CL100A
Internet Linking Controller

Instruction Manual

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Chapter 1 - Introduction and Specifications

The CL100A 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 CL100A will convert the receiver's audio and COR outputs into digital packets and send them through the Internet to another CL100A 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 CL100A'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 CL100A will connect to another CL100A at the specified IP address.

An RS232 Port is provided to assign the CL100A's IP, Gateway and Mask addresses. This port also displays the operation for diagnostic testing and performance.

Connect the CL100A to a port on your router. Use your computer's Internet web browser to program the CL100A's internal web pages. 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 CL100A provides an optional tone to let the RF user know each time the remote unit stops sending packets.

Eight timers control the CL100A operation.

If the COR timer is enabled, when a continuous input exceeds the setting of the COR timer the CL100A will send a PTT off packet to the remote unit. At factory default the COR timer is set for three minutes and it 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 it 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 and it is enabled.

If Auto Reconnect is enabled after a loss of Internet service or a power failure when service is restored the CL100A will automatically reconnect to the priority IP address. The default setting of the Auto Reconnect timer is one minute.

If the Inactivity Disconnect timer is enabled after a period of inactivity the CL100A will automatically disconnect. The default setting of the disconnect timer is ten minutes.

If the COR De-bounce timer is enabled the CL100A will delay responding to a COR input. This timer's default setting is 250 milliseconds and it is enabled.

If the Pre Voice timer is enabled the CL100A will delay its voice announcements for a period of time after PTT has become active. This will prevent the first word of the announcement from being cut off. This timer's default setting is 500 milliseconds and it is enabled.

It is possible to temporarily suspend communications between two CL100As by disabling Packet Transfer. The CL100As will remain connected with normal handshaking occurring but no audio or PTT packets will be sent or received.

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 ten 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 CL100A disconnects. The factory default is set to five missed pings.

Communications between the CL100A 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 CL100A units. Output #2 momentarily switches to ground when the CL100A disconnects. These outputs can be used to execute repeater controller macros.

When the CL100A's Logic input is momentarily grounded by a repeater controller's switch, the CL100A will automatically connect to the priority IP address. This permits the repeater controller to automatically connect the CL100A for a scheduled net.

The CL100A has an automatic reconnect feature. If Internet service is lost or after a power failure the CL100A will attempt to reconnect at a rate determined by the reconnect timer. The timer's default setting is one minute.

Five user controlled FET relay driver switches permit control of equipment located with the CL100A. Control is accomplished by entering DTMF commands through the CL100A'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 twenty units can be supported.

Specifications

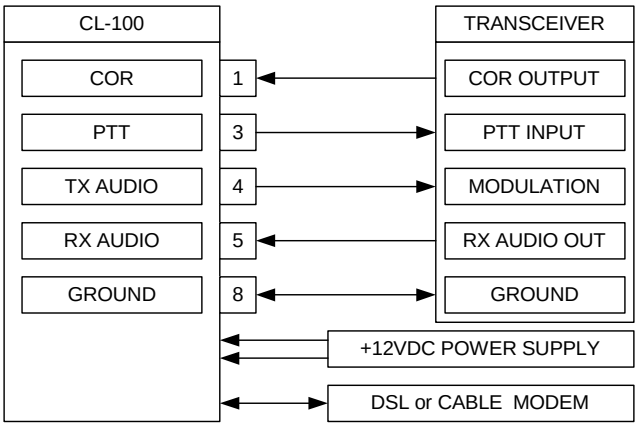
Microprocessor	TI ARM Cortex Processor
Memory	20 IP Addresses with Call Letter Identification
Voice synthesizer	TI – MSP53C391N
Logic Output Switches	(5) Open Drain Active Low (Sink to Ground) 40 VDC 100ma.
Logic Input Quick Connect	(1) Active Low (Pull to Ground)
Receive Audio Input	70 to 600mVAC (10K ohm Impedance)
Transmit Audio Output	0 to 200mVAC (600 ohm Impedance)
Operating Temperature	-15 to +55 degrees C
Web page IP Address	http://192.168.1.240 (CL100A default Address)
Web page GATEWAY Address	http://192.168.1.1 (CL100A default Address)
Serial Interface	RS232 - 115200 Baud 8N1 (No Flow Control)
Power	+9 to +15VDC at 150mA MAX
Size	8.0" x 5.0 x 1.5"

Voice Over IP
The CL100A uses G.711 Pulse Code Modulation (PCM) having a bit-rate of 64kbit/s (8Khz sampling frequency at 8 bits per sample) and uses the u-law algorithm audio compression.

FCC Part 15 RF Interference
When installed in the RME-200L rack mount enclosure, the CL100A 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.

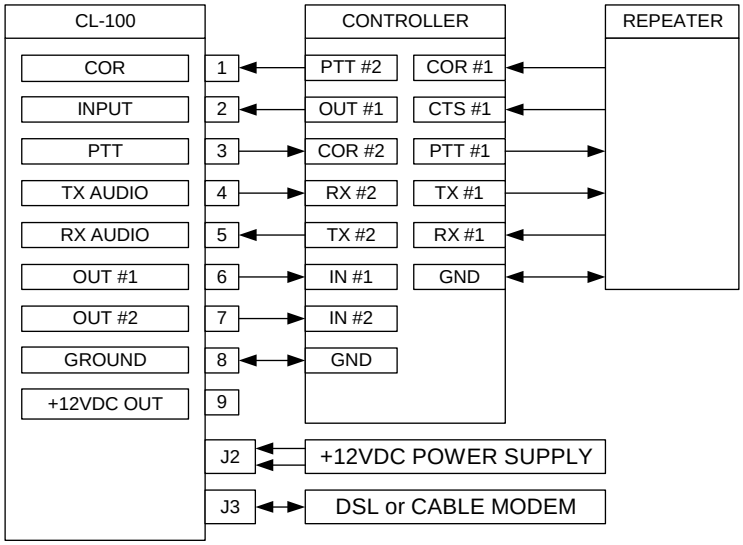
Chapter 2 - System Configuration

Transceiver Interface In this configuration the CL100A is connected between a transceiver and a 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 Controller Interface In this configuration the CL100A 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 CL100A. 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 CL100A's PTT output is an open drain switch requiring a pull-up resistor on the repeater controller's COR input. OUT #1 pulses when the CL100 connects and OUT #2 pulses when the CL100 disconnect. Use these two signals to trigger controller macros.



Dip Switch Settings
A four-position dipswitch configures various functions of the CL100A.

Switch 1 This switch determines COR input logic. Switch #1 should be ON if the repeater receiver's COR is active low and OFF if COR is active high. NOTE: The CL100A 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 CL100A in duplex mode. When connected to another CL100A a full duplex link will be established. Both units will transmit and receive at the same time. NOTE: The CH100 hub will not support duplex operation. See Chapter 9 for full duplex set-up instructions.

Switch 3 This switch is used to place the CL100A in the programming mode. Set this switch to ON and apply power to the CL100A. The 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 CL100A internal web page. This switch must be OFF to control or program the CL100A with your web browser. Once programmed if you want to prevent access to the internal web page set dipswitch #4 to the ON position.

CH100 Hub Operation The CL100A is designed for a two-unit point-to-point connection. If you require additional connections a HUB must be added to your system. The CH100 will support the connection of up to twenty CL100s. The CH100 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 at least 1.5mbps.

Power Requirements DC power is supplied through coaxial power connector J3. The center pin is positive. If a power failure occurs the CL100A will disconnect. Since the connect information is stored in volatile memory the CL100A will need to be manually re-connected. To prevent this, the CL100A should be supplied by a backed up power source. The CL100A has an Auto Reconnect feature. If Zone 1 Channel 7 is enabled the CL100A will connect to the IP address stored in the User IP priority table position when power is restored.

Chapter 3 - Control by DTMF Commands

Interrogate Control Channels 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." Use default control codes [200], [300] and [400] to interrogate zones 2, 3 and 4.

Changing Control Channels 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." Use default control codes [200], [300] and [400] to interrogate zones 2, 3 and 4.

	Zone #1 Control Table Control Operator Code 100	
1	CL100A	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

	Zone #2 Control Table 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*

	Zone #3 Control Table Control Operator Code 300	
1	Connect Message	Enable*
2	Packet Transfer	Enable*
3	Reserved	Enable
4	Reserved	Enable
5	Reserved	Enable
6	Reserved	Enable
7	Reserved	Enable
8	Reserved	Enable

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

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

Zone 1 Control Definitions

1. CL100A Enable
When this channel is enabled the CL100A will accept a command to connect to one of the twenty IP addresses listed in the User IP table, perform a keypad test or control the five remote control switches. To disable the CL100A turn this channel OFF. Key-up and send [10010].

2. Keypad Test Enable
This control channel must be enabled to perform a DTMF keypad test. To disable the keypad test feature key-up and send [10020].

3. End of Transmission Tone Enable
This control channel must be enabled to hear the end of transmission tone on the transmitting unit when the COR signal drops at the receiving unit. To eliminate the tone key-up and send [10030]

4. Quick Connect Enable
This control channel must be enabled to activate the quick connect feature. When J4 pin 2 is monetarily grounded the CL100A will connect to the address located in the User IP priority table position. To eliminate the quick connect feature key-up and send [10040].

5. COR Timer Enable
When this control channel is enabled a COR input that exceeds the COR timer setting will cause the receiving CL100A to time out and stop sending packets. The default setting of this timer is 180 seconds. To disable the COR timer key-up and send [10050].

6. PTT Timer Enable
When this control channel is enabled a PTT output that exceeds the PTT timer setting will cause the transmitting CL100A to time out and turn off its transmitter. The default setting of this timer is 180 seconds. To disable the PTT timer key-up and send [10060].

7. Auto Reconnect Enable
When this control channel is enabled at power up the CL100A will attempt to connect to the priority IP address. If the connection is unsuccessful the CL100A will continue to try and connect at a rate determined by the setting of the Auto Reconnect timer. The default setting of this timer is one minute. Only enable Auto Reconnect on one of the CL100A units. If a user sends a link disconnect command this channel will automatically turn off. This will prevent the CL100A from continuous reconnecting. To disable Auto Reconnect, key-up and send [10070].

NOTE: The default priority IP address is position one of the User IP table. Do not enable Auto Reconnect unless you have programmed the Priority IP address.

8. Inactivity Disconnect Timer
When this control channel is enabled, 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. To disable Inactivity Disconnect timer key-up and send [10080].

