CL-100
Internet Linking Controller

Instruction Manual

Table of Contents

Introduction and Specifications

The CL-100 is a complete standalone RF interface to the Internet. A pair of Cat-Links will provide a VOIP link between two transceivers or repeaters. The CL-100 will convert the receiver's audio and COR outputs into digital packets and send them through the Internet to another CL-100 that will convert them into a PTT and TX audio signal to control a transmitter or the link port of a repeater controller.

Space is provided for twenty IP addresses with their port assignments. The CL-100's address table will also store a unique connect number with call letter voice identification for each of the twenty positions. When a DTMF command is entered on its RF input, the CL-100 will connect to another CL-100 at the specified IP address.

An RS-232 Port is provided to assign the CL-100's IP, Gateway and Mask addresses. This port also displays the operation for diagnostic testing and performance.

Connect the CL-100 to a port on your router. Use your computer's Internet web browser to program the CL-100's internal web page. Select your control codes and timer settings. Enter your list of IP addresses, port settings, connect codes and voice identifications.

In addition to identifying the transmitter each time the units disconnect, the voice synthesizer will announce the Internet connect and disconnect messages, timeout messages and the status of the five remote control switches. A DTMF keypad test will read back the numbers decoded in a synthesized voice.

The CL-100 provides an optional tone to let the RF user know each time the remote unit stops sending packets.

Seven timers control the CL-100 operation. If the COR timer is enabled, when a continuous input exceeds the setting of the COR timer the CL-100 will send a PTT off packet to the remote unit. At factory default the COR timer is set for three minutes and is enabled. If the PTT timer is enabled a continuous PTT that exceeds the setting of the PTT timer will cause the transmitter to turn off. At factory default the PTT timer is set for three minutes and is enabled. If the ID timer is enabled the voice synthesizer will announce the ID whenever the transmitter is active. The default setting of the ID timer is ten minutes. The COR, PTT and ID timers are user programmable. If the Auto Reconnect timer is enabled after a power failure when power is restored the CL-100 will automatically reconnect to the IP address stored in table position one. If the Inactivity Disconnect timer is enabled after a period of inactivity the CL-100 will disconnect.

If the COR De-bounce timer is enabled the CL-100 will delay responding to a COR input. The default setting is 1000 milliseconds. This feature is used to eliminate undesired key-ups when multipliable CL-100s are connected to a CH-100 hub system.

Since the CATLINK system provides a continuous connection during periods of inactivity the Internet connection must be maintained. This is accomplished by sending pings between units. Every thirty seconds a ping is send and received. The Ping timer determines the time period between pings. The Ping Counter determines how may pings are missed before the CL-100 disconnects. The factory default is set to three missed pings.

Communications between the CL-100 and a repeater controller is accomplished through two logic outputs and one logic input. Output #1 momentarily switches to ground when a connection is established between two CL-100 units. Output #2 momentarily switches to ground when the CL-100 disconnects. These outputs can be used to execute repeater controller macros.

When the CL-100's Logic input is momentarily grounded by a repeater controller's switch, the CL-100 will automatically connect to the IP address located in the number one table position. This permits the repeater controller to automatically connect the CL-100 for a scheduled net.

The CL-100 has an automatic reconnect feature. If Internet service is lost the CL-100 will attempt to reestablish the connection once every thirty seconds. The number of retries are determined by the user programming the retry connect counter during the CL-100 setup procedure. If set to the maximum of 99 tries the CL-100 will attempt to reconnect for fifty minutes. The counter's default setting is 20 or ten minutes.

Five user controlled FET relay driver switches permit control of equipment located with the CL-100. Control is accomplished by entering DTMF commands through the CL-100's RF port or through the Internet by checking the switch boxes in the Zone #2 window with your web browser.

The CATLINK is intended for a direct connection between two units. By adding the optional CATHUB to your system ten units can be supported.
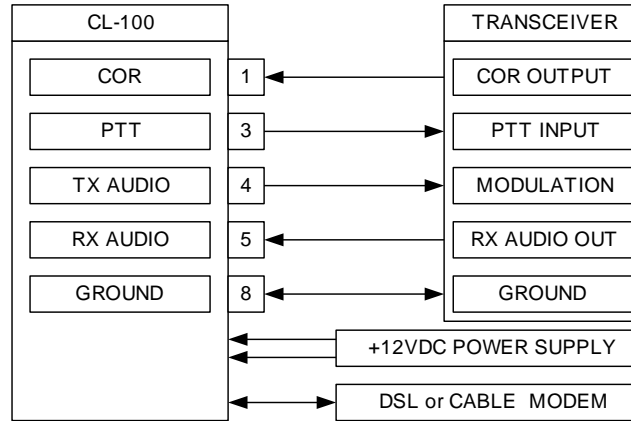
Specifications

Microprocessor	TI ARM Cortex Processor
Memory	20 IP Addresses with Call Letter Identification
Voice synthesizer	TI – MSP53C391N
Logic Output Switches	(5) Open Drain Active Low (Sink to Ground) 40 VDC 100ma.
Logic Input Quick Connect	(1) Active Low (Pull to Ground)
Receive Audio Input	70 to 600mVAC (10K ohm Impedance)
Transmit Audio Output	0 to 200mVAC (600 ohm Impedance)
Operating Temperature	-15 to +55 degrees C
Web page Address	http://192.168.1.240 (CL-100 default Address)
Serial Interface	RS-232 - 115200 Baud 8N1 (No Flow Control)
Power	+9 to +15VDC at 200mA MAX
Size	8.0" x 5.0 x 1.5"

FCC Part 15 RF Interference
When installed in the RME-200L rack mount enclosure, the CL-100 has been tested and found to meet the standards for a Class A digital device, as specified in Part 15 of the FCC Rules. These specifications are designed to provide reasonable protection against such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation.
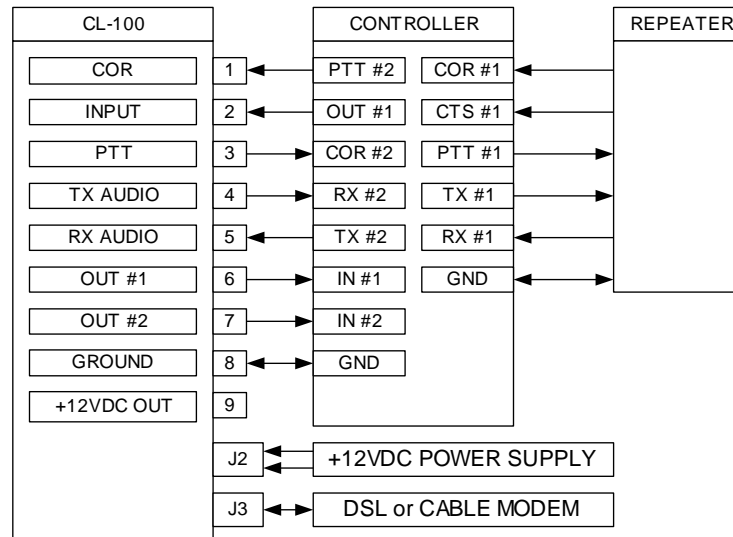
System Configuration

Transceiver Interface In this configuration the CL-100 is connected between a transceiver and a DSL or CABLE modem.

