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PRELIMINARY

CSI-SUPER 32 Community Repeater Tone Panel

With TONETRAK™

Instruction and Service Manual

Second Edition

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If your radio does not contain a COS point:

What is needed is a DC level shift that occurs when an on-frequency signal is present. A switching transistor, opto isolator, or logic chip may need to be interfaced at a point that has this DC shift, or if the level is insufficient to be useful. As a last resort internal squelch can be used, but it is worth the time to find an external squelch point.

The dip switch positions that are paired, such as Active High/Low COS, internal/external squelch, pre and flat emphasis, etc. should have one or the other on, not both at the same time. Using both will not work correctly and may cause damage to the panel and/or the radio.

As shipped from the factory SW1-1 and 4 are on; SW 16-2, 4, and 6, are on. SW 1 is the 8 position dip switch on the left and SW 16 on the right. This setup works for the GE Mastr 2 and Radius R100 with no switch position changes.

Interface sheets are available for most applications as a "guide" to interfacing the radios. Each installation is unique. The options you have or the model revision boards your radio contains may not work exactly the same as the one submitted to us by the field or done locally. The information works for 95% of the installs, so be prepared to modify the procedure as necessary for your installation and operation. These sheets have been submitted to us from operational installations in the field or done locally with the equipment available at our test site. They are working models for the radios on which they were done. Any modification you can suggest to our procedures will be shared with others in order to facilitate the installation of the panel. Your recommendations and comments are welcome and will be incorporated in future sheets. The more model specific you can be, the easier it will be to complete the interface.

4. After hook-up to the points in the radio, check for any loading by the panel. If loading occurs use isolation resistors, diodes, and/or Capacitors to DC isolate the radio and the panel.
5. With everything hooked up and powered, enter the programming mode. Enter "12345" and the Prog LED will come on. Depending on software, a "Pt, Id, Pd, At" will show in the display. If At shows, key in 99 # (note that # is the same as the Enter key when done remotely, in which case "99 Enter" would be appropriate). This should put you back to PT (Program Tone). Then enter 91# 91# (91 Enter 91 Enter). This keystroke will initialize the panel and you will see the tone table being rebuilt as it scrolls across the screen rapidly. After this is done the display goes back to showing PT. You can always get it back to factory values in this manner. Be careful, if done after other programming has been done it will clear the program out and new programming will need to be input.

After the panel is set up according to your application, document your input so that it is on hand, should you need to reprogram at a later date.

here check the receiver itself. There should be no distortion or tone twist at this point or the remote commands will not be recognizable and phone access problems can happen. Once this level is set at TP 2 do not adjust it further.

8. With the receive signal input adjust the CTCSS level for 750 hz of transmitter deviation on the encoded tone. (It will encode what it decodes unless you change the programming, or you have not programmed in the test tone earlier in this procedure.)
9. With the receive signal on, the output level can be adjusted using the offset generator or second service monitor to see the repeat audio. Adjust the output level pot for 4.5 Khz deviation of the transmitted signal, as seen on the service monitor (tone included). It should be set for 1 to 1. 4.5 in, 4.5 Khz out. Note that if the output level adjustment is too sharp, a 100K resistor can be placed parallel to R83 (U24 output amp) this will increase the range of adjustment. (Not applicable for "D" or earlier boards).
10. The DTMF level adjustment is next. This level adjustment also affects the transponded DTMF back to the user, ID level, Acknowledge tone level, and courtesy tone level; as they all come from the DTMF encoder. Adjust DTMF level and you adjust them all.

If you are not using the phone board (CSI 32 PLUS) for the interconnect, adjust the DTMF level at the rear of the panel for a comfortable transpond level. One that deviates the transmitter sufficiently so that if you have the Remote Display Unit or a DTMF decoder the display is correct, and matches the front panel display.

If you have no display to see, set it for correct decoding on the CSI-12. If you are not using a 12, set it to a comfortable listening level on ID or courtesy tone or acknowledge tones.

11. For the phone board and interconnect adjustments, several things come into play. The phone company is looking at the DTMF level to break dial tone and for the numbers from the panel side. There is also an interacting adjustment on the phone board for the "Line Out" (R11 green board) or "Transmit Level Adjust" (R3 blue board) that will effect the DTMF and audio level that the telephone line sees.

* Note: to operate the phone interconnect: "STAR" (*) brings up dial tone and pound (#) knocks it down, after a call has been made.

To dial a number, enter the digits followed by a # and the panel will redial it out to the line.

Example: * (dial tone) 206 745 1100 #.