Zone 2 Control Definitions

1. Switch #1 Enable (J4-10)
When this control channel is enabled switch #1 a FET relay driver switch will turn on providing a sink to ground. To turn off the switch, key-up and send [20010].

2. Switch #2 Enable (J4-11)
When this control channel is enabled switch #2 a FET relay driver switch will turn on providing a sink to ground. To turn off the switch, key-up and send [20020].

3. Switch #3 Enable (J4-12)
When this control channel is enabled switch #3 a FET relay driver switch will turn on providing a sink to ground. To turn off the switch, key-up and send [20030].

4. Switch #4 Enable (J4-13)
When this control channel is enabled switch #4 a FET relay driver switch will turn on providing a sink to ground. To turn off the switch, key-up and send [20040].

5. Switch #5 Enable (J4-14)
When this control channel is enabled switch #5 a FET relay driver switch will turn on providing a sink to ground. To turn off the switch, key-up and send [20050].

6. Activity ID Enable
When this control channel is enabled the CL100A 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, key-up and send [20080].

7. Incoming ID Enable
When someone connects to the CL100A the voice says: LINK UP. When this control channel is enabled the CL100A will say LINK UP and announce the identification of the CL100A linking to it. To disable the ID portion of the connect message key-up and send [20070].

8. Voice ID Enable
When this control channel is enabled anytime the link disconnects the CL100A will send the voice ID on the transmitter. To eliminate this ID announcement key-up and send [20080].

Zone 3 Control Definitions

1. Connect Announcement Enable
When this control channel is enabled the CL100A's voice will say: "CONNECTING TO" and announce the identification listed in the User IP table during the connect process. To eliminate this announcement, key-up and send [30010].

2. Packet Transfer Enable
This control channel must be enabled for the CL100A to send and receive packets. If this control channel is disabled the two CL100As will remain connected with normal handshaking occurring but no audio or PTT packets will be sent or received. This control channel must be on for normal operation. To temporally suspend packet transfer key-up and send [30020].

3. Reserved Enable
Reserved for future assignments.

4. Reserved Enable
Reserved for future assignments.

5. Reserved Enable
Reserved for future assignments.

6. Reserved Enable
Reserved for future assignments.

7. Reserved Enable
Reserved for future assignments.

8. Reserved Enable
Reserved for future assignments.

Zone 4 Control Definitions

1. Report Enable
When this control channel is enabled and a computer is connected to the port the CL100A 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 a "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. NOTE: When the computer is not connected to the CL100A turns Zone 4 Channel 1 off. To disable this feature, key-up and send [40010].

2. ICMP Protocol Enable
ICMP is a network protocol test utility useful in testing the performance of the Internet connection. When this control channel is enabled the CL100A will respond to pings when time delay tests are conducted to determine Internet timing and path routing.

3. COR Debounce Enable
When this channel is enabled the CL100A will add a debounce delay before it will respond to a COR input. The debounce timer determines the time. The default setting is 250 milliseconds. To disable COR Debounce key-up and enter [40030].

4. DTMF Muting
The CL100A fully supports DTMF signaling. There may be times when it is not desirable to pass DTMF tones through the system. When this channel is enabled DTMF tones will be blocked. To disable DTMF muting, key-up and send [40040].

5. Reserve Enable
Reserved for future assignments.

6. Reserve Enable
Reserved for future assignments.

7. Reserve Enable
Reserved for future assignments.

8. Reserve Enable
Reserved for future assignments.

Chapter 4 – Operation

Link Interrogation
The default command to interrogate the CL100A is: 100*. If the CL100A is not connected the voice will say: LINK IS DOWN. If the CL100A is connected to another CL100A the voice will say: LINK IS UP. If the CL100A is connected to a CH100 hub the voice will announce the hub's ID followed by the IDs of any CL100As connected to the hub. If an empty IP address is selected the voice will say: "ERROR IP IS ZERO"

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 to a CL100A that is already connected too another CL100A you will receive a voice message saying: "REMOTE IN USE".

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.

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 CL100A is connected to another CL100A.

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 CL100A will send an un-key command to the remote CL100A. The default setting of this timer is 180 seconds.

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 CL100A will un-key its transmitter. The default setting of this timer is 180 seconds.

Remote Control Switches
The CL100A 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 [900]. Using this code in place of the [200] will reduce exposing the Control Zone #2 code.

Interrogate Firmware Version
Key-up and send the Zone #1 control code [100] followed by [99]. The voice synthesizer will announce the firmware version. NOTE: The read back is disabled when the CL100A is connected to another CL100A.

Reset Processor
Key-up and send the Zone #1 control code [100] followed by [98] to reset the CL100A. NOTE: The reset is disabled when the CL100A is connected to another CL100A.

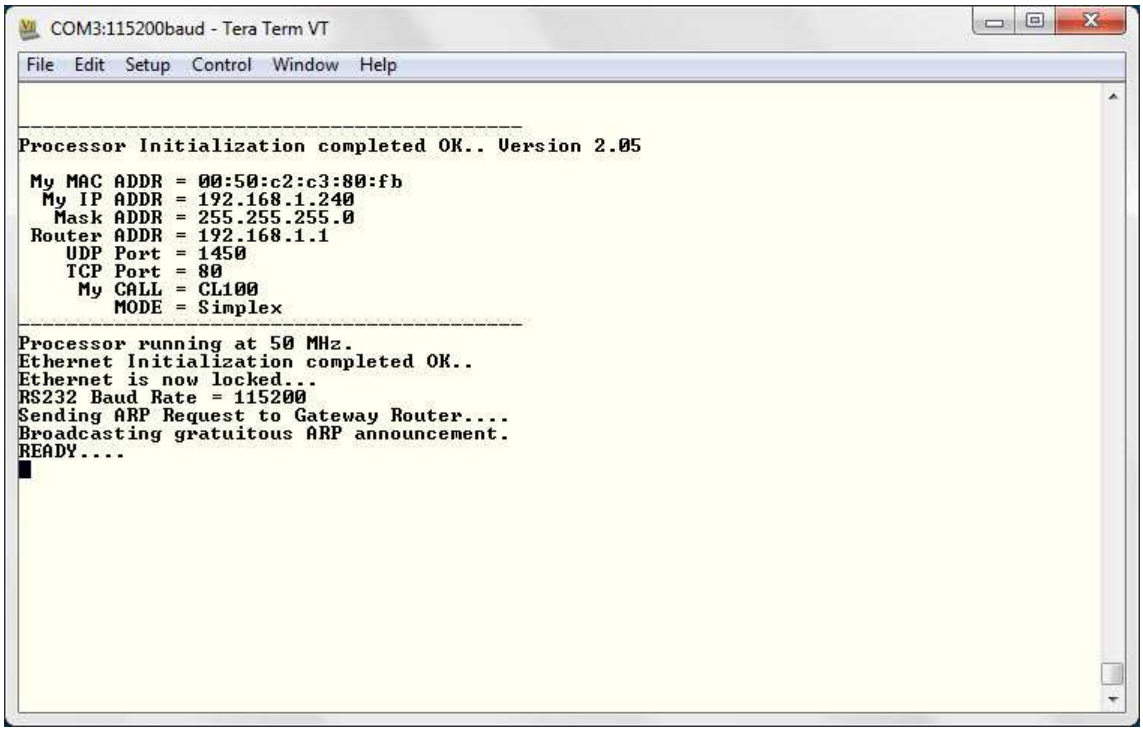
Automatic ID
When Automatic ID is enabled the CL100A will provide voice identification whenever the transmitter is active. The voice synthesizer will announce the CL100's call letters. The Automatic ID is polite and will wait for the transmitter to un-key before sending the voice ID. A user programmable timer is provided to set the ID period. The maximum length between IDs is 30 minutes. The timer's default setting is ten minutes.

Power Up Message
When DC power is applied the CL100A will key-up the transmitter and the voice synthesizer will announce the power up message. EXAMPLE: "C L ONE HUNDRED VERSION ONE POINT ZERO SIX" followed by its call letter identification if Zone 2 Channel 8 is enabled.

NOTE: If the Auto Reconnect feature is enabled the CL100A will skip the power up message.

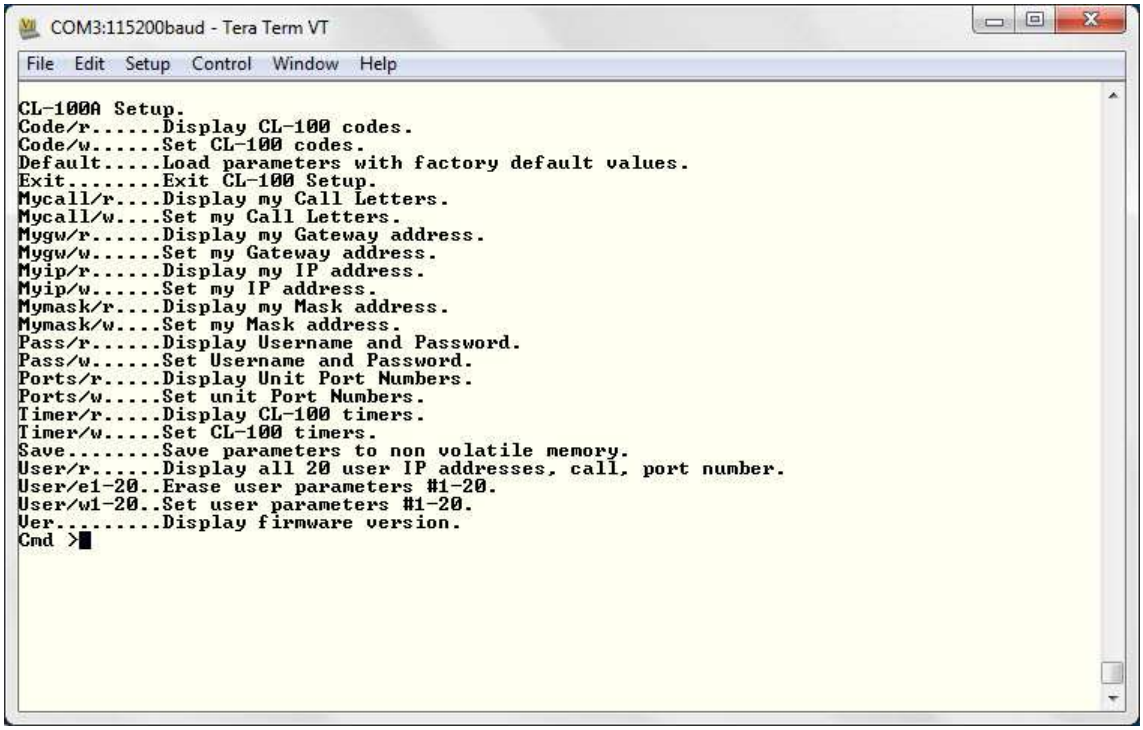
Chapter 5 - Setup Using RS-232 Port

Connect a "direct" cable between the port on the CL100A 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. Apply power to the CL100A. The computer will display the default settings. Set the power to off.