CL-100		TRANSCEIVER
COR	1 ←	COR OUTPUT
PTT	3 →	PTT INPUT
TX AUDIO	4 →	MODULATION
RX AUDIO	5 ←	RX AUDIO OUT
GROUND	8 ↔	GROUND
	←	+12VDC POWER SUPPLY
	↔	DSL or CABLE MODEM

NOTE: If the transceiver is tuned to the output of a repeater the repeater's transmitter must have a CTCSS tone gated on and off with the repeater's input signal.

Repeater Interface In this configuration the CL-100 is connected between the link port of a repeater controller and a DSL or CABLE modem. Please note the controller's TX audio output is connected to the RX audio input of the CL-100. RX audio is connected to TX audio and PTT is connected to COR. Since the controller's PTT output is active LOW dipswitch #1 must be set to the ON position. The CL-100's PTT output is an open drain switch requiring a pull-up resistor on the repeater controller's COR input.

CL-100		CONTROLLER		REPEATER
COR	1 ←	PTT #2	COR #1 ←	
INPUT	2 ←	OUT #1	CTS #1 ←	
PTT	3 →	COR #2	PTT #1 →	
TX AUDIO	4 →	RX #2	TX #1 →	
RX AUDIO	5 ←	TX #2	RX #1 ←	
OUT #1	6 →	IN #1	GND ↔	
OUT #2	7 →	IN #2		
GROUND	8 ↔	GND		
+12VDC OUT	9			
	J2 ←	+12VDC POWER SUPPLY		
	J3 ↔	DSL or CABLE MODEM		

Page 4

Dip Switch Settings

A four-position dipswitch configures various functions of the CL-100.

Switch 1 This switch determines COR input logic. Switch #1 should be ON if the repeater receiver's COR is an active low and OFF if COR is active high. NOTE: The CL-100 has an on board resistor pulling-up the COR input to +5VDC through a protection diode.

Switch 2 This switch is used to place the CL-100 in duplex mode. When connected to another CL-100 a full duplex link will be established. The CL-100s will transmit and receive at the same time. NOTE: The CH-100 hub will not support duplex operation.

Switch 3 This switch is used to place the CL-100 in the RS-232 programming mode. Set this switch to ON and apply power to the CL-100. The RS-232 programming menu will be displayed on the computer screen. This operating mode is used to initially enter the IP, Gateway and Mask addresses.

Switch 4 This switch is used to lock the CL-100 internal web page. This switch must be OFF to program the CL-100 with your web browser. Once programmed if you want to prevent access to the internal web page set dipswitch #4 to the ON position.

CH-100 Hub Operation The CL-100 is designed for a two-unit point-to-point connection. If you require multiple connections a HUB must be added to your system.   The CH-100 will support the connection of up to twenty CATLINKs. The CH-100 can be located anywhere a high-speed Internet connection and constant DC power is available. To support twenty connections the Internet upload speed should be 1.5mbps.

Power Requirements DC power is supplied through coaxial power connector J3. The center pin is positive. If a power failure occurs the CL-100 will disconnect. Since the connect information is stored in volatile memory the CL-100 will need to be manually re-connected. To prevent this disconnect the CL-100 should be supplied by a backed up 12VDC power source.

Setup Using RS-232 Port
Connect a "direct" RS-232 cable between the RS-232 port on the CL-100 and your computer. Open your Terminal emulator program and select the active COMM port. Set the port for 115200 Baud 8N1. Set the Flow Control to NONE. To activate the RS-232 port, set dipswitch #3 to ON and apply DC power. The computer should display the CL-100 setup menu.

Program IP Address If the CL-100 is connected to a router and the default IP address is 192.168.1.240 it is not necessary to change the address. If the CL-100 is directly connected to a DSL or cable modem enter the IP address assigned by your Internet provider. Use the **Myip/r** and **Myip/w** commands to display and program the IP Address.

NOTE: The CL-100 requires a static IP address since the IP address will be stored in the IP address table of other CL-100 units wishing to connect to you.

Processor Initialization completed OK. Version 2.03

Entering CL-100 parameters setup

CL-100 Setup.
Default..……….Load parameters with factory default values.
Exit.…..………..Exit CL-100 Setup.
Mygw/r...…….Display my Gateway address.
Mygw/w...….Set my Gateway address.
Myip/r..……...Display my IP address.
Myip/w...…...Set my IP address.
Mymask/r....Display my Mask address.
Mymask/w...Set my Mask address.
Pass/r...……..Display Username and Password.
Pass/w...…...Set Username and Password.
Ports/r...…...Display Unit Port Numbers.
Ports/w...…..Set unit Port Numbers.
Save..…..……..Save parameters to non volatile memory.
Ver...…..……….Display firmware version.
Cmd >

Program Gateway Address If the CL-100 is connected to a router and the default GW address is 192.168.1.1 it's not necessary to change the address. If the CL-100 is directly connected to a DSL or cable modem enter the GW address assigned by your Internet provider. Use the **Mygw/r** and **Mygw/w** commands to display and program the Gateway Address.

Program MASK Address From the Programming menu use the **Mymask/r** and **Mymask/w** commands to display and program the Mask Address. The default MASK address is 225.225.225.0. It is not necessary to change this address unless the CL-100 is operating within a different sub-net.

Read MAC Address From the Programming menu use the **Mymac/r** command to display the Mac Address. This is a unique number assigned to any device that is connected to the Internet. This number can be used as an electronic serial number for your CL-100.

Program USERNAME and PASSWORD From the Programming menu use the **Pass/r** and **Pass/w** commands to display and program the CL-100's Username and Password. The default Username is "CATLINK" and the Password is "cl100". The Username and Password are used to access the CL-100's internal web page with your Internet browser.

Program PORTS The default UDP Port Number is 1450 and the TCP default Port Number is 80. If your system requires these port numbers to be changed use the **Ports/r** and **Ports/w** commands.

NOTE: After making changes be sure to use the **Save** command before existing the RS232 setup mode.

Router Setup
When the CL-100 is connected to a router a port must be opened. The CL-100 is defaulted to port 1450. Use your Internet browser to access your router's setup page. In the case of a Linksys router select the tab called "Applications & Gaming". Enter port 1450 to 1450 and set the protocol to "UDP". Also check the enable box.
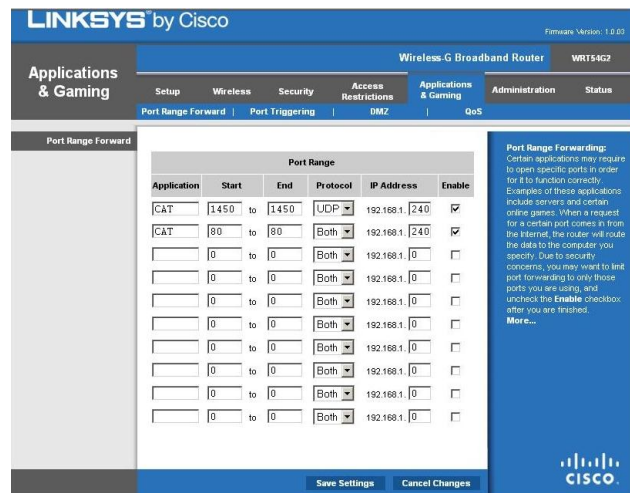
If you want to have access to the CL-100 through the Internet for control or programming make the second entry to the table. Enter Port 80 to 80 and set the protocol to "Both". Also check the enable box.

