363	
1	MAIN BOARD ASY.	13	872362	
1	DISPLAY, VF 20 X 2	12	790014	
1	CABLE ASSEMBLY, 20 PIN IDC	11	600073	
1	DISPLAY WINDOW COVER	10	470263	
4	SUPPORT POST, 1/4" LG DUAL LOCKING	9	450652	
1	TOP PANEL	8	378305	
1	BOTTOM PANEL	7	378304	
1	REAR PANEL	6	378303	
1	FRONT PANEL	5	378302	
1	KEYPAD C-1610	4	0240045	
3	BOARD SUPPORT BRACKET	3	216897	
2	HOLE COVER PLATE	2	0216896	
2	SPEAKER AMP PCB ASY	1	0120115	

NEXT ASSY	USED ON
APPLICATIONS	

UNSPECIFIED LIMITS OF TOLERANCE
DECIMAL: FRACTION:
.X = ±.030 IN MACHINED
.XX = ±.010 IN FINISH 64
.XXX = ±.005 IN

ANGLES ± 1°, BENDS ±2°

STRAIGHTNESS AND/OR FLATNESS .005 IN./1 IN.

CONCENTRICITY

UNMARKED ANGLES, BENDS AND INTERSECTIONS 90°

THREADS - EXT. CLASS 2A
INT. CLASS 2B

DATE	03/08/01
DR BY	S K LLOYD
CHK BY	
APPR'D	
PROD	
MAT'L	SEE TABLE

Telex®
TELEX COMMUNICATIONS INC.
Lincoln, Nebraska U.S.A.

TITLE C-1610 RACK MOUNT ASSEMBLY

SIZE	CODE IDENT	DWG. No.
D	57010	879484
SCALE: N/A		SHEET: 1 OF 1

12 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, Web: 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**

Visit our web site at **www.vega-signaling.com**

13 Specifications

Front panel controls

- Select and Unselect status for each line
- Ten Function tone button selection
- TX and RX ALL buttons
- Mute button
- Alert button
- AUX Relay Button
- MONITOR
- INTERCOM
- PTT button
- 16 digit DTMF keypad
- Select and Unselect volume controls
- Supervisory control
- Line Activity Monitor LED for each line

Two Simultaneous Microphones

- Handset/Headset and Desk microphone/gooseneck

Features

- 2 or 4 wire per line (field Programmable)
- Simplex/full duplex per line (field Programmable)
- Programmable squelch control per line
- Four Alert tone cadence (keypad Programmable)
- Crossmute per line (hardwire)
- TX notch filter
- Wildcard group groupings (function tones)

PTT	Wildcard Group
1-10	none
1-8	9/10
1-6	7/8 9/10
1-4	5-10

Special features

- Automatic initial level settings
- Self Tuning receive circuit
- Internal tuning via keypad
- Clock and VU meter
- Summed audio recorder output
- Incoming Select Call DTMF detection

Specifications

Sequential tone line input and output impedance:
Two-Wire: 600, 1200, 1800, and 2400 ohm, jumper selectable, transformer isolated,

Four-Wire TX Line: 600 ohm, 1200, 1800, and 2400 ohm, jumper selectable, transformer isolated,

Four-Wire RX Line: 600 or 10K ohm jumper selectable, transformer isolated,

Local Control keying,
Each Line Input Level: -40 dBm to +10 dBm.
Each Line Output Level: -20 dBm to +10 dBm into a 600-ohm line, adjustable (high-level guard tone only).
Audio Compression (selected and Unselected receive and transmit): Less than 3-dB change in output level for a 25 dB change in input above threshold.
Distortion: 3% maximum at full compression.
Hum and Noise: 50 dB below operating levels.
Speaker (one): 4 in, 8 ohm, heavy-duty.
Amplifier Power: 5 W maximum at 3% THD into an 8 ohm load or equivalent
Optional Handset Earpiece Level: Adjustable level independent of speaker volume controls.
Audio Frequency Response: + 1/-3 dB, 300 to 3000 Hz, except at the transmit tone notch frequency.
Tone Frequencies: All Function frequencies are selectable from 600 to 3300 Hz. Accuracy ± 1 Hz.
Select All (simulcast): Selection of all sequential tone lines.
Time mute: temporarily mutes "Unselected" audio.
Group select: for easy selection of TX/RX line combinations.
Operating Temperature Range: 0 to +50 degree C.
Power Requirements: .117 Vac, 60Hz, 25W, or 12.0 Vdc at 2 A maximum
Microphone Connection: Handset and Headset 4-wire; Desk and Gooseneck use 6-wire

Note: Specifications are subject to change with out notice.

VEGA®

TELEX® Signaling Product Company

8601 East Cornhusker Highway, Lincoln, Nebraska, 68507
Phone: (402) 467-5321 / (800) 752-7560 Fax: (402) 467-3279
E-mail: vega @telex.com, Web: www.vega-signaling.com

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