NOTE: The CL100's default IP address is 192.168.1.240 and the GATEWAY address is 192.168.1.1. If the CL100A is going to be connected to a router it is not necessary to change its IP or GATEWAY address.

To change the CL100A, set dipswitch #3 to on and apply power. The computer will display the setup menu.



Program IP Address The CL100's default IP address is 192.168.1.240. If the CL100 is connected to a router it is not necessary to change its IP address. If the CL100A 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 new IP Address.

NOTE: The CL100A requires a static IP address since the IP address will be stored in the User IP table of other CL100A unit is connect too. The CL100A will work with a dynamic address if it is connected to a CH100 Hub.

Program Gateway Address The CL100's default GW address is 192.168.1.1. If the CL100A is connected to a router it's not necessary to change this address. If the CL100A 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 CL100A is operating within a different sub-net.

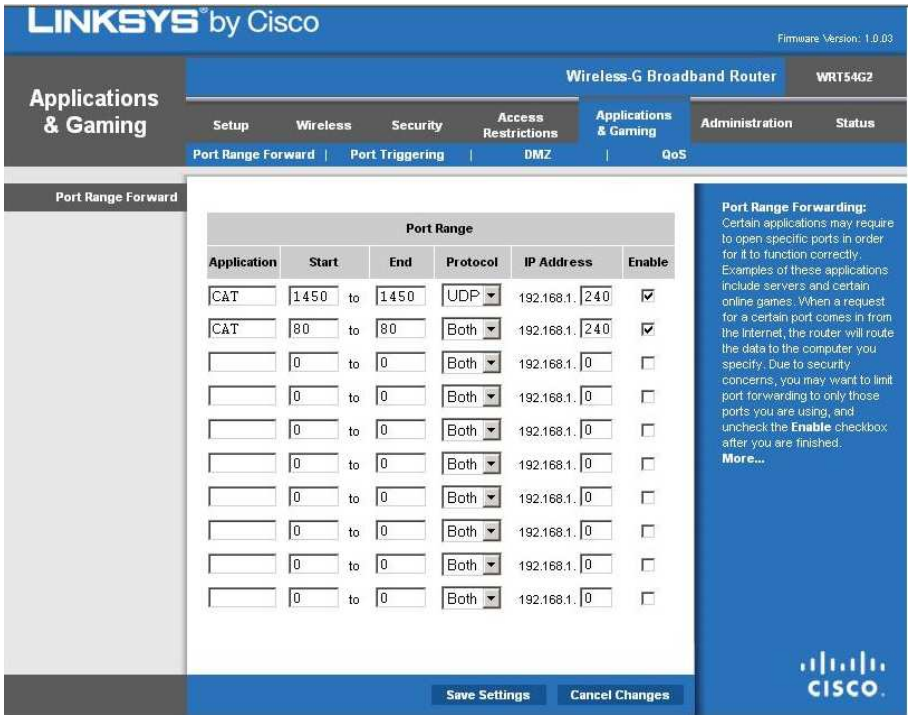
Read MAC Address From the Programming menu use the **Mymac/r** command to display the Mac Address. This is a unique number assigned to any device that is connected to the Internet. This number can be used as an electronic serial number for your CL100A.

Program USERNAME and PASSWORD From the Programming menu use the **Pass/r** and **Pass/w** commands to display and program the CL100A's Username and Password. The default Username is "CATLINK" and the Password is "cl100". The Username and Password are used to access the CL100A's Internet web page with your 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 setup mode.

Router Setup
When the CL100A is connected to a router a port must be opened. The CL100A 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 CL100A 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.

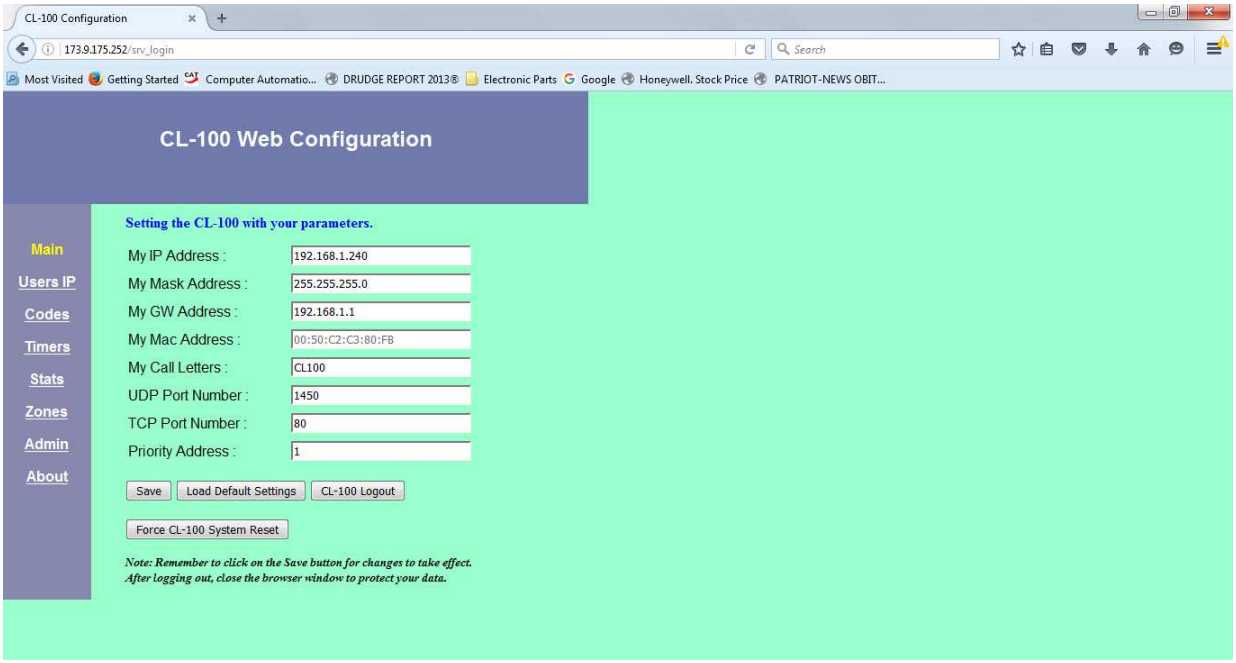


The CL100A uses JavaScript to exchange data with your web browser. The computer's security settings must have active scripting enabled. If active scripting is disabled, all of the data boxes will appear blank.

Chapter 6 - CL100A Setup Using Web Browser

Use your Internet browser to connect to the CL100A. To access the CL100A enter the Username **CATLINK** and the Password **cl100**.

Main Window
Once logged in the CL100 will display the Main window.



The **My IP Address** cell displays the default IP address 192.168.1.240 or the address you entered during the set-up. NOTE: The CL100A requires a static IP address since its IP address will be stored in the IP address table of other CL100A unit.

The **My MASK Address** cell displays the MASK address of 225.225.225.0. It is not necessary to change this address unless the CL100A is connected to a Sub Net.

The **My GW Address** cell displays the default GATEWAY address 192.168.1.1 or the address you entered during the set-up.

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 CL100A.

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.

UDP Port Number The CL100A's factory default UDP port number is 1450. This port may be changed. Remember to open the new port number on your router. Two CL100As can share the same IP address when they are connected to the same router and are using different port numbers. Remember for two CL100As to connect to each other they must have the same port number.

TCP Port Number The CL100A's factory default TCP port number is 80. This port may be changed. Remember to open the new port number on your router if you wish to communicate with the CL100A through the Internet using your web browser.

Priority Address
At default table position one is assigned as the priority address. You can reassign the priority address to any of the twenty table positions. The priority address is used by the CATLINK reconnect and quick connect features.

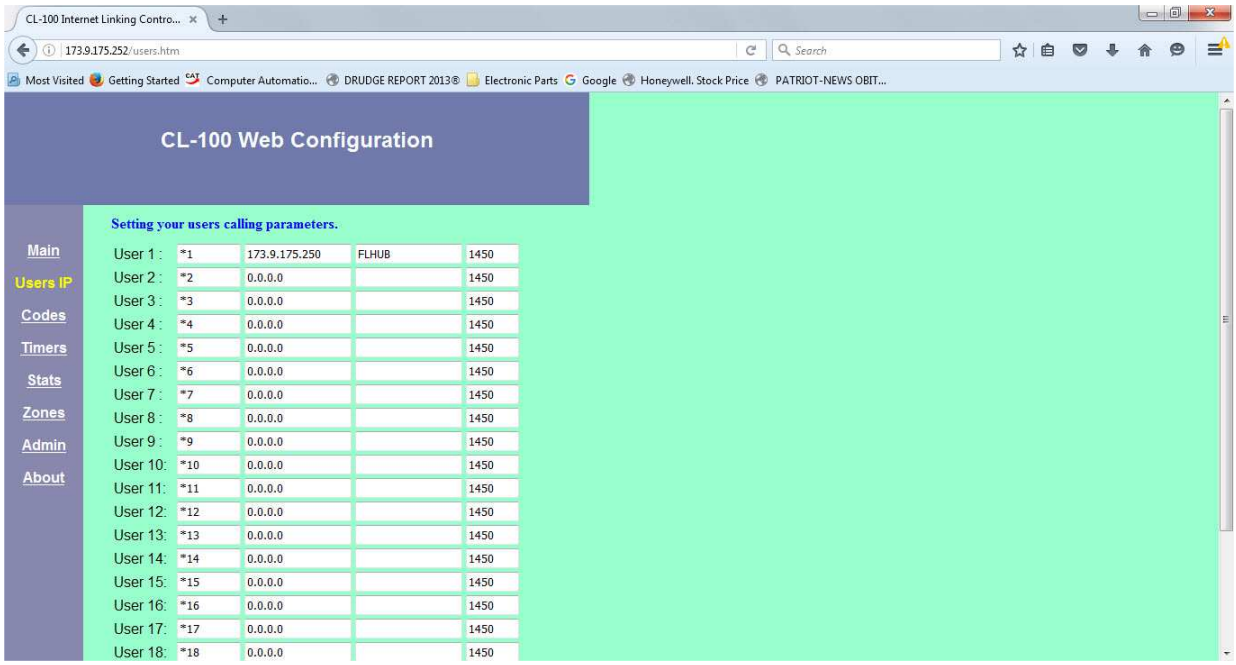
Load Default Settings If you want to return the CL100A to the factory default settings click: "Load Default Settings" button and the save button.