The CL-100 uses JavaScript to exchange data with your web browser. The computer's security settings must have active scripting enabled. If active scripting is disabled, all of the data boxes will appear blank.
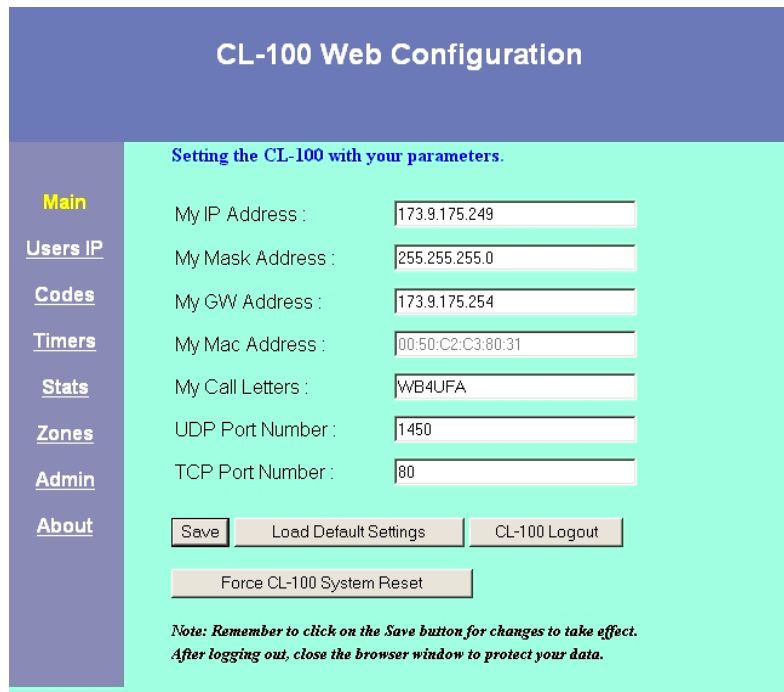
CL-100 Setup Using Web Browser

Use your Internet browser to program the codes, timer settings, call letter identification and IP look-up table. To access the CL-100's web page open your web browser and enter the Username **CATLINK** and the Password **cl100**.

CL-100 Authentication Required.
Username: catlink
Password: *****
Click to login
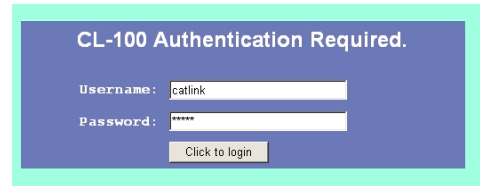
CL-100 Main Web Page
The **My IP Address** cell displays the IP address of the CL-100 as entered during the RS-232 Setup. NOTE: The CL-100 requires a static IP address since its IP address will be stored in the IP address table of other CL-100 units.

CL-100 Web Configuration

Setting the CL-100 with your parameters.

Main
Users IP
Codes
Timers
Stats
Zones
Admin
About

My IP Address :	173.9.175.249
My Mask Address :	255.255.255.0
My GW Address :	173.9.175.254
My Mac Address :	00:50:C2:C3:80:31
My Call Letters :	WB4UFA
UDP Port Number :	1450
TCP Port Number :	80

Save   Load Default Settings   CL-100 Logout

Force CL-100 System Reset

Note: Remember to click on the Save button for changes to take effect.
After logging out, close the browser window to protect your data.

The **My MASK Address** cell displays the MASK address of 225.225.225.0. It is not necessary to change this address unless the CL-100 is connected to a Sub Net.

The **My GW Address** cell displays the gateway address of the CL-100 as entered during the RS-232 Setup.

The **My MAC Address** cell displays the MAC Address. This address is assigned to every piece of equipment that connects to the Internet. This number cannot be changed and is the electronic serial number for your CL-100.

My Call Letters The voice synthesizer uses the call letter identification as part of the link disconnect message and to ID your transmitter. Memory space is provided for eight letters or numbers. The default identification is: CL100. Enter your call letter identification in the My Call letter cell.

CL-100 UDP Port Number The CL-100's factory default UDP port number is 1450. This port may be changed. Remember to open the new port number on your router. Two CL-100s can share the same IP address when they are connected to the same router and are using different port numbers. Remember for two CL-100s to connect to each other they must have the same port number.

CL-100 TCP Port Number The CL-100's factory default TCP port number is 80. This port may be changed. Remember to open this port on your router if you wish to communicate with the CL-100 through the Internet using your web browser.

Load Default Settings If you want to return the CL-100 to the factory default settings click: "Load Default Settings" button.

CL-100 System Reset To reset the CL-100, click the "CL-100 System Reset" button. This will cause the CL-100 to do a reset identical to applying power to the unit. The voice synthesizer will announce the power up message and the firmware version.

CL-100 User IP Web Page
Use your Internet browser to program the twenty user positions with the IP addresses of other CL-100 units. Assign a connect code to each of the addresses. The code can be from one to seven digits. Also assign the call letter identification and a port number. The call letters can be up to eight numbers or letters.

The IP address in the table #1 position is a priority address. The CL-100 will connect to this address when J4 pin 2 is momentarily grounded if Zone 1 Channel 4 is enabled. The CL-100 will also connect to the IP address in table position #1 if the Auto Reconnect feature is enabled Zone 1 Channel 7.

The IP address in table position #19 will connect to the Fort Lauderdale hub. This hub is maintained by C.A.T. and is available for CL-100 owners to test and perform multiple connections. The hub will support up to twenty users. If you would like to sponsor your own hub, order a CH-100 from Computer Automation Technology at www.catauto.com.

The IP address in table position #20 will connect to a packet test recorder. Key-up and make a ten second recording. The recorder will store your packets. When you un-key your packets will be returned to your CL-100. The packet test recorder will automatically disconnect after two minutes. The packet test recorder is maintained by C.A.T and is available for CL-100 owners.

CL-100 CODE Web Page
Use this web page to enter your preferred control code settings. These codes can be
between one and seven digits.

Enter a unique Zone #1 code to control the CL-100 Enable, Keypad Test, End of
Transmission Tone, Quick Connect, COR Timeout, PTT Timeout, Auto Reconnect Timer,
Inactivity Disconnect Timer.

Enter a unique Zone #2 control code. This code is used to control the five Remote Control
Switches, Activity ID, Incoming ID, and Voice ID.

Zone #3 is reserved for future use.

Enter a unique Zone #4 control code. This code is used to control the RS-232 Report, the
ICMP Protocol Test Utility and the COR De-bounce timer.

Enter a unique Disconnect Code, DTMF Pad Test Code and User Output Switch Code.

Use this web page to enter your preferred timer settings. The timers can be programmed for 1 to 1799 seconds.

The **PING TIMER** controls the amount of time between pings being sent between two CATLINKs. The default setting is every 30 seconds. You can increase or decrease this time.

The **LOST PING TIMEOUT COUNT** controls how many ping are missed before the CL-100 disconnects causing the link to go down during a loss of Internet service. With the ping timer set to 30 seconds and the ping counter set to 20 if Internet services fails for more than 10 minutes the CL-100 link will disconnect.

CL-100 Web Configuration

Setting the CL-100 timers and counters values.