First try the star to get dial tone. If you do get dial tone, call your shop number. If it

After the mobile answers, it may be necessary to adjust the level at the Line In so that the mobile can understand and hear what is being said. This is the only level from the phone to the mobile that you can adjust. In repeater mode, if the level is correct and the phone side is low, this is the adjustment to make. It only effects the phone-to-mobile audio. If the level is too low, talk to the phone company because it is too low coming in off the phone line. The phone board is built and designed to look exactly like a bell telephone level-wise, impedance-wise, and otherwise.

On the older version of the phone board there is also a hybrid adjustment. This should be set for minimum noise on the line. This is done by changing jumpers on the board.

Phone systems vary from place to place and levels, ring voltage, and current vary greatly from system to system, as well as from place to place within that system. Most phone problems are level related. More level is not necessarily better, and in many cases makes things worse. Loop current available varies with line length. Ring frequency also varies from place to place. Interfacing to a phone system takes careful adjustments. You must be aware of the phone system as well as the interface itself. Take the time to set it up correctly the first time; not just so it works most of the time, but all of the time. The system must have a DTMF line into it to receive calls from the land line side, it will not work with a dial pulse input. You may, however call out from the mobile to the land line side with dial pulse, if it is programmed in.

By increasing the audio level at transmission and reducing it at reception, the signal-to-noise ratio is maintained at a high level. Audio signals detected by the receiver are in the pre-emphasized state and must be de-emphasized. This de-emphasis is usually handled in the receiver itself, often by an R/C network immediately following the discriminator stage. The audio is then passed to the amplifier stages in flat form.

Audio which is injected into the FM transmitter may be flat or pre-emphasized, depending on the type of transmitter used, and whether or not the audio undergoes any processing before the actual modulation circuitry. Audio which is injected into the modulation circuitry of a direct FM transmitter must be pre-emphasized, since this type of transmitter adds no pre-emphasis. However, there is often pre-emphasis circuitry preceding the modulator so that MIC audio, which is flat, can be injected at this point. A phase modulated transmitter on the other hand, automatically pre-emphasizes the audio, therefore requiring injection of flat audio.

3.4 Jumper Switch Configurations

Prior to rack mounting the tone panel, with power disconnected, remove the top cover by removing the ten screws, and configure the internal jumper switches for your particular application. The following table lists the user selectable switches employed by the panel. These switches operate in a mutually exclusive paired arrangement, where one of the switches is intended to be ON while its partner is OFF. *In most cases, only one of the switches in a pair should be ON simultaneously.* The factory default setting for each switch pair is indicated by an asterisk (*) following the switch number. The 2 switch blocks SW1 & SW16 are located inside the panel on the Main Circuit Board. The switches are numbered from left to right, corresponding to the numbers screened onto the switch body.

NOTE: The original manual referred to the above 2 switch blocks as 1 and numbered them in the manual and schematic as SW1 through SW16. This was confusing because the individual switches were numbered from 1 to 8 on the switch body. We are listing both the old and new numbering below because the schematics have not been changed.

Switch Block SW1	Description
------------------	-------------

J3 Rear Panel Connector Pinout

(15-pin D-sub)

3.6
Refer
posi
circ

<u>Pin Number</u>	<u>Description</u>
1	No Connection
2	RX Discriminator Input - Using a shielded cable, connect the unsquelched audio from the repeater receiver to this pin. Audio may be picked up directly off the discriminator before the de-emphasis network. Ground the shield at both ends of the cable to reduce noise.
3-6	No Connection
7	CTCSS Tone (Digital Code) Output - Using shielded cable connect this pin to the CTCSS tone input point on the repeater transmitter. Be sure to attach the shield to ground at both ends to reduce noise.
8	Audio Output - Using the shielded cable supplied, connect this pin to the voice audio input (MIC input) on the repeater transmitter. Ground the shield at both ends of the cable.
9	Alarm Input - This pin requires a contact to ground to trigger the alarm. Be sure to use a ground return to the tone panel. If the alarm is not used, no connection is necessary.
10-13	System Ground - Use these pins for all ground connections and cable shield connections from the panel to the repeater receiver and transmitter. These pins are common to the power supply ground.
14	COS Input - Connect this pin to an RF carrier indicator in the repeater receiver. The panel will detect an active high or an active low COS indication depending upon the position of internal switch jumpers SW 1 & 2. See Section 3.4 regarding COS Jumper selections. <i>Do not</i> use the internal COS.
15	Transmitter PTT - Connect this pin to the PTT line on the repeater transmitter. This pin provides an active LOW PTT output.

1. Connect the COS input, J3 pin 14, to ground if active high polarity is selected, or to the positive supply voltage if active low polarity is chosen.