System Reset To reset the CL100A, click the "CL100A System Reset" button. This will cause the CL100A to do a reset identical to applying power to the unit. The voice synthesizer will announce the power up message and the firmware version.

User IP Table Window

Use your Internet browser to program the twenty user positions with the IP addresses of other CL100A 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 the port number. The call letters can be up to eight numbers or letters.

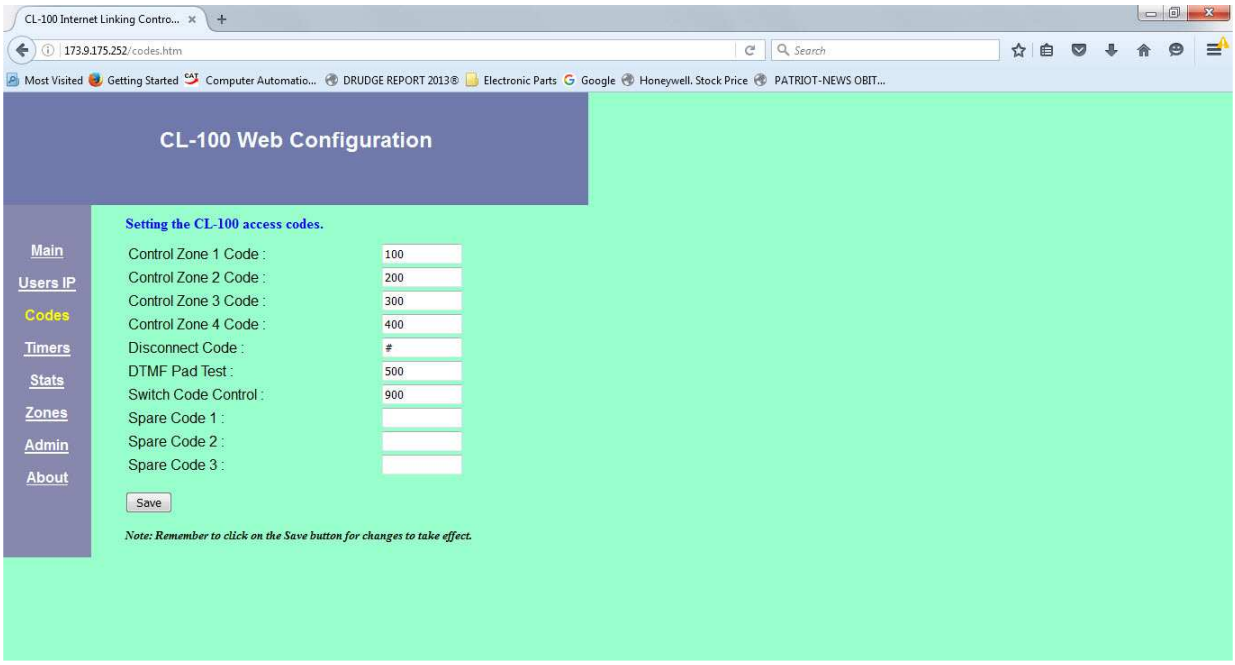
The IP address in table position one is the priority address. The CL100A will connect to this address when J4 pin 2 is momentarily grounded if Zone 1 Channel 4 is enabled. The CL100A will also connect to the IP address in table position #1 if the Auto Reconnect feature is enabled Zone 1 Channel 7. NOTE: It is possible to change the priority address to a different table position. Change the number in the box titled "Auto Reconnect To User" located in the main web page window.



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 CL100A 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 CH100 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 CL100A. The packet test recorder will automatically disconnect after two minutes or you can manually disconnect by sending the "#". The packet test recorder is maintained by C.A.T and is available for CL100A owners.

Control Code Window
Use this window to enter your preferred control code settings. These codes can be between one and seven digits. Enter a unique control code for each of the four control zones, disconnect code, DTMF Pad Test and Switch Control.



Control Zone 1 Code
This code must precede the control channel numbers in Zone #1 to read or change their settings.

Control Zone 2 Code
This code must precede the control channel numbers in Zone #2 to read or change their settings.

Control Zone 3 Code
This code must precede the control channel numbers in Zone #3 to read or change their settings.

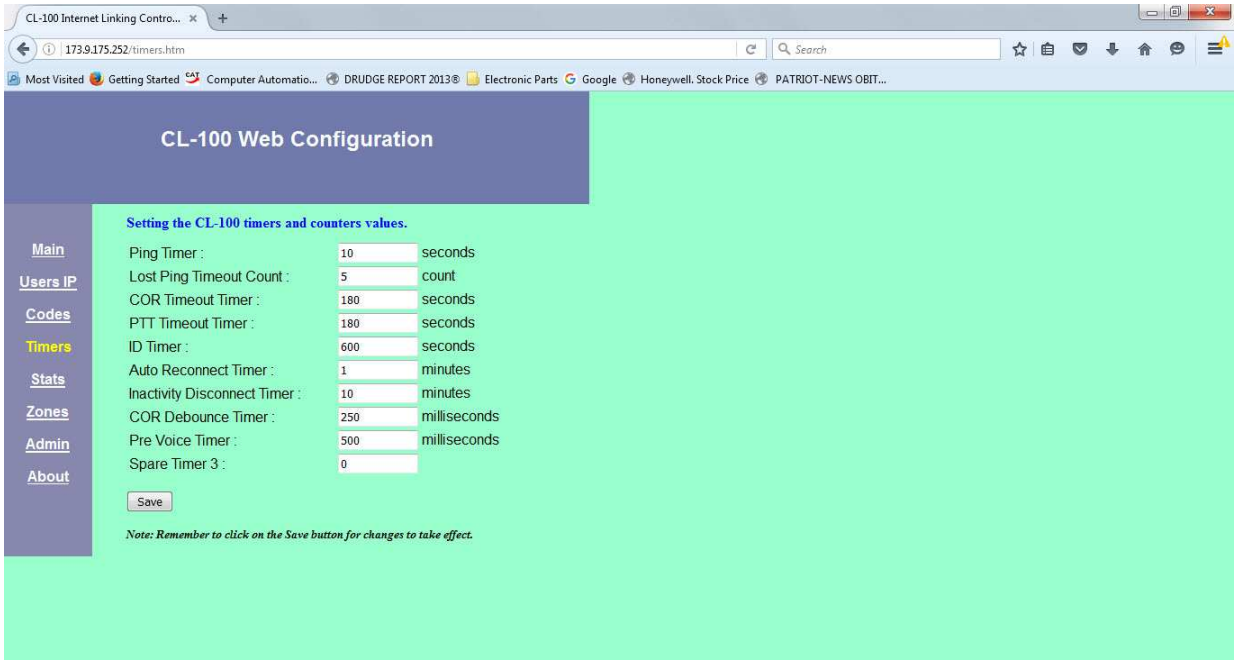
Control Zone 4 Code
This code must precede the control channel numbers in Zone #4 to read or change their settings.

Disconnect Code
This code must be entered to disconnect the CL100A.

DTMF Pad Test
This code must precede the string of DTMF tones to be tested. When you un-key the voice will read back all the numbers that were decoded.

Switch Control Code
This code must precede the switch number followed by a 1 to turn the switch on, a 0 to turn the switch off or a 2 to pulse the switch for 500 milliseconds.

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



The **PING TIMER** sets how often pings are sent between Catlinks or a Catlink and a Cathub. The default setting is once every 10 seconds. You can increase or decrease this time.

The **LOST PING TIMEOUT COUNT** controls how many ping are missed before the CL100A disconnect during loss of Internet service. With the ping timer set to 10 seconds and the ping counter set to 5 if Internet services fails for more than 50 seconds the CL100A will disconnect.

The **COR** timer controls the amount of time a continuous input signal to the receiver may be present before the CL100A sends an 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 enabled.

The **ID** timer determines how often the voice ID is sent when the CL100A is active. The default setting is 600 seconds. Zone #2 Channel #6 must be enabled. The CL100A will wait for PTT to drop before sending a voice ID.

The **AUTO RECONNECT** timer determines how long the CL100A will wait between attempts to reconnect to the IP address stored in the priority table position. If the connection is unsuccessful the CL100A will continue to try and connect until the link is reestablished. Zone 1 Channel 7 must be enabled. The default setting of this timer is one minute.