Navigation	Setting	Value	Unit
Main	Ping Timer :	30	seconds
Users IP	Lost Ping Timeout Count :	3	count
Codes	COR Timeout Timer :	180	seconds
Timers	PTT Timeout Timer :	180	seconds
Stats	ID Timer :	600	seconds
Zones	Auto Reconnect Timer :	5	minutes
Admin	Inactivity Disconnect Timer :	10	minutes
About	COR Debounce Enable :	1000	milliseconds
	Spare Timer 2 :	0	
	Spare Timer 3 :	0	

Save

The **COR** timer controls the amount of time a continuous input signal to the receiver may be present before the CL-100 sends a un-key command. The default setting is 180 seconds. Zone #1 Channel #5 must be on to enable this timer.

The **PTT** timer controls the amount of time a continuous push-to-talk signal is applied to the transmitter before the PTT times out. The default setting is 180 seconds. Zone #1 Channel #6 must be on to enable this timer.

The **ID** timer determines how often the voice ID is sent when the CL-100 is active. The default setting is 600 seconds. Zone #2 Channel #6 must be on to enable this timer. The CL-100 will wait for PTT to drop before sending the voice ID.

The **AUTO RECONNECT** timer determines how long the CL-100 will wait before it attempts to reconnect to the IP address stored in table position one. If the connection is unsuccessful the CL-100 will continue to try and connect for the setting of the Auto Reconnect Timer.

The **INACTIVITY DISCONNECT** timer determines the period of inactivity before the CL-100 does an automatic disconnect. The default setting of this timer is ten minutes.

The **COR DEBOUNCE** timer determines the delay before the CL-100 responds to a COR input. The default setting is 1000 milliseconds.

CL-100 Stats Web Page This page monitors CL-100 activity. The amount of connects that take place; both incoming and outgoing are recorded. This information is stored in volatile memory and will clear if power is interrupted to the CL-100.

CL-100 Zone Web Page
Use this web page to display the Zone #1 through Zone #4 settings. By checking the boxes you can enable the various control functions.

1-1   CL-100 Enable
This box must be checked to enable the CL-100 to connect to one of the twenty IP address, perform a keypad test or control the five remote control switches. To disable the CL-100 uncheck the box or send [10010].

1-2   Keypad Test Enable
This box must be checked to enable the DTMF keypad test feature. To disable the keypad test uncheck the box or send [10020].

1-3   End of Transmission Tone Enable
When this box is checked a chirp will be heard on the transmitting unit when the COR signal drops at the receiving unit. To eliminate the chirp uncheck the box or key-up and send [10030]

1-4   Quick Connect Enable
This box must be checked to enable the Quick Connect feature. When J4 pin 2 is monetarily grounded by an external controller at the repeater site the CL-100 will connect to the unit who's address is located in table position one. To eliminate the quick connect feature uncheck the box or key-up and send [10040].

1-5   COR Timer Enable
When this box is checked a COR input that exceeds the COR timer setting will cause the receiving CL-100 to time out and stop sending packets. To disable the COR timer uncheck the box or key-up and send [10050].

1-6   PTT Timer Enable
When this box is checked a PTT output that exceeds the PTT timer setting will cause the transmitting CL-100 to time out and turn off the transmitter. To disable the PTT timer uncheck the box or key-up and send [10060].

1-7   Auto Reconnect Enable
When this box is checked, at power up the CL-100 will attempt to connect to the IP address stored in table position one. If the connection is unsuccessful the CL-100 will continue to try and connect for the setting of the Auto Reconnect Timer.

1-8   Inactivity Disconnect Timer
When this box is checked, the link will disconnect after a period of inactivity determined by the setting of the Inactivity Disconnect Timer. The default setting of this timer is ten minutes.

2-1 thru 2-5   CL-100 Switch Control Enable
When these boxes are checked the associated switches will be turned on. Five open drain FET relay driver switches can be used to control equipment at your repeater site. During normal operation these switches can be changed by DTMF commands through the radio input. To turn on switch #1 check the box or key-up and send [20011]. To turn the switch #1 off uncheck the box or send [20010]

2-6   Activity ID Enable
When this box is checked the CL-100 will provide voice identification whenever the transmitter is active. The voice synthesizer will announce the transmitter's call letters. This Automatic ID is polite and will wait for the user to un-key before sending the voice ID. A user programmable timer is provided to set the ID period. The maximum length between IDs is 30 minutes. The timer's default setting is ten minutes. To disable the Voice ID uncheck the box or key-up and send [20080].

2-7   Incoming ID Enable
When someone connects to your CL-100 your unit says: LINK UP. When this box is checked your CL-100 will say linkup and announce the identification of the CL-100 linking to you. To disable the ID portion of the connect message uncheck the box or send [20070].

2-8   Voice ID Enable
When this box is checked anytime the link disconnects the CL-100 will send the voice ID on the transmitter. To eliminate the ID uncheck the box or key-up and send [20080].

3-1 through 3-8 Enable
Reserved for future assignments.

4-1   RS-232 Report Enable
When this box is checked and a computer is connected to the RS-232 port the CL-100 will display its step-by-step activity. When the link connects and disconnects, who established the link, which is the server and client. Every thirty seconds the units will perform a handshake. This will be displayed as "ping-pong". Each time a control packet is sent to turn the transmitter on and off a "KEY_RADIO" and a "UNKEY_RADIO" will appear. This feature is very handy in verifying proper system operation.

4-2   ICMP Protocol Enable
ICMP is a network protocol test utility useful in testing the performance of the Internet connection. When this box is checked the CL-100 will respond to pings when time delay tests are conducted to determine Internet timing and path routing.

4-3   COR De-bounce Enable
When this box is checked the CL-100 will add a delay before it will respond to a COR input. Use the timer window to select the amount of time required. The default setting is 1000 milliseconds.

4-4 through 4-8 Enable
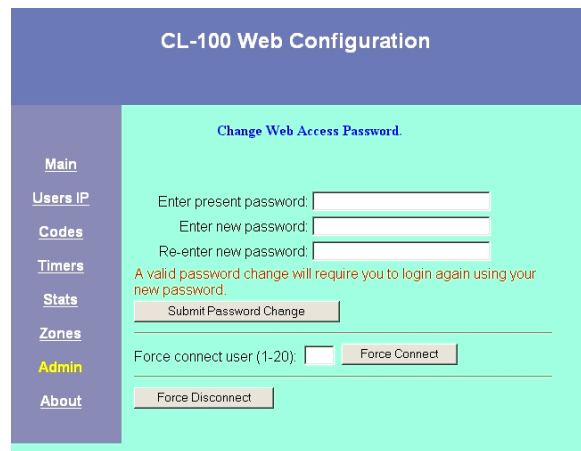Reserved for future assignments.

Admin Web Page
Use this web page to change the password and force the CL-100 to connect to or disconnect from one of the IP addresses in the table.

To change the password, enter the existing password followed by the new password entered twice. To effect the change you must log out and log back in using the new password.

If you are unable to reach the CL-100 by radio you can force a connection. Enter the User IP table position number in the **Force Connect** cell and click the **Force Connect** button.

If you are unable to reach the CL-100 by radio you can force a disconnect by clicking the **Force Disconnect** button.

CL-100 Security
Access to the previous web pages is available through the Internet once a user name and password are entered. Once you have completed the programming if absolute security is required set dipswitch #4 to on before connecting the CL-100 to the Internet.