3.9 Super 32 With Display

Power the unit and verify that the sign-on message appears in the front panel display, after which the display will blank, and the READY LED will light. Enter the Program Mode by pressing 12345. The display will then respond with the prompt Pt. Enter the Command Code 45 # to access the Set-up sub-menu. The display will then respond with the prompt At (Align tone). The following level adjustments may be made while the panel is in the Set-up sub-menu. See Section 4.66, Program Command Code Summary for a complete list of the Alignment Keystrokes.

3.10 Input Level Setting

The input circuitry of the panel was designed to accommodate discriminator audio levels from approximately 50 mV to 1 Volt P-P. The following Input Level Setting Procedures will enable you to align the panel for maximum repeat audio levels (without distortion), decode sensitivity, and clear repeat audio. These settings should remain undisturbed after the initial adjustment. The object is to route the receivers audio to the panel in such a fashion that the audio will be flat for the DTMF decoder and the microprocessor.

NOTE: All previous manuals and setup procedures used TP1. *Do Not* use TP1.

1. Select a point in the receiver for connection to the panel either just after the discriminator or following the de-emphasis network. A level of 300-500 millivolts is ideal. If convenient, this point can be the high side of the volume control for the receiver speaker.

2. Select the Input Compensation Switch appropriate for the input audio source:

	SWITCH #1 SW3	SW4
Flat audio	OFF	ON
Pre-emphasized audio	ON	OFF

3. Turn the rear panel potentiometer labelled INPUT LEVEL fully counterclockwise. Set SW7 to the ON position.
4. Connect the Oscilloscope or Voltmeter to TP2, on Rev E boards (Pin 1 of U-27).
5. Using the RF Signal Generator or Service Monitor, inject a full quieting signal on the receiver frequency with a *valid* CTCSS tone set at 750 Hz of deviation.

3.13 Set DTMF Tone Level

1. Enter 08 #, 1 # to generate DTMF tone D.
2. Adjust the rear panel DTMF OUTPUT LEVEL control for 3 KHz deviation.
3. Enter 08 #, 0 # to turn off the DTMF tone output.

3.14 Internal COS Setting

The original panel design had an internal Carrier Operated Switch circuit designed for use in the absence of an appropriate signal from the repeater receiver. Please use an external COS source to obtain optimum results.

3.15 Site Alarm

The panel includes a Site Alarm feature. The Site Alarm transmits a four digit DTMF address on the repeater output channel upon a contact closure to ground on the Alarm Input, located on the back panel connector (J3-9). The Alarm Input should be connected to a switch that closes when the alarm is to be activated. The other side of the switch should be returned to the ground connection of the tone panel. The Site Alarm will transmit the DTMF address only once upon the switch closure, but will repeat the DTMF address whenever the switch closure is sensed. The Site Alarm is active only when the panel is in the normal repeat mode. See section 4.59, (Site Alarm Address) and section 4.60, (Site Alarm Tone) for additional information.

3.16 Battery-Backed RAM

The unit utilizes the latest technology to protect the user-programmable information. All user-programmable input is securely stored and protected by an internal battery with a shelf life of ten years. For your convenience, we recommend that the panel be programmed at the radio shop to reduce the installation time at the repeater site.

4.1.1 System Level/Per Tone Parameters

The following features can be programmed as either Per Tone Parameters or System Level Parameters. (These will be marked with [SYS] throughout this chapter):

- | | |
|--------------------------------------|----------------|
| • Courtesy Tone On/Off | Section 4.5 |
| • Busy Channel Lock Out On/Off | Section 4.6 |
| • Air Time Traffic Controller On/Off | Section 4.13 |
| • Maximum Access Timer | Section 4.13.1 |
| • Standby Timer | Section 4.13.2 |
| • Penalty Timer | Section 4.13.3 |
| • Tone Encode Extension Timer | Section 4.49 |

Per Tone Parameter

A Per Tone Parameter allows you to customize individual CTCSS Tones with the features listed above. For example, if the Courtesy Tone is to be activated for only one tone on the system, enter the programming command sequence once for that user's tone.

Enable Courtesy Tone on a Per Tone basis: 03# 1230# 1#

Disable Courtesy Tone on a Per Tone basis: 03# 1230# 0#

System Level Parameter

A System Level Parameter allows Regardless of the total number of active CTCSS Tones or Digital Codes in the panel, when a System Level Parameter is selected, the Programming Command sequence need only be entered once. For example, to turn the Courtesy Tone on for all of the active tones on the system, select the System Level Parameter for the Courtesy Tone, rather than a particular tone frequency, or Digital Code. The Tone/Code Switch, Command Code 22#, may be in either position, as it has no effect on programming command sequences. To select a System Level Parameter, enter three zeros (000) in place of a specific CTCSS Tone:

Enable Courtesy Tone as a System Level Parameter: 03# 000# 1#

Disable Courtesy Tone as a System Level Parameter: 03# 000# 0#

Executing a Programming Command sequence as a System Level Parameter does not prevent you from changing the setting on a per tone basis at a later time. For example, if there were 10 active CTCSS Tones or Digital Codes in the panel with the Courtesy Tone enabled on a System Level basis, and a customer requested that the Courtesy Tone be turned off, the programming command sequence would be entered as a Per Tone Parameter for that customer's CTCSS Tone. In this way, a single Courtesy Tone may be

Status Polling is available on the following features:

- Activate/Inactivate CTCSS Tones
- Insert/Delete Tones In The Tone Table
- Courtesy Tone On/Off
- Busy Channel Lock Out On/Off
- Community Station ID Switch On/Off
- Air Time Traffic Controller On/Off
- Display On/Off (*Optional*)
- Programming Acknowledgement Transponder On/Off
- Digital Input Polarity Switch On/Off
- Digital Output Polarity Switch On/Off
- Set Private Carrier CW-ID Operation
- TX Hold Delay
- Tone Reserve (Soft Off)
- Tone Reserve Masking Tone
- Hot Standby On/Off
- DTMF Regeneration Mode On/Off

Section 4.3
Section 4.4
Section 4.5
Section 4.6
Section 4.8
Section 4.13
Section 4.18
Section 4.19
Section 4.21
Section 4.22
Section 4.45
Section 4.46
Section 4.47
Section 4.48
Section 4.55
Section 4.58

4.2 Accessing and Exiting the Program Mode

The CSI-Super 32 can be programmed from the front panel keyboard, or with any optional 12 button DTMF encoder on the repeater input frequency. The default Program Access Code is 12345. When the Access Code has been entered, the Optional Front Panel Display LED will respond with the prompt Pt. The repeat function of the panel is disabled while in the Program Mode. To exit the Program Mode, enter 99#. The panel will automatically exit the program mode after five minutes of inactivity. (To find out how to change the Program Access Code, see Section 4.61.)

Access the Program Mode: 12345

Exit the Program Mode: 99#

4.5 Courtesy Tone On/Off [T/C][SYS][PAT]

The Courtesy Tone is a single short beep sent at the end of a transmission when the CTCSS Tone is no longer being received by the panel. The Courtesy Tone is used as a roger/over, signalling the receiving party that it is their turn to talk. The Courtesy Tone can be enabled on either a per tone or system level basis. This feature is disabled as shipped from the factory.

To Enable Courtesy Tone: 03# 1230# 1#

To Disable Courtesy Tone: 03# 1230# 0#

Note: See Section 4.52 to set the Courtesy Tone Pitch.

4.6 Busy Channel Lock Out [T/C][SYS][PAT]

Busy Channel Lock Out has been changed from previous software versions. The CTCSS Tone is no longer generated during the carrier delay time. This feature provides positive control of the repeater by the CTCSS Tone that has current access. Control is retained during the carrier delay time and will not terminate until the transmitter drops, at which time any user may access the repeater. When a new or different tone is decoded during the carrier delay time, the Optional Front Panel Display will indicate the tone frequency, but *will not regenerate it or repeat the new audio, locking out the second user*. Busy Channel Lock Out can be enabled on either a per tone or system level basis. This feature is disabled as shipped from the factory.

To Activate: 04# 1230# 1#

To Inactivate: 04# 1230# 0#

Note: See Section 4.49, Tone Encode Extension Timer, to set CTCSS tone during the carrier delay period. Extending the Carrier Delay Timer will automatically increase the amount of time a CTCSS tone can control the repeater.

4.8 Community Station ID Switch On/Off [T/C][PAT]

The Community Station ID Switch turns a Station ID on or off after an ID has been assigned to a CTCSS tone. Community Station ID may be turned on or off without altering the ID. It is not necessary to turn an ID on after assigning an ID to a CTCSS tone. (See Section 4.7) The Community Station ID feature begins the identification cycle for each tone at the beginning of a conversation if the following conditions have been met:

- A valid ID has been set for that tone.
- Station ID is turned on for that tone.
- Approximately 2 minutes have lapsed since the last transmission by the same user, or a different tone has accessed the system.
- The CW-ID time interval has lapsed for the given tone. See Section 4.43 to set the CW-ID Time Interval.

To turn the Community Station ID Switch on, enter the keystrokes 06#, followed by 1230#, then 1#. To turn the Community Station ID Switch off, enter keystrokes 06#, followed by 1230#, then 0#.

Switch On: 06# 1230# 1#

Switch Off: 06# 1230# 0#

Note: This keystroke is disabled if a valid Private Carrier CW-ID is set.