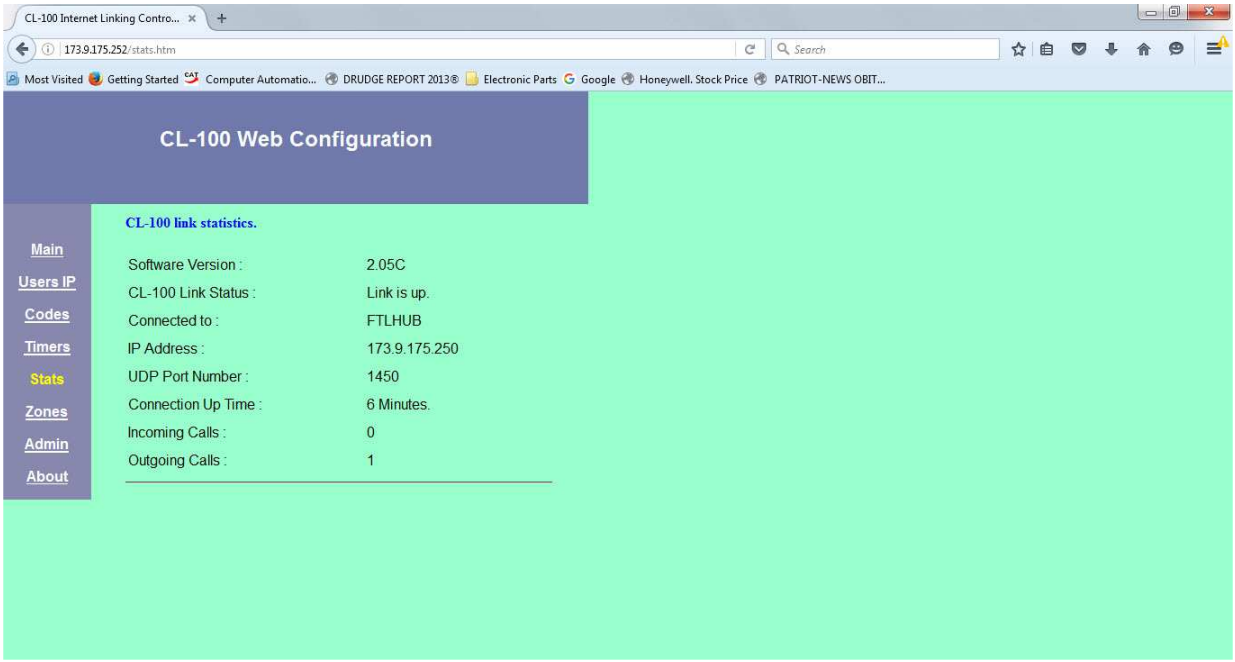
The **INACTIVITY DISCONNECT** timer determines the period of inactivity before the CL100 does an automatic disconnect. The default setting of this timer is ten minutes. Zone 1 Channel 8 must be enabled.

The **COR DEBOUNCE** timer determines the delay before the Catlink responds to a COR input. The default setting is 250 milliseconds. Zone 4 Channel 3 must be enabled.

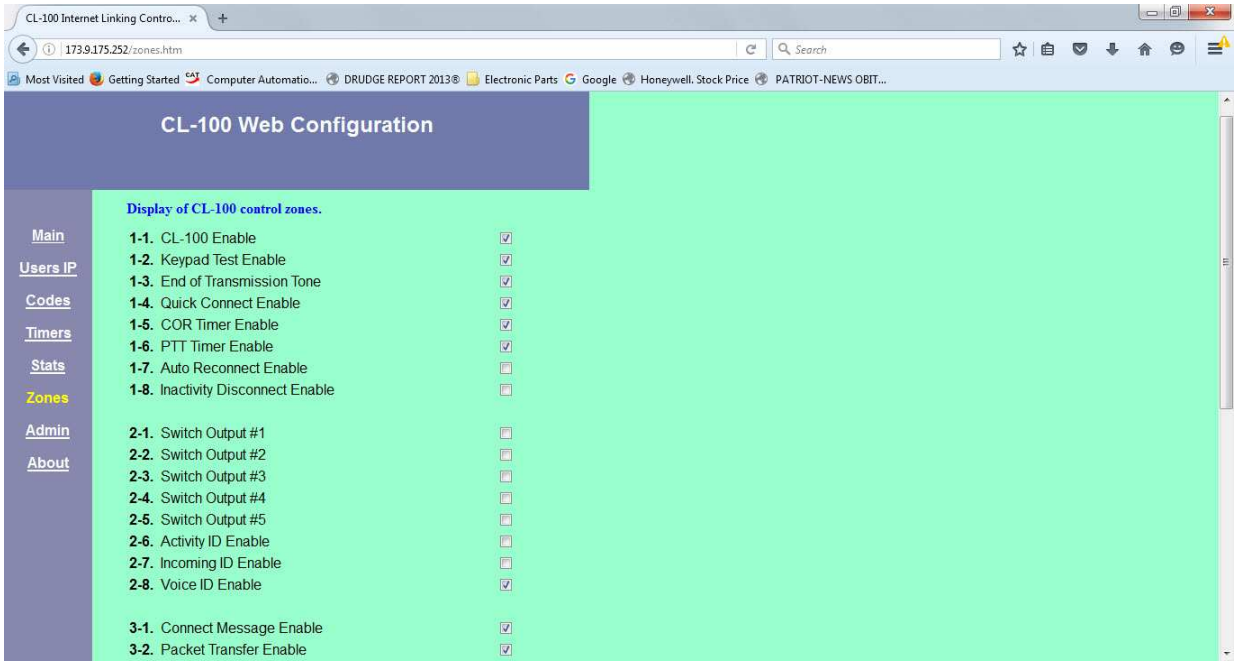
The **PRE VOICE** timer determines the delay before the voice speaks after PTT goes active. This provides time for the transmitters in the system to stabalize before the first word is sent.

Stats Window

This page monitors CL100A activity. The connection up time and the number of incoming and outgoing calls are recorded. NOTE: This information is stored in volatile memory and will clear if power is interrupted to the CL100A.



Control Zone Window
Use this web page to display the Zone #1 through Zone #4 settings. By checking the boxes you can enable or disable the various control functions.



1-1 CL100A Enable
This box must be checked to enable the CL100A to connect to one of the twenty IP address, perform a keypad test or control the five remote control switches. To disable the CL100A uncheck the box and click the SAVE button at the bottom of the page.

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 and click the SAVE button at the bottom of the page.

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 and click the SAVE button at the bottom of the page.

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 CL100A will connect to the unit who's address is located in the priority table position. To eliminate the quick connect feature uncheck the box and click the SAVE button at the bottom of the page.

1-5 COR Timer Enable
When this box is checked a COR input that exceeds the COR timer setting will cause the receiving CL100A to time out and stop sending packets. To disable the COR timer uncheck the box and click the SAVE button at the bottom of the page.

1-6 PTT Timer Enable
When this box is checked a PTT output that exceeds the PTT timer setting will cause the transmitting CL100A to time out and turn off the transmitter. To disable the PTT timer uncheck the box and click the SAVE button at the bottom of the page.

1-7 Auto Reconnect Enable
When this box is checked, at power up the CL100A will attempt to connect to the IP address stored in the priority table position. If the connection is unsuccessful the CL100A will continue to try and connect per the setting of the Auto Reconnect Timer. The default timer setting is one minute. NOTE: It is only necessary to enable reconnect on the CL100 you have chosen to be your primary unit. To disable Auto Reconnect uncheck the box and click the SAVE button at the bottom of the page.

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. To disable the Inactivity Disconnect timer uncheck the box and click the SAVE button at the bottom of the page.

2-1 Switch #1 Enable
When this box is checked switch #1 will be turned on. During normal operation this switch can be changed by DTMF commands through the radio input. To turn switch #1 off uncheck the box and click on SAVE.

2-2 Switch #2 Enable
When this box is checked switch #2 will be turned on. During normal operation this switch can be changed by DTMF commands through the radio input. To turn switch #2 off uncheck the box and click on SAVE.

2-3 Switch #3 Enable
When this box is checked switch #3 will be turned on. During normal operation this switch can be changed by DTMF commands through the radio input. To turn switch #3 off uncheck the box and click on SAVE.

2-4 Switch #4 Enable
When this box is checked switch #4 will be turned on. During normal operation this switch can be changed by DTMF commands through the radio input. To turn switch #4 off uncheck the box and click on SAVE.

2-5 Switch #5 Enable
When this box is checked switch #5 will be turned on. During normal operation this switch can be changed by DTMF commands through the radio input. To turn switch #5 off uncheck the box and click on SAVE.

2-6 Activity ID Enable
When this box is checked the CL100A 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 and click on SAVE.

2-7 Incoming ID Enable
When someone connects to the CL100A its voice will says: "LINK UP". When this box is checked the CL100A will say linkup and announce the identification of the CL100A linking to you. To disable the ID portion of the connect message uncheck the box and click SAVE.

2-8 Voice ID Enable
When this box is checked anytime the link disconnects the CL100A will send the voice ID on the transmitter. To eliminate the ID uncheck the box and click SAVE.

3-1. Connect Announcement Enable
When this control channel is enabled the CL100A's voice will say: "CONNECTING TO" and announce the identification listed in the User IP table during the connect process. To eliminate this announcement, uncheck the box and click SAVE.

3-2. Packet Transfer Enable
This control channel must be enabled for the CL100A to send and receive packets. If this control channel is disabled the two CL100As will remain connected with normal handshaking occurring but no audio or PTT packets will be sent or received. This control channel must be on for normal operation. To temporally suspend packet transfer uncheck the box and click SAVE.

3-3. Reserved Enable
Reserved for future assignments.

3-4. Reserved Enable
Reserved for future assignments.

3-5. Reserved Enable
Reserved for future assignments.

3-6. Reserved Enable
Reserved for future assignments

3-7. Reserved Enable
Reserved for future assignments.

3-8. Reserved Enable
Reserved for future assignments.

4-1 RS232 Report Enable
When this box is checked and a computer is connected to the RS232 port the CL100A 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 CL100A will respond to pings when time delay tests are conducted to determine Internet timing and path routing.

4-3. COR Debounce Enable
When this box is enabled the CL100A will add a debounce delay before it will respond to a COR input. The debounce timer determines the time. The default setting is 250 milliseconds. To disable COR Debounce uncheck the box and click SAVE.

4-4. DTMF Muting
The CL100A fully supports DTMF signaling. There may be times when it is not desirable to pass DTMF tones through the system. When this channel is enabled DTMF tones will be blocked. To disable DTMF muting, uncheck the box and click SAVE.