Control by DTMF Commands

Interrogate Control Zone #1 by Radio
Key-up and send the default control code [100] followed by [0]. The voice synthesizer will read back the channels that are turned on in Zone #1. If all the channels are off, the voice will say: "ALL CLEAR."

Interrogate Firmware Version
Key-up and send the Zone #1 control code [100] followed by [99]. The voice synthesizer will announce the firmware version.

Reset the CL-100
Key-up and send the Zone #1 control code [100] followed by [98] to reset the CL-100.

CL-100 Timer Web Page

Changing a Control Zone #1 Channel by Radio
To change a control channel in Zone 1, key-up and send the control code [100] followed by the channel number and a [1] to turn the channel ON or a [0] to turn the channel OFF. Un-key and the voice will read back the channel number and say: "ON." or "OFF."

	Control Zone #1 Control Operator Code 100	
1	CL-100	Enable*
2	Keypad Test	Enable*
3	End of Transmission Tone	Enable*
4	Quick Connect	Enable*
5	COR Timer	Enable*
6	PTT Timer	Enable*
7	Auto Reconnect	Enable
8	Inactivity Disconnect	Enable

	Control Zone #2 Control Operator Code 200	
1	User Output Switch #1	Enable
2	User Output Switch #2	Enable
3	User Output Switch #3	Enable
4	User Output Switch #4	Enable
5	User Output Switch #5	Enable
6	Activity ID	Enable
7	Incoming ID	Enable
8	Voice ID	Enable*

	Control Zone #3 Control Operator Code 300	
1	Reserved	Enable
2	Reserved	Enable
3	Reserved	Enable
4	Reserved	Enable
5	Reserved	Enable
6	Reserved	Enable
7	Reserved	Enable
8	Reserved	Enable

NOTE: (*) Indicates the channel is defaulted to ON.

	Control Zone #4 Control Operator Code 400	
1	RS-232 Report	Enable
2	ICMP Protocol	Enable
3	COR De-bounce	Enable
4	Reserved	Enable
5	Reserved	Enable
6	Reserved	Enable
7	Reserved	Enable
8	Reserved	Enable

CL-100 Interrogation

To determine if there is an active Internet connection, key-up and enter the default Control Zone #1 code [100] followed by a [*]. Un-key and the voice will say: "LINK UP" if the CL-100 is connected to another unit through the Interned or "LINK DOWN" if there is no connection.

NOTE: When the CL-100 is connected to a CATHUB the voice will announce the hub's ID and the ID of all of the stations that are connected.

Voice ID Enable

When this channel is enabled anytime the link disconnects the CL-100 will send the voice ID on the transmitter. To eliminate the ID turn Zone 2 Channel 8 4 off. Key-up and send [20080].

RS-232 Report Enable

When this channel is enabled the CL-100 will provide a step-by-step activity report on the RS-232 port. The computer will display when the link is established, who established the link and if the CL-100 is designated as the server or client. Every thirty seconds the units will perform a handshake. This will be displayed as "ping-pong". Each time a control packet is sent to turn the transmitter on and off a "KEY_RADIO" and a "UNKEY_RADIO" will appear. If a timer causes the link to disconnect that will also be displayed as will a manual disconnect. This feature is very handy in verifying proper system operation.   NOTE: When the computer is not connected to the CL-100 turns Zone 4 Channel 1 off. To disable this feature, key-up and send [40010].

CL-100 Switch Control
Five open drain FET relay driver switches control equipment at your repeater site. These switches are controlled by DTMF commands. They can be made to turn OFF, ON or Momentarily change state, any time you choose. EXAMPLE: To turn on switch #3, key-up and enter the Control Zone #2 default control number [200] followed by the switch number [3] and a [0] to turn the switch OFF, a [1] to turn the switch ON or a [2] to momentarily change the switch setting for 0.5 seconds.

Automatic ID Enable
When this channel is enabled the CL-100 will provide voice identification whenever the transmitter is active. The voice synthesizer will announce the transmitter's call letters. The Automatic ID is polite and will wait for the transmitter to un-key before sending the voice ID. A user programmable timer is provided to set the ID period. The maximum length between IDs is 30 minutes. The timer's default setting is ten minutes.

CL-100 Linking Operation
Apply DC power.   The CL-100 will key-up the transmitter and the voice synthesizer will announce the power up message. EXAMPLE: "C L ONE HUNDRED VERSION ONE POINT ZERO ZERO" followed by the call letter identification. If the RS-232 port is connected to a computer the following information will be displayed:

```
-------------------------------------------
Processor Initialization completed OK.. Version 2.00
Sending Gratuitous ARP.

My MAC ADDR = 00:50:c2:c3:80:3d
 My IP ADDR = 192.168.1.240
   Mask ADDR = 255.255.255.0
Router ADDR = 192.168.1.1
    UDP Port = 1450
    TCP Port = 80
System MODE = Simplex
     My CALL = CL100
-------------------------------------------
Ethernet Initialization completed OK..
Ethernet is now locked...
```

CL-100 Operation

CL-100 Link Connection
To initiate a connection, key-up and enter the connect code assigned to one of the addresses in the IP table. The voice will say: "CONNECT TO KB4ABC". If the connection is successful the voice will say: "LINK UP". If the link does not connect the voice will say: "CONNECT FAILURE". If you are trying to connect too a CL-100 that is already connected too another CL-100 you will receive a voice message saying: "REMOTE IN USE".

CL-100 Link Disconnection To terminate the connection, key-up and enter the default command: [#]. The voice will say: "IP LINK DOWN" followed by your transmitter's call letter identification.

CL-100 Interrogation The default command to interrogate the CL-100 is: 100*. If the CL-100 is not connected the voice will say: LINK IS DOWN. If the CL-100 is connected to another CL-100 the voice will say: LINK IS UP. If the CL-100 is connected to a CH-100 cathub the voice will announce the hub's ID followed by the IDs of any CL-100s connected to the hub. If an empty IP address is selected the voice will say: ERROR IP IS ZERO

Keypad Test To test your DTMF keypad, key-up and enter the default keypad test code [500] followed by the numbers on you pad. The voice synthesizer will read back all the numbers that were decoded. EXAMPLE: Enter [5001234567890]. The voice will say: "KEYPAD TEST ONE TWO THREE FOUR FIVE SIX SEVEN EIGHT NINE ZERO". NOTE: The keypad test is disabled when the CL-100 is connected to another CL-100.

CL-100 Link COR Timeout When this feature is enabled a continuous COR input that exceed the setting of the COR timeout timer will cause the voice synthesizer to say: "COR TIME OUT". The CL-100 will send an un-key command to the remote CL-100. The default setting of this timer is 180 seconds.

CL-100 Link PTT Timeout When this feature is enabled a continuous push-to-talk output that exceeds the setting of the PTT timeout timer will cause the voice synthesizer to say: "PTT TIME OUT". The CL-100 will un-key its transmitter. The default setting of this timer is 180 seconds.

CL-100 Remote Switches The CL-100 has five-remote control FET relay driver switches. These switches are controlled by DTMF commands. EXAMPLE: To turn on switch #3, key-up and enter the Control Zone #2 default control number [200] followed by the switch number [3] and a [0] to turn the switch OFF, a [1] to turn the switch ON or a [2] to momentarily change the switch setting for 0.5 seconds. A separate UF Output Code is provided to control these switches. The default code is [950]. Using this code in place of the [200] will reduce exposing the Control Zone #2 code.