4.9 Test Station ID [T/C]

Both Community and Private Carrier Station CW-ID's may be tested by entering this command. This test will key the transmitter and broadcast the CW-ID requested. In order to use this feature, a valid CW-ID must be programmed.

The Community Station ID Switch need not be enabled in order to test a particular tone's ID. To test the Community Station ID for 123.0 Hz., enter the keystrokes 07#, followed by 1230#.

To Test: 07# 1230#

To test the Private Carrier Station ID, enter the keystrokes 07#.

To Test: 07#

4.11 Crisscross Encoding [T/C]

With Crisscross Encoding the crossing of CTCSS tones to Digital Codes or Digital Codes to CTCSS tones may be performed. For example, the panel can be programmed to encode digital code 023 when CTCSS tone 146.2 Hz. is being decoded or the panel can encode tone 146.2 Hz. when code 356 is being decoded. The decode tone of a crossed pair must be in the Tone Table and have been previously activated. The encode tone does not have to be activated, nor need it be present in the Tone Table. As shipped from the factory, the panel is programmed for same tone decode/encode. In order to cross a Digital Code to a tone, the Tone/Code Switch, Command Code 22#, must be set to the digital input position. (See Section 4.20)

To Crisscross CTCSS tone 123.0 Hz. to digital code 315, enter the keystrokes 09#, followed by 1230#, then 315#.

Tone to Code: 09# 1230# 315#

Code to Tone: 22# 09# 315# 1230#

The above examples show the crossing of CTCSS tone 123.0 Hz. to the digital code 315 and the crossing of the digital code 315 to the CTCSS tone 123.0 Hz. Crossing a CTCSS tone or digital code to itself will cause the XFER light to continue to function and is not recommended. To reset a CTCSS tone or digital code to its normal encode/decode status, see Section 4.12.

Note: Using Busy Channel Lock Out with Crisscross Encoding *will cause interference* and is not recommended.

4.12 Reset Cross Tone Encoding [T/C]

Reset Cross Tone Encoding is used to restore the normal encode/decode status of a tone or digital code that has been assigned to the Decode Tone of a crossed or crisscrossed pair. To reset 123.0 Hz., enter the keystrokes 10# followed by 1230#. In order to reset a Crossed, or Crisscrossed Digital Code, the Tone/Code Switch, Command Code 22#, must be set to the digital input position. (See Section 4.20)

Reset CTCSS Tone: 10# 1230#

Reset Digital Code: 22# 10# 315#

The above examples show how to reset the CTCSS tone 123.0 Hz. and the digital code 315 to their normal encode/decode status. This need only be done for the decode tone or code of the crossed pair, as the encode tone or code has not been affected.

4.13.1 Maximum Access Timer [T/C][SYS]

The Maximum Access Timer regulates the total amount of time that a single user may access the repeater. The time is counted from the initial decode and continues during Carrier Delay Hang Time. The timer follows the last user after the carrier drops and runs for the duration of the Standby Time. The Maximum Access Timer is programmable on a per tone basis, from 30 to 600 seconds in one second increments. The factory default is 180 seconds, or 3 minutes. Enter the keystrokes 12#, followed by 1230#, then the new setting, 240#.

To Set: 12# 1230# 240#

The above example would set the Maximum Access Time to 240 seconds.

4.13.2 Standby Timer [T/C][SYS]

The Standby Timer mandates that the last user tone wait at least the duration of the time that has been set, thereby allowing other users access to the repeater. The Standby Timer immediately begins accumulating time whenever the carrier drops between transmissions. This time period prevents the last user from resetting the Maximum Access Timer by letting the carrier drop. The Standby Timer is programmable from 0 to 300 seconds in 1 second increments on a per tone basis. The factory default is 20 seconds. Enter the keystrokes 13#, followed by 1230#, then the new time, 30#.

To Set: 13# 1230# 30#

The above example would set the Standby Timer to 30 seconds.

4.13.3 Penalty Timer [T/C][SYS]

The Penalty Timer determines the duration of the barred time before a penalized subscriber tone may again access the repeater. The Penalty Timer will remember a penalized user and will prevent that tone from accessing the system for the full duration of Penalty time. The Penalty Timer is programmable from 30 seconds to 600 seconds in 1 second increments on a per user basis. The factory default is 60 seconds.

To Set: 14# 1230# 45#

The above example would set the Penalty Timer to 45 seconds. - Must be

over
"30"

4.16 Transmitter Time Out Timer

The Transmitter Time Out Timer checks for continuous input activity from one CTCSS Tone. If any one tone is decoded without a break for the length of the Time Out Timer setting, the transmitter is temporarily shut down. The Time Out Timer will reset when this tone disappears. The Timer is programmable from 1 to 9 minutes in 1 second increments. The factory default is 3 minutes.