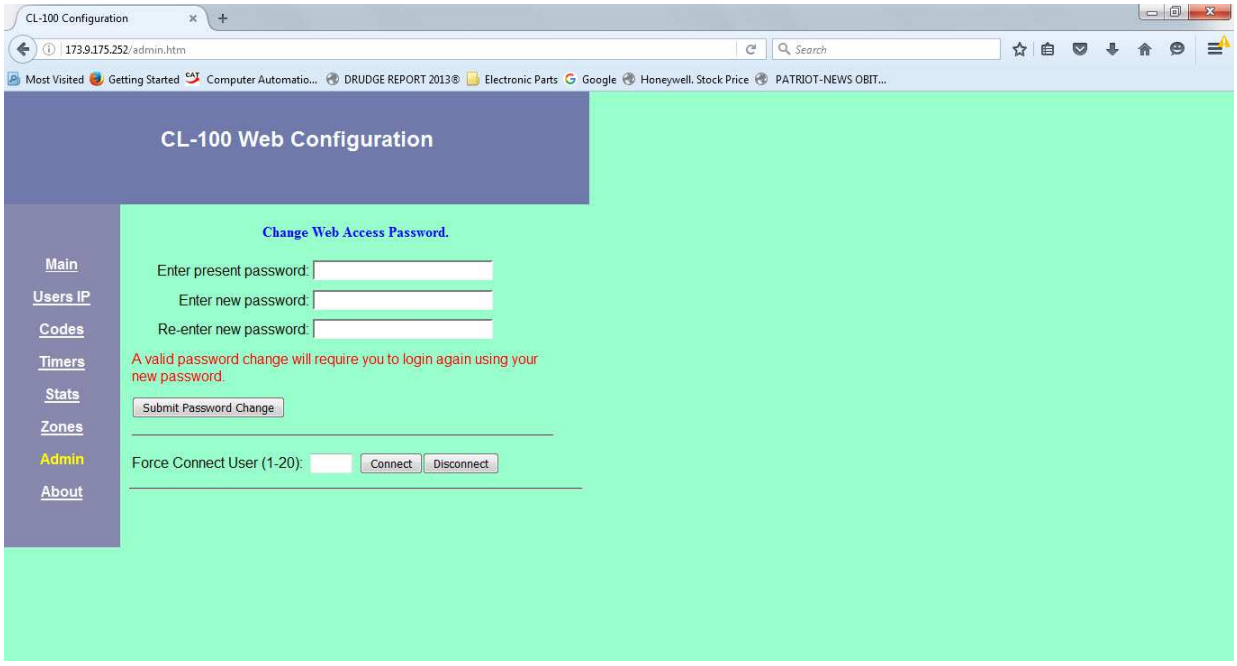
4-5 Reserve Enable
Reserved for future assignments.

4-6 Reserve Enable
Reserved for future assignments.

4-7 Reserve Enable
Reserved for future assignments.

4-8 Reserve Enable
Reserved for future assignments.

Admin Window
Use this web page to change the password and force the CL100A to connect to or disconnect from one of the IP addresses in the table.



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

Force Connect
If you are unable to reach the CL100A by radio you can force a connection through the Internet. Enter the User IP table position number in the Force Connect cell and click the **FORCE CONNECT** button.

Force Disconnect
If you are unable to reach the CL100A by radio you can force a disconnect through the Internet by clicking the **FORCE DISCONNECT** button.

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 CL100A to the Internet.

Chapter 7 - Interfacing to Other Equipment

COR INPUT (J4-1)
This input is pulled up to +5VDC with a 10K resistor on the CL100A board. This input provides an indication to the CL100A 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.

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

LOGIC INPUT (J4-2)
This input is pulled up to +5VDC with a 10K resistor on the CL100A board. When this input is momentarily grounded (0.5 seconds), the CL100A will connect to the address stored in the priority IP table position.

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 CL100A 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.

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 CL100A connects to another CL100A 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 CL100A disconnects from another CL100A on the Internet. This output can be used to notify the repeater's controller that disconnect has occurred.

GROUND (J4-8)
This pin provides a ground connection for a transceiver or repeater controller.

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

SWITCH #1 (J4-10)
This output is an open FET relay driver switch. This output will sink to ground when Zone 2 Channel 1 is enabled.

SWITCH #2 (J4-11)
This output is an open FET relay driver switch. This output will sink to ground when Zone 2 Channel 2 is enabled.

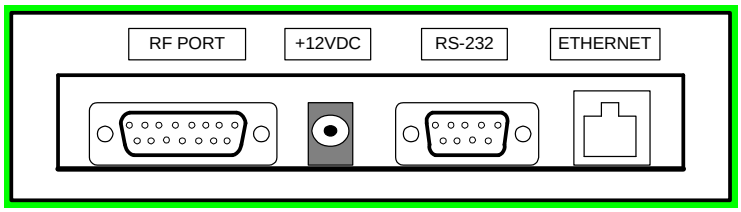
SWITCH #3 (J4-12)
This output is an open FET relay driver switch. This output will sink to ground when Zone 2 Channel 3 is enabled.

SWITCH #4 (J4-13)
This output is an open FET relay driver switch. This output will sink to ground when Zone 2 Channel 4 is enabled.

SWITCH #5 (J4-14)
This output is an open FET relay driver switch. This output will sink to ground when Zone 2 Channel 5 is enabled.

GROUND (J4-15)
This pin provides ground connection for a transceiver or repeater controller.

Real Panel Layout



Connector Kit
Included with the CL100A 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 [+]. The CL100 requires a 12VDC power source.

Chapter 8 - Front Panel Display

Six LED indicators display the CL100A activity.

The green POWER LED will light when +12VDC is supplied to the CL100A.

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 microprocessor send a signal to the PTT switch to ground the transmitter's PTT line at J1-3. This does not guarantee the PTT switch is functional.

The yellow CONNECT LED will light when the CL100A is connected to a router, DSL or CABLE modem.

The green ACTIVITY LED will flash when data is being sent or received. When the CL100A is connected to another unit even if the link is inactive the green ACTIVITY LED will periodically flash. This is the normal hand shaking that occurs between the two units.

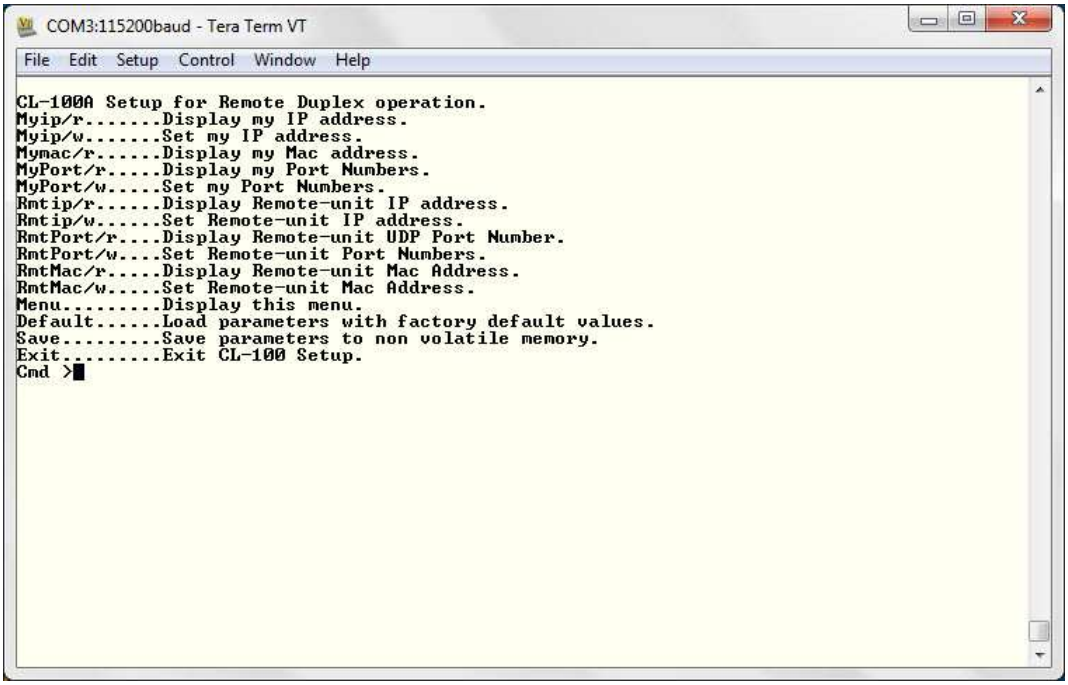
During a firmware upgrade when all four dipswitches are turned on and power is applied the COR, DTMF, PTT, CONNECT and ACTIVITY LEDs will strobe three times to indicate the CL100A has entered into the boot loader mode.

During upload the COR LED will blink to indicate the CL100A is receiving the new firmware program.

Chapter 9 – Full Duplex Operation

Switch 2 This switch is used to place the CL100A in duplex mode. When connected to another CL100A a full duplex link will be established. The CL100As will transmit and receive at the same time. NOTE: The CH100 hub will not support duplex operation. See Chapter 9 for set-up instructions.

Connect a "direct" RS232 cable between the RS232 port on the CL100A 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 RS232 port for full duplex operation, set dipswitch #2 and #3 to ON and apply DC power. The computer should display the CL100A Remote duplex operation setup menu.



Program the Local Unit's IP Address The CL100's default IP address is 192.168.1.240. If the CL100 is connected to a router it is not necessary to change its IP address. If the CL100A 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 a new IP Address. NOTE: Both CL100As require a static IP address for duplex operation.

Program the Remote Unit's IP Address From the Programming menu use the **Rmtip/w** command to program the IP Address.

Program the Remote Unit's MAC Address From the Programming menu use the **RmtMac/w** command to program the Mac Address.

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 **MyPorts/w** and **RmtPorts/w** commands.

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

Chapter 10 - CL100A 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 CL100A is supplied with discriminator audio it may be necessary to de-emphasize the receive audio. Move the jumper at P3 to pins 2 and 3. 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 CL100A 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 2 and 3. This will insert an attenuator in the TX audio path lowering the audio level and improve the adjustment of the TX audio control.