Interfacing to Other Equipment

COR INPUT (J4-1)
This input is pulled up to +5VDC with a 10K resistor on the CL-100 board. This input provides an indication to the CL-100 that a signal is present on the RF port. This input is settable for a logic high or low input. If the COR signal is active high dipswitch should be in the off position. If the COR input is active low dipswitch should be in the on position. Dipswitch #1 default position is on.

LOGIC INPUT (J4-2)
This input is pulled up to +5VDC with a 10K resistor on the CL-100 board. When this input is momentarily grounded (0.5 seconds), the Cl-100 will connect to the address stored in position #1 of the IP table. This table position is designated the primary address.

PTT OUTPUT (J4-3)
This output is an open FET relay driver switch. This output will ground the transmitter's push-to-talk line when the CL-100 receives packets from the Internet.

TX AUDIO OUTPUT (J4-4)
This is a 600 ohm audio output adjustable from 0 to 200mVAC. Jumper at P1 will produce a six to one reduction in transmit audio output to facilitate the adjustment of transmitters that have a very sensitive modulation input.

J4-1	COR INPUT
J4-2	LOGIC INPUT
J4-3	PTT OUTPUT
J4-4	TX AUDIO OUTPUT
J4-5	RX AUDIO INPUT
J4-6	CONNECT OUTPUT
J4-7	DISCONNECT OUTPUT
J4-8	GROUND
J4-9	+12VDC OUTPUT
J4-10	SWITCH #1
J4-11	SWITCH #2
J4-12	SWITCH #3
J4-13	SWITCH #4
J4-14	SWITCH #5
J4-15	GROUND

RX AUDIO INPUT (J4-5)
This is a 10K ohm audio input. The nominal input is (-10dbM) or 220mVAC. The adjustment range of the RX control (R44) will facilitate input levels from 70 to 600mVAC.

CONNECT OUTPUT (J4-6)
This output is an open FET relay driver switch. This output will turn on for 500mSEC when the CL-100 connects to another CL-100 through the Internet. This output can be used to notify the repeater's controller that a connection has been made.

DISCONNECT OUTPUT (J4-7)
This output is an open FET relay driver switch. This output will turn on for 500mSEC when the CL-100 disconnects from another CL-100 on the Internet. This output can be used to notifies the repeater's controller that a disconnect has occurred.

GROUND (J4-8) – (J4-15)
These pins provide ground connections for the transceiver and the repeater's controller.

+12VDC OUTPUT (J4-9)
This pin provides a +12VDC output to power accessories. NOTE: <u>Do not exceed 100mA.</u>

Switch #1 thru Switch #5 (J4-10 thru J4-14)
These switches permit remote control of equipment at the CL-100 location.   They are open
FET relay driver switches that sink current to ground when turned on.

Front Panel Display

Six LED indicators display the CL-100 activity. The green POWER LED will light when
+12VDC is supplied to the CL-100. The green COR LED will light when an active COR logic
signal is present on J1-1. The yellow DTMF LED will light when a DTMF tone is decoded.
The red PTT LED will light when the PTT output is active low at J1-3. The yellow CONNECT
LED will light when the CL-100 is connected to a DSL or CABLE modem. The green ACTIVE
LED will flash when data is being sent or received.

When the CL-100 is connected to another unit and the link is inactive the green LED will
flash approximately every thirty seconds. This is the normal hand shaking between the two
units.
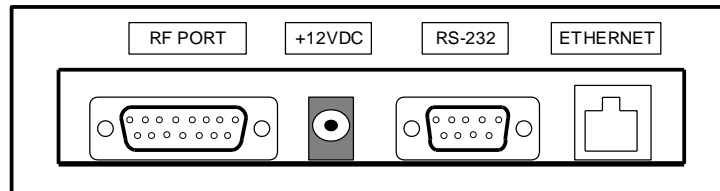
CL-100 DC Power Requirements
Connect +12VDC power to the 2.5/5.5mm connector. The center pin is (+). The CL-100
requires approximately 250mADC.

Connector Kit
Included with the CL-100 is a connector kit containing a 15 pin "D" male connector to mate
with J4 and a 2.5 by 5.5mm power plug to mate with J3. The center pin is [+].

CL-100 Alignment

COR Logic Activity
If the COR input is active high greater than 2.5VDC dipswitch #1 should be in the OFF position. If the COR is active low less than 0.7VDC dipswitch #1 must be set to the ON position. The COR input J4-1 is pulled-up to +5VDC through a 10K ohm resistor.

Audio De-Emphasis
If the CL-100 is supplied with discriminator audio it may be necessary to de-emphasize the receive audio. Move the jumper at P3 to pins 1 and 2. This will insert a .0047uF capacitor across the feedback resistor R55 reducing the gain of the amplifier at the higher audio frequencies.