To change the Transmitter Time Out Timer, enter the keystrokes 17#, and then the new value in seconds, 180#.

To Set: 17# 210#

The above example would set the Transmitter Time Out Timer to 210 seconds, or 3 1/2 minutes.

Note: When using the Air Time Traffic Controller, the Transmitter Time Out Timer should be set at least one minute longer than any of the three Air Time Traffic Controller timers (see Sections 4.13 - 4.13.3).

4.17 Data Transpond Timing

Data Transpond Timing is the rate at which the panel transponds DTMF data. For manual logging of the transponded data, the Data Transpond Timing must be set slow enough to allow the user to read the received data. However, the maximum setting allows rapid data retrieval when the panel is interrogated using the CSI-12 Remote Display Unit. The Data Transpond Timing is programmable from 1 to 20 digits per second. The factory default is 10 digits per second.

To change the Data Transpond Timing, enter the keystrokes 18#, followed by a new value (1-20)#.

To Set: 18# 12#

The above example would set the Data Transpond Timing to 12 digits per second.

4.20 Tone/Code Switch

When programming the CSI-SUPER 32, the panel default setting is for CTCSS Tones. In the Tone Input Mode, all input pertaining to individual user functions, such as activating a tone, enabling the Courtesy Tone, displaying individual time and hit information, etc., is assumed to be CTCSS Tone input. In this mode, the Optional Front Panel Display LED indicates Pt, and any tone input is prompted by a display of "___." in anticipation of tone frequency input. When programming remotely, the Programming Acknowledgement Transponder will emit two short audible tones between programming steps.

When Digital Code information is to be input to the panel, it must be set to the Digital Input Mode. This is done entering the keystrokes 22#, which will switch the panel from the CTCSS Tone Mode to the Digital Code Mode. In this mode, all input pertaining to individual user functions is assumed to be assigned to a Digital Code. The Optional Front Panel Display LED indicates Pd, and any digital code input is prompted by a display of "___". When programming remotely, the Programming Acknowledgement Transponder will emit one long audible tone between programming steps. When entering a Digital Code, if more than three digits are entered, the leading digit will be scrolled off the display and disregarded. No digit greater than 7 will be accepted by the panel as a Digital Code.

Commands which require the Tone/Code Switch to be set to the Digital input mode, are indicated by [T/C] in all Programming Command headings and in the Program Command Code Summary (Section 4.66). In the Digital Mode, for example, Command Code 32 (Display Tone Table) will display all the entries in the Digital Code Table only.

In the Tone Mode position, the Display Tone Table command will display all entries in the CTCSS Tone Table only. The Display Last User command (Command Code 40), on the other hand, will display the last user, either CTCSS Tone or Digital Code, regardless of what position the Tone/Code Switch is in. Likewise, the Display Active User Time and Hits command will display, or transpond both CTCSS Tone and Digital Code user data. The Tone/Digital Code Switch defaults to the Tone Mode position whenever the Program Mode is entered. The panel will remain in the Digital Mode until it is switched back, or until exiting the Program Mode.

To Switch: 22#

4.23 Program Access Code Security Tone [T/C]

The panel as shipped from the factory, requires a 5 digit DTMF access code in order to gain remote access. The Program Access Code Security Tone features can provide additional security against authorized remote radio access. This feature enables you to specify a specific CTCSS Tone that must be decoded, in addition to the correct 5 digit access code, to gain remote access to your panel.

Additionally, upon decoding this tone, the panel will look for a pattern match in any incoming DTMF. If the first DTMF digit received by the panel matches the first digit of the Program Access Code, the repeated audio is muted so as not to transmit the entire access code over the air.

To program this feature, enter keystroke 25#, followed by the desired CTCSS Tone.

To program the Security Tone: 25# 1230#

The above example would require 123.0 Hz. to be decoded in addition to the correct 5 digit Program Mode Access Code.

4.24 Clear Program Access Code Security Tone

Upon execution of this command, the panel will no longer require a CTCSS Tone be decoded when accessing the Program Mode.

Clear Security Tone: 26#

4.28 Display Active Tones [RDU]

To display the current list of activated CTCSS Tones and Digital Codes, enter the keystrokes 30#.

To Display: 30#

4.29 Display Tone Table [T/C]

This command will cause the panel to display a list of the CTCSS Tones which are currently in the Tone Table. This command is influenced by the Tone/Code Switch, Command Code 22# (see Section 4.20). In the Code position, all Digital Codes located in the Tone Table are displayed.

To display the list of CTCSS Tones or Digital Codes present in the Tone Table, enter the keystrokes 32#.

To Display: 32#

4.30 Display Active Tones

This command will display, or transpond, the activated CTCSS Tones followed by the activated Digital Codes.