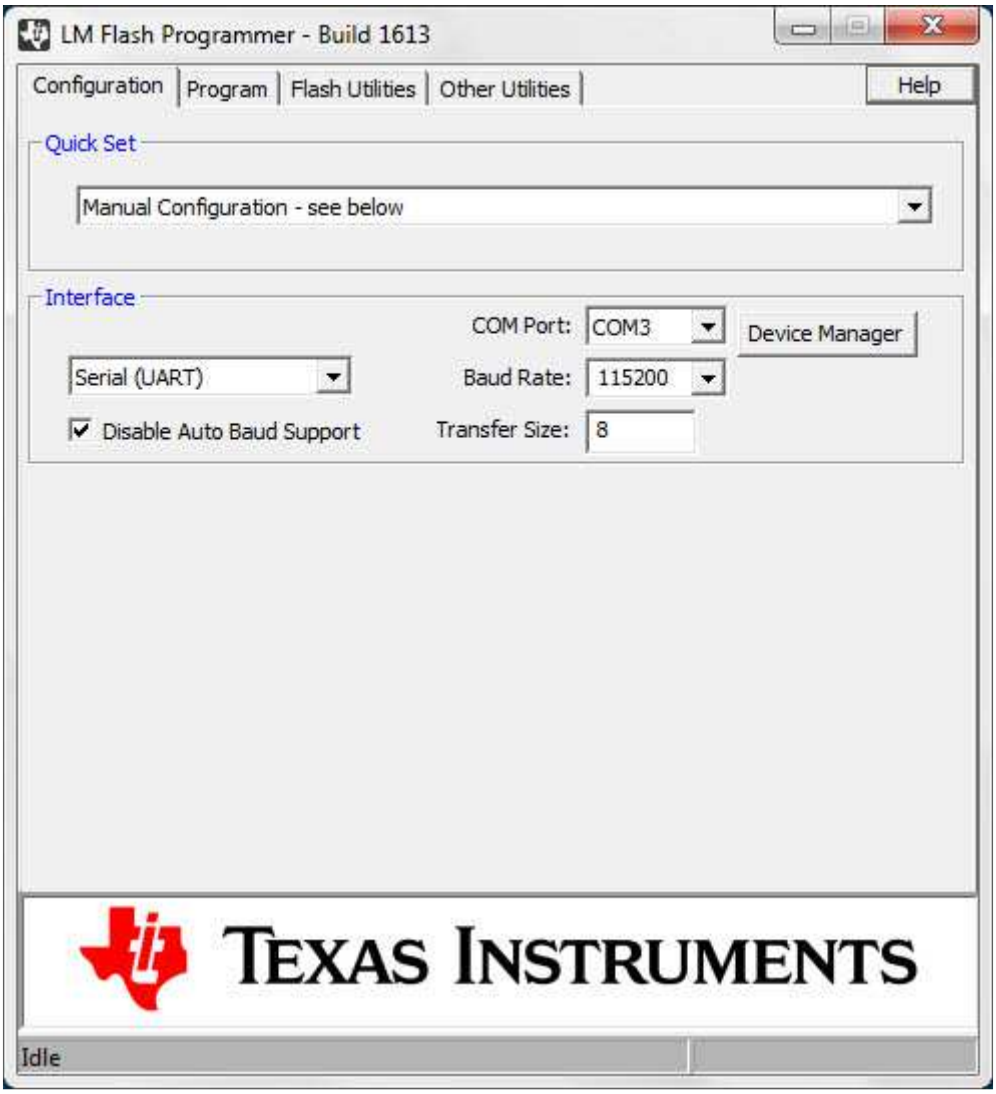
Voice Synthesizer Audio Adjustment
Once the TX audio level has been set cycle power to the CL100A to produce the power-up message. While the power-up message is active, adjust the VOC audio control R33 for the desired transmitter deviation. The voice synthesizer audio level should be adjusted lower that the audio being received from the link.

Chapter 11 – Firmware Upgrade Procedure

The CL100A uses its port to install future firmware upgrades. Go to Computer Automation Technology's website at: www.catauto.com. Click on the File Download GO button. Under Internet Controllers and Hubs select CL-100. Download and install the "LM Flash Micro controller Update Program" and the "Stellaris FTDI Driver Files".

Down load the latest firmware file for the CL100A. Open the LM Flash Programmer. Turn off power to the CL100A. Set all four dipswitches to on and turn on power. The front panel LEDs will flash three times in a strobe pattern. This indicates the CL100A has activated its boot-loader.

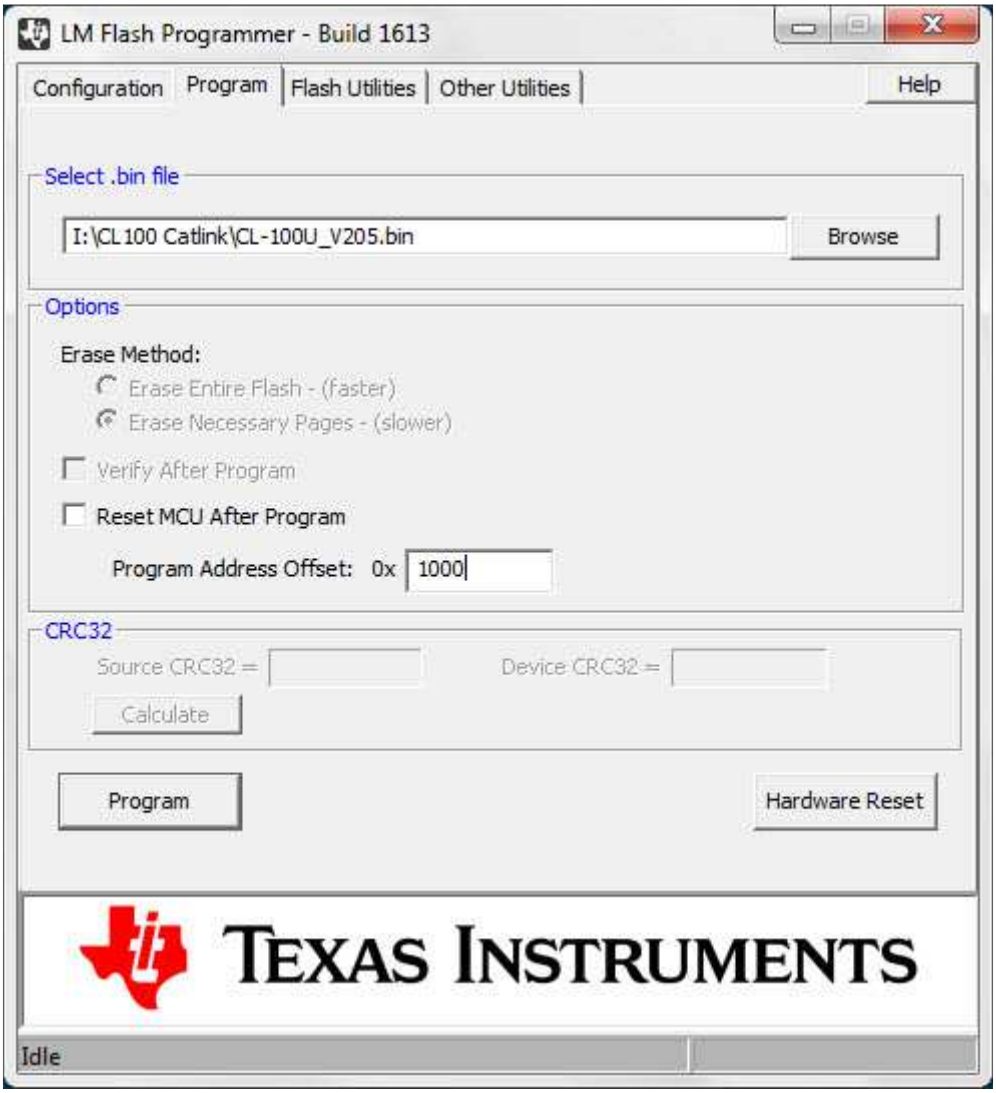
Set up the LM Flash Programmer configuration tab window as shown below. If you are using a USB converter cable you may need to check what COM port has been assigned to it by your computer. Click on the DEVICE MANAGER button to check the COM port assignment. Enter that COM port in the COM Port cell.



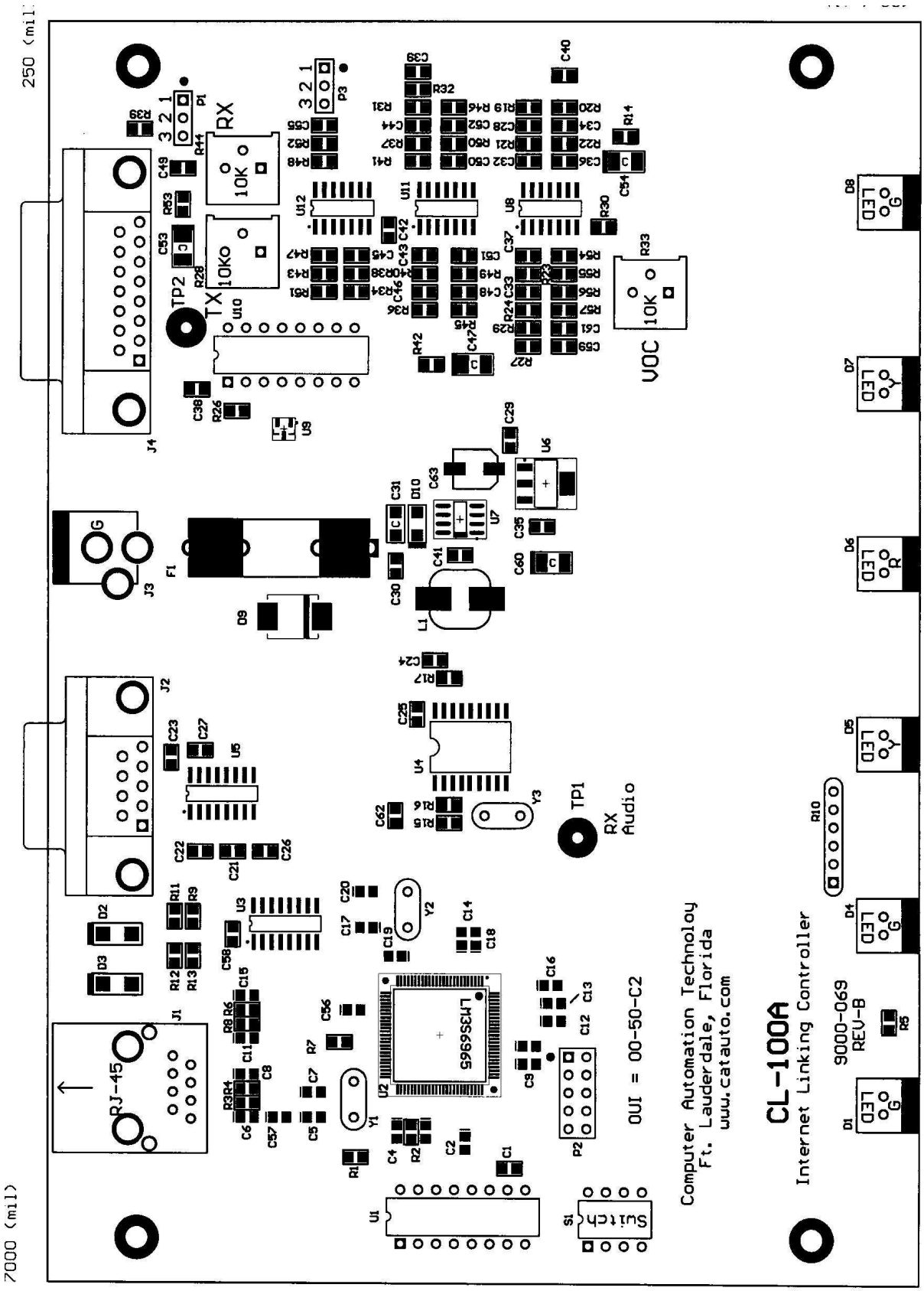
Click the PROGRAM tab to display the window below. Click the BROWSE button and select the new "bin" file. The letter "U" will denote an update file. Set the program offset to 1000. When ready click the PROGRAM button. When programming begins the front panel COR LED will flash.