Receive Audio Adjustments
Apply 12VDC to the J3 connector. The CL-100 will key the transmitter and announce the power-up message including the firmware version. Key-up and enter a DTMF tone. Adjust the RX control R44 for 200mVAC at TP1. Note the green COR LED is illuminated and the yellow DTMF LED will light each time a tone is received.
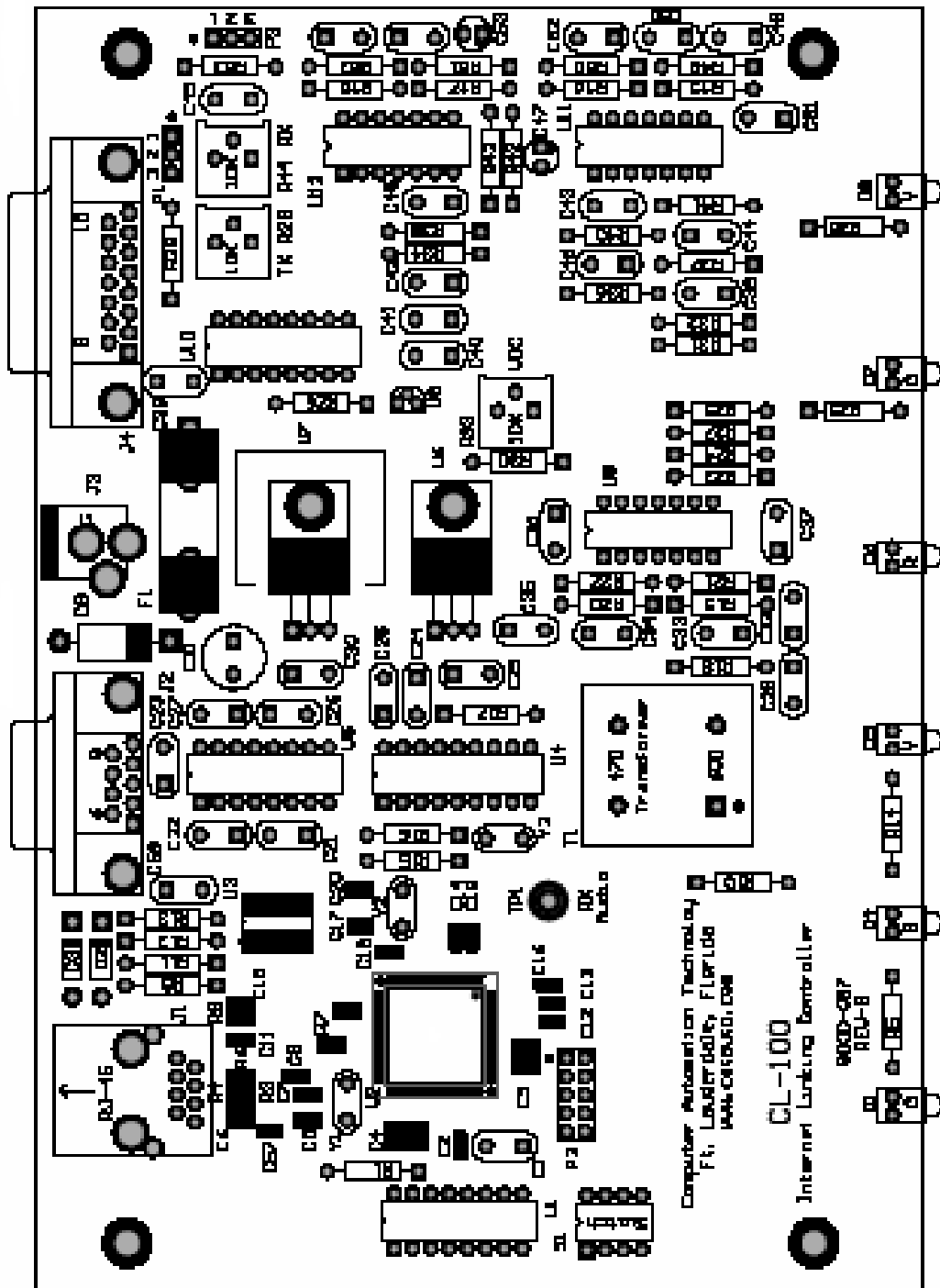
Transmitter Audio Adjustment
To adjust the transmit audio it is necessary to connect to another unit. If another unit is not available you can connect to the test packet recorder and adjust the TX audio output using your own recording. The test packet recorder is defaulted in table position#20. While receiving audio adjust the TX audio control R28 for the desired transmitter deviation level. If you fine the TX control near the full CCW position, move the jumper at P1 to pins 1 and 2. This will insert an attenuator in the TX audio path lowering the audio level and improve the adjustment of the TX audio control.
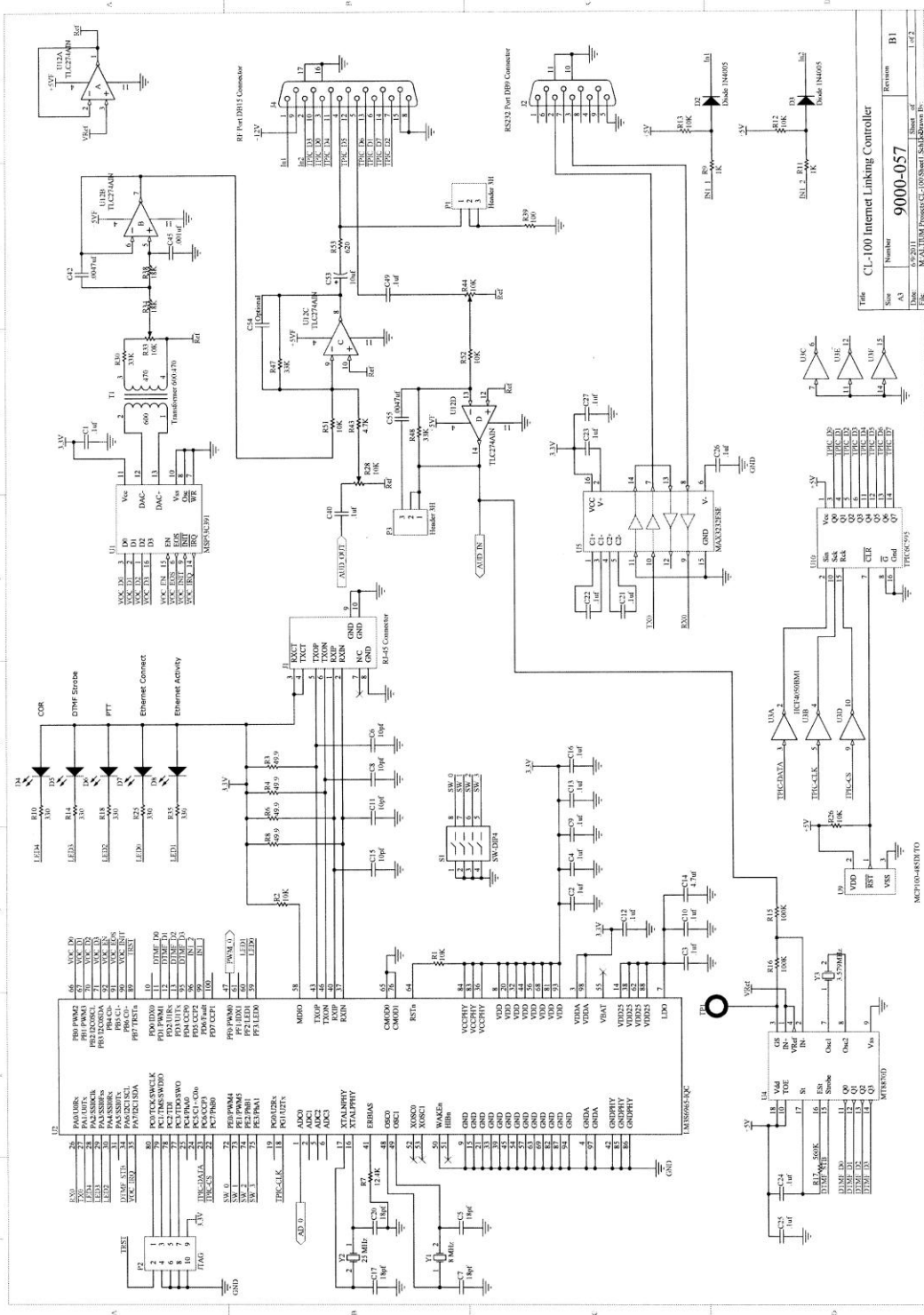
Voice Synthesizer Audio Adjustment
Once the TX audio level has been set cycle power to the CL-100 to produce the power-up message. While the power-up message is active, adjust the TX audio control R33 for the desired transmitter deviation. The voice synthesizer audio level should be adjusted lower that the audio being received from the link.
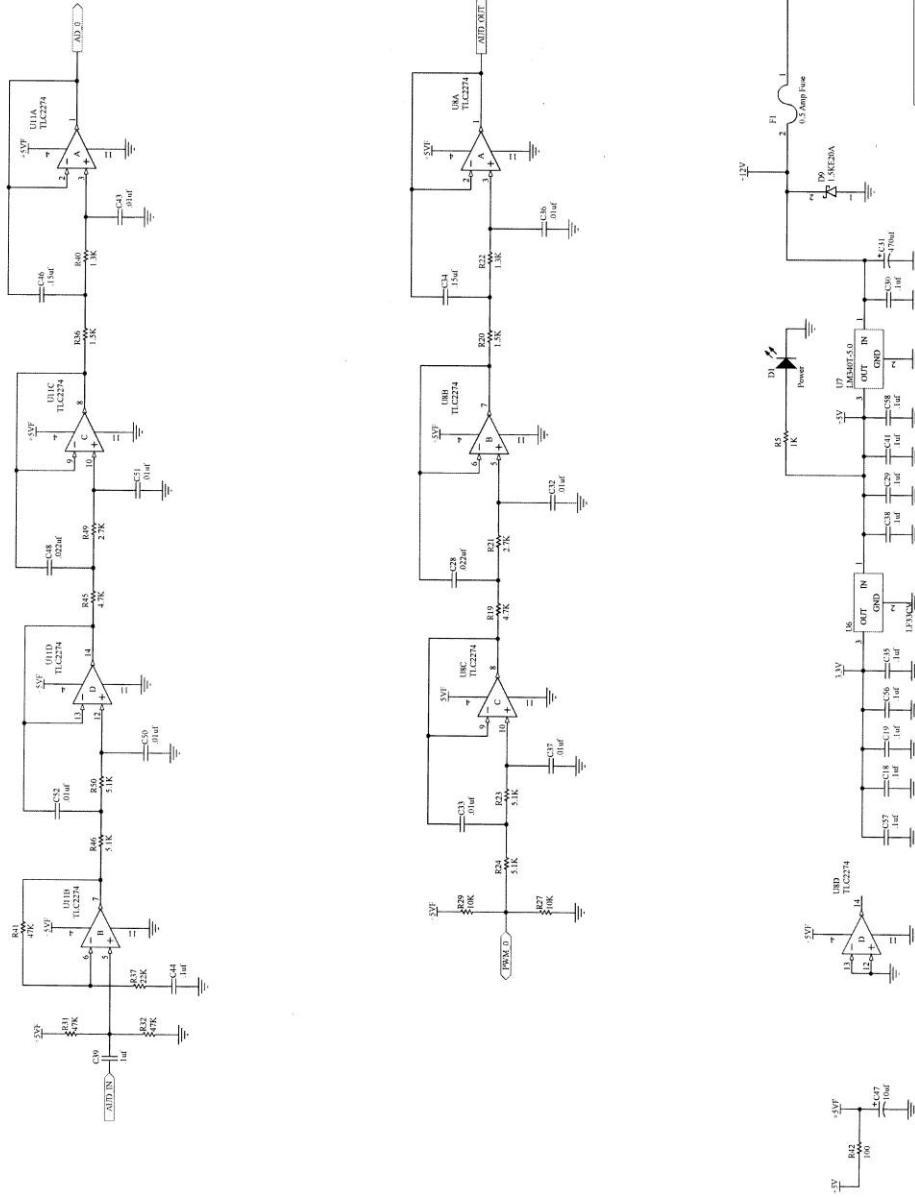
CL-100 Drawing