To display the current list of activated CTCSS Tones and Digital Codes, enter the keystrokes 33#.

To Display: 33#

4.33 Display All Time And Hits [T/C]

This command will display, or transpond a sequential listing of the time and hit accumulation of each CTCSS Tone and Digital Code located in the Tone Table. The repeater frequency, if programmed, will be displayed at the beginning of the listing. Next the tone frequency is displayed, followed by its respective time, followed by the number of hits accumulated for that tone. The panel will continue in this manner, giving a complete listing of time and hit accumulation for all CTCSS Tones and Digital Codes present in the Tone Table.

Enter the keystrokes 36# to display this table. To clear an individual Time and Hit Accumulator, see Section 4.38. To clear all Time and Hit Accumulators, see Section 4.39.

To Display: 36#

4.34 Display Active Tone Time And Hits [T/C]

This command will display, or transpond, a sequential listing of the time and hit accumulation of all activated CTCSS Tones and Digital Codes. First the tone frequency is displayed, followed by its respective time, followed by the number of hits accumulated for that tone. The panel will continue in this manner giving a complete listing of the time and hit accumulation for all activated CTCSS Tones and Digital Codes.

Enter the keystrokes 37# to display this table. The repeater frequency (if programmed), will be displayed at the beginning of the listing. To clear an individual Time and Hit Accumulator, see Section 4.38. To clear all Time and Hit Accumulators, see Section 4.39.

To Display: 37#

4.35 Display Total Transmitter/COS Time

The panel accumulates and stores the total repeater transmitter time up to 254 hours, 59 minutes, and 59 seconds. When interrogated, the panel will first display the Total Transmit time followed by the Total COS time. This information is helpful for channel loading studies or scheduling preventative maintenance.

To display this information, enter the keystrokes 38#.

To Display: 38#

To clear the Transmitter/COS Time Accumulator, see Section 4.40.

4.39 Clear All Time And Hit Accumulators

The Time and Hit Accumulators of *all* CTCSS Tones and Digital Codes present in the Tone Table will be reset to zero using this command. To prevent accidental erasure of this information, the keystroke command sequence must be entered twice in succession.

To Clear: 42# 42#

4.40 Clear Transmitter/COS Time Accumulator

To clear the Transmitter/COS Time Accumulator, enter the keystrokes 43#.

To Clear: 43#

4.41 Clear Timed Out User

When a user times out the repeater by exceeding the Transmitter Time Out Time, the CTCSS Tone frequency or Digital Code of the user is recorded by the panel. This command clears the register holding that information.

To clear the Timed Out User register, enter the keystrokes 44#.

To Clear: 44#

4.42.3 Generate CTCSS Tone On/Off [T/C]

With this command, the panel will generate a CTCSS Tone or Digital Code, to allow adjustment of the tone output level and to check for Digital Code inversion. The repeater transmitter must be keyed to transmit a tone frequency. The polarity of the transmitted Digital Code is determined by the Digital Output Polarity Switch (Section 4.22). To generate a CTCSS Tone, enter the keystrokes 07#, followed by 1230#. To turn the tone off, enter 07#, followed by 0#.

To Generate 123.0 Hz: 07# 1230#

To Turn Tone Generator Off: 07# 0#

4.42.4 Generate DTMF Tone (D) On/Off

When this command is entered, the panel will generate DTMF Tone (D) to allow adjustment of the DTMF Tone Output Level. The repeater transmitter must be keyed to transmit this tone.

To generate DTMF Tone, enter the keystrokes 08#, followed by 1#. To turn the DTMF Tone off, enter 08#, followed by 0#.

DTMF On: 08# 1#

DTMF Off: 08# 0#

4.42.5 DTMF Keypad Mode (Optional)

The DTMF Keypad Mode allows DTMF generated by the RDU or the optional Front Panel Keyboard to pass through to the repeater transmitter. When pressed, any of the numeric keys will generate their corresponding DTMF Tone, which will be transmitted, providing the transmitter is on.

To place the panel in the DTMF Keypad Mode, enter the keystrokes 09#. To exit this mode, press #.

DTMF Keypad Mode On: 09#

DTMF Keypad Mode Off: #

4.43 CW-ID Time Interval

The CW-ID Time Interval is used to set the time interval between CW-ID transmissions for both Private Carrier and Community ID, and is programmable from 1 to 255 minutes, in one minute increments. The factory default is every 15 minutes. To reset the CW-ID time interval, enter the keystrokes 47#, followed by the time in minutes.

Set CW-ID Time Interval: 47# 30#

Note: The above example would cause CW-ID to transmit every 30 minutes either automatically, or with activity, depending on the configuration that has been selected.