After programming has completed turn the CL100A power to off.

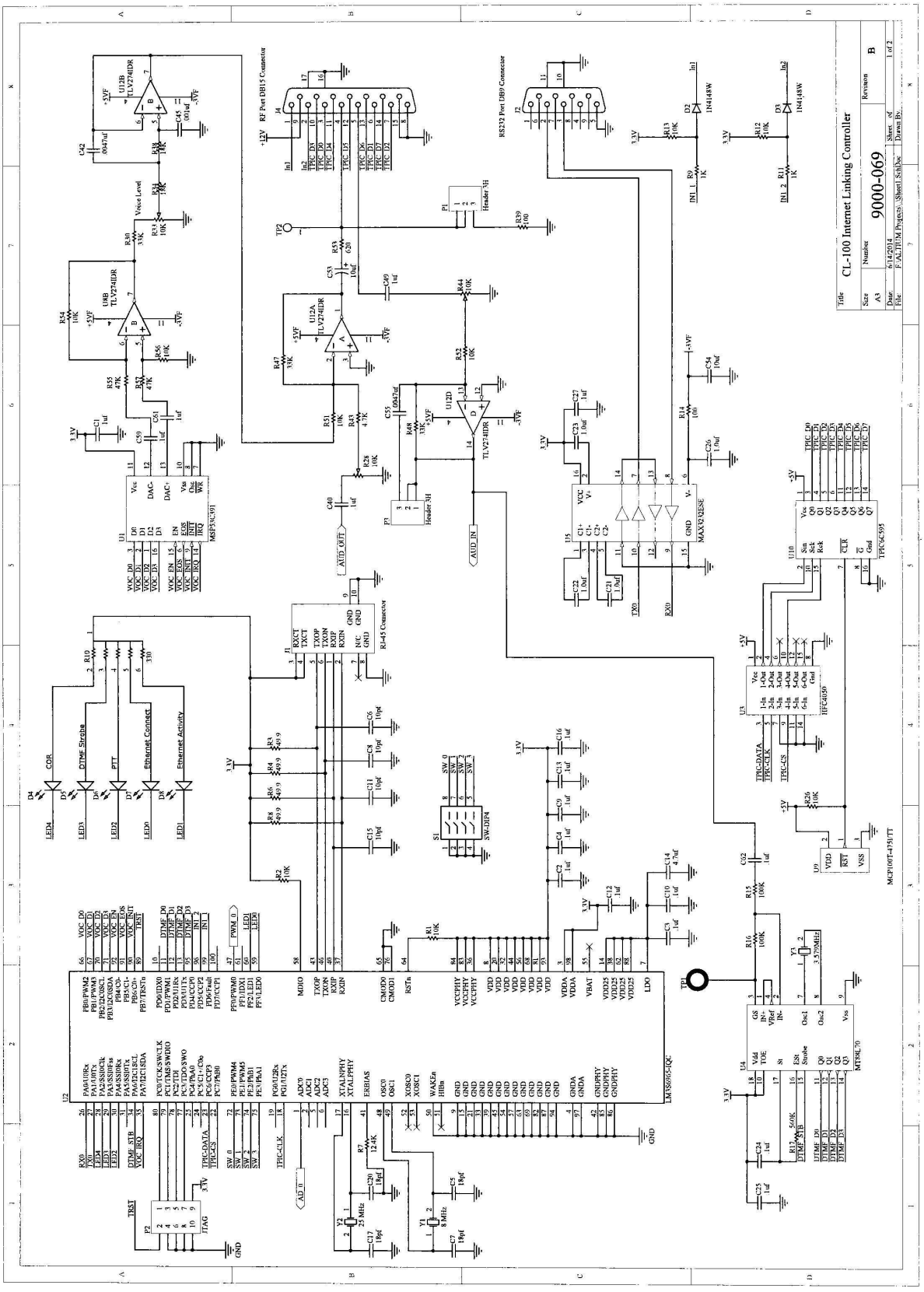
Reset the dipswitches to their previous positions. Apply power and listen for the voice to announce the new version number.



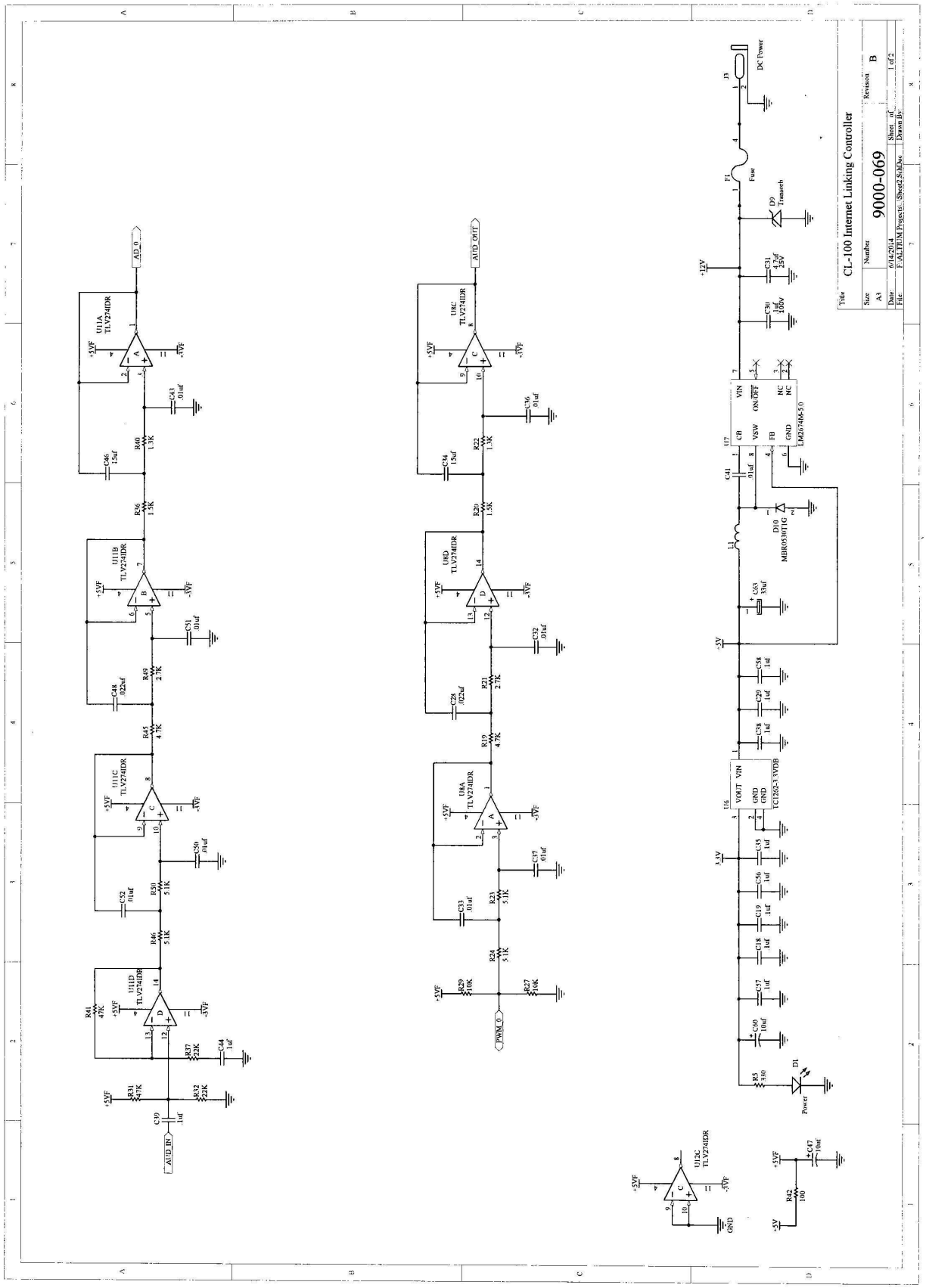
Chapter 12 - CL100 Drawing



Chapter 13 - CL100A Schematic Sheet 1 of 2



CL100 Schematic Sheet 2 of 2



Chapter 14 – CL100 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

Chapter 15 - CH100 Hub Information

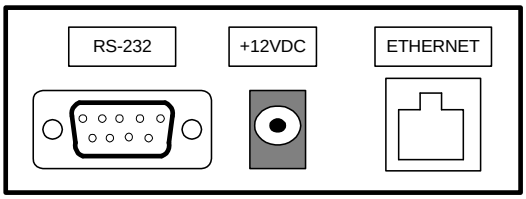
The CH100 makes a perfect addition to the CATLINK system by providing multiple connections. The CH100 is a ROIP repeater hub designed to support the operation of up to twenty CL100A units. Digital control and audio packets received from one CL100A will be forwarded to up to twenty other CL100As. The CH100 can be located anywhere a high-speed Internet connection is available.

CH100 Front Panel Display Indicators
Four LED indicators display the CH100 activity. The green POWER LED will light when +12VDC is supplied to the CH100. The red HEARTBEAT LED will flash once a second to indicate the CH100 is executing its program. The yellow CONNECT LED will light when the CH100 is connected to a DSL or CABLE modem. The green ACTIVE LED will flash when data is being sent or received.

CH100 Normal Operation
In the normal operation mode any CL100A can connect to the CH100.

CH100 Controlled Operation
In the controlled operation mode, the CH100 has a twenty-position look-up table. A CL100A wishing to connect to the hub must have had its IP address entered into one of the CH100 look-up table positions.

CH100 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 CL100As that are currently connected to the HUB. This information is stored in volatile memory and will clear if power is interrupted to the CH100.

CH100 Rear Panel

The 9 pin "D" connector is used to program the CH100 through its 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 CH100 will disconnect. Since the connect information is stored in volatile memory the CH100 will need to be manually re-connected. If possible the CH100 should be supplied by a backed up 12VDC power source.