CL-100 Schematic Sheet 1 of 2

Part List

|			
2	Capacitor	470pf	C36, C43
3	Capacitor	.001uf	C32, C45, C51
2	Capacitor	.0018uf	C37, C50
4	Capacitor	.0022uf	C28, C33, C48, C52
2	Capacitor	.0047uf	C42, C55
2	Capacitor	.0082uf	C34, C46
18	Capacitor	.1uf	C1 – C58
1	Capacitor	Not Populated	C54
2	Capacitor	10uf @ 16V	C47, C53
1	Capacitor	470uf @ 25V	C31
1	Connector	9Pin D Female	J2
1	Connector	5Pin D Female	J4
1	Connector	DC Power	J3
1	Connector	Ethernet RJ-45	J1
1	Crystal	8 MHz	Y1
1	Crystal	25 MHz	Y2
1	Crystal	3.58 MHz	Y3
2	Diode	1N4005	D2, D3
1	Diode	1.5KE20A	D9
3	Diode LED	Green Lens	D1, D4, D7
2	Diode LED	Yellow Lens	D5, D8
1	Diode LED	Red Lens	D6
1	Fuse	0.5 Amp (Small)	F1
1	I.C.	HEF4050BT (SM)	U3
1	I.C.	LM340T-5.0	U7
1	I.C.	MCP100-485	U9
1	I.C.	LM3S6965 (SM)	U2
2	Resistor	100 Ohm	R39, R42
5	Resistor	330 Ohm	R10,R14,R18,R25,R35
1	Resistor	620 Ohm	R53
3	Resistor	1K Ohm	R5, R9, R11
1	Resistor	4.7K Ohm	R43
8	Resistor	10K Ohm	R1 - R52
3	Resistor	10K Variable	R34, R38
2	Resistor	21.5K Ohm 1%	R20, R36
2	Resistor	33K Ohm	R30, R47, R48
2	Resistor	46.4K Ohm 1%	R23, R50
3	Resistor	47.5K Ohm 1%	R31, R32, R41
2	Resistor	48.7K Ohm 1%	R22, R40
2	Resistor	59.0K Ohm 1%	R21, R49
2	Resistor	100K Ohm	R15, R16
1	Resistor	560K Ohm	R17
1	Switch	4 Position	S1
1	Transformer	600:400	T1

CH-100 Cathub

The CH-100 makes a perfect addition to the CATLINK system by providing multiple connections. The CH-100 is a ROIP repeater hub designed to support the operation of up to twenty CL-100 units. Digital control and audio packets received from one CL-100 will be forwarded to up to twenty other CL-100s. The CH-100 can be located anywhere a high-speed Internet connection is available.
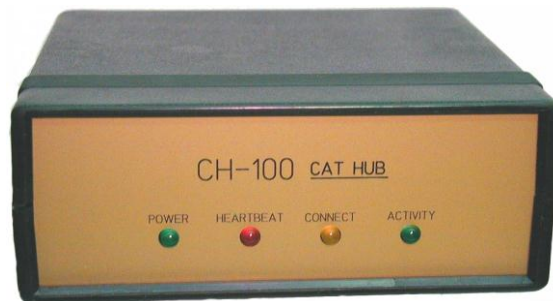
CH-100 Front Panel Display Indicators
Four LED indicators display the CH-100 activity. The green POWER LED will light when +12VDC is supplied to the CH-100. The red HEARTBEAT LED will flash once a second to indicate the CH-100 is executing its program. The yellow CONNECT LED will light when the CH-100 is connected to a DSL or CABLE modem. The green ACTIVE LED will flash when data is being sent or received.

CH-100 Normal Operation
In the normal operation mode any CL-100 can connect to the CH-100.

CH-100 Controlled Operation
In the controlled operation mode, the CH-100 has a twenty-position look-up table. A CL-100 wishing to connect to the hub must have had its IP address entered into one of the CH-100 look-up table positions.

CH-100 Stats Web Page
This page displays the Software Version, HUB status, total connection time and the number of active connections. In addition the HUB Connection List will contain the identification of the CL-100s that are currently connected to the HUB. This information is stored in volatile memory and will clear if power is interrupted to the CH-100.

CH-100 Rear Panel
The 9 pin "D" connector is used to program the CH-100 through its RS232 port. The RJ45 jack is used to connect to your router, DSL or cable modem. DC power is supplied to the 2.5 / 5.5mm connector. The center pin is positive. If a power failure occurs the CH-100 will disconnect. Since the connect information is stored in volatile memory the CH-100 will need to be manually re-connected. If possible the CH-100 should be supplied by a backed up 12VDC power source.

| RS-232 | +12VDC | ETHERNET |