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4.45 Set Private Carrier CW-ID Operation [PAT]

This command is used to determine if the CW-ID will be sent automatically, or only when there has been activity. In With Activity mode, the CW-ID will be sent once when the system is first used, and again at each time interval as set by the system operator (see Section 4.43, CW-ID Time Interval). If the conversation is less than the timed interval, the panel will, at the next interval, ID again. The default setting from the factory is With Activity.

In the Automatic mode, the ID will be broadcast once each time interval as set by the system operator, regardless of activity.

To enable Automatic CW-ID, enter the keystrokes 49#, 1#. To reset the panel to the factory default setting, enter the keystrokes 49#, 0#.

Automatic CW-ID: 49# 1#

With Activity: 49# 0#

Note: This feature is used in conjunction with Sections 4.43, CW-ID Time Interval and 4.44, Set Private Carrier CW-ID.

4.46 TX Hold Delay [PAT]

This feature drops the repeater transmitter immediately if the tone panel sees Tx activity for less than one second. The mobile will not hear repeater hang-time unless the MIC is keyed for one second or longer. This feature is only recommended in HAM or amateur applications. To set the TX Hold Delay, enter the keystrokes 50#, followed by 1#. To turn it off, enter keystrokes 50#, followed by 0#.

TX Hold Delay On: 50# 1#

TX Hold Delay Off: 50# 0#

4.49 Tone Encode Extension Timer [T/C][SYS]

The Tone Encode Extension Timer is an adaption of the previous Tone Lock Out feature. This feature provides continuous regenerated CTCSS Tone during the carrier delay time. It can be used in conjunction with Busy Channel Lock Out (Section 4.6), or as a stand-alone feature. This feature is disabled as shipped from the factory. To enable this feature, determine the setting for the carrier delay timer and set the CTCSS encode tone to expire from 250 to 350 milliseconds before the transmitter drops. The Tone Encode Extension Timer is programmable from 0 to 9 seconds. This feature is programmable in 50 millisecond increments, using settings from 1 to 180. For example, 10 x 50 milliseconds = .5 seconds, or 55 x 50 milliseconds = 2.75 seconds. Enter the keystrokes 53#, followed by 1230#, then a value from 1 to 180, followed by #.

To Activate: 53# 1230# 55#

To Inactivate: 53# 1230# 0#

The above example would set the Tone Encode Extension Timer for 55 x 50 = 2.75 seconds, which will drop the tone 250 milliseconds before the transmitter drops.

Note: The following is an example of how the feature will improve system operation. When on, the CTCSS Tone is generated during carrier delay, and is set to turn off 250 milliseconds prior to the carrier delay timer dropping the transmitter. This enables the mobile tone decoders to reset, thus eliminating the mobile squelch burst normally heard by the vehicle occupant. Another use for the feature is to provide CTCSS tone during the carrier delay time for mobile radios equipped with Busy Channel Lock Out boards.

4.51 Set Repeater Audio Delay Time

The CSI-SUPER 32 contains an analog delay circuit which is used for squelch-tail elimination. With this circuit, the panel is able to determine when the tone is gone, and close the audio gate before the repeater receiver's squelch burst is passed to the transmitter. This feature is unique to this product. The delay timer is programmable from zero to 100 milliseconds in 10 millisecond increments (for example: 1 = 10 milliseconds, 2 = 20 milliseconds, etc.). The factory default setting is 70 milliseconds.

To set the Audio Delay Time period, enter the keystrokes, 55# time#.

Set Audio Delay: 55# 5#

This example would set the delay to 50 milliseconds.

Note: An echo will be heard on a receiver if the radio is physically located within earshot of the transmitted audio source. This is normal operation caused by the delayed transmission of the repeated audio and is *not* a malfunction. However, if an echo is heard and the transmitter is clearly *not* within earshot of the audio source (for instance, 5 miles away in a vehicle), check the installation for a second audio path and disable it. Remove the audio output from the CSI panel and try the repeater. Some repeaters, such as MICOR, have their own audio processing between the receiver and the transmitter. This second path must be disabled.

4.53 CSI-12/SUPER Programming Mode

This command is used with the CSI-12 Remote Display Unit and the CSI-SUPER 32 *without display*. When programming locally, enter the keystrokes 59#. To exit the CSI-12 program mode, enter the keystrokes 99# (Exit Program Mode), and the CSI-SUPER 32 will return to normal repeat operation.

CSI-12 Programming Mode: 59#

Exit Program Mode: 99#

4.53.1 Back Door Access

If the Program Access code is not available for any reason, this feature will allow the system operator to enter the Program Mode so that a new Access Code may be set. With the CSI-12 Remote Display Unit connected to the CSI-SUPER 32 without display, set the CSI-12 to generate DTMF digit 5. Turn the power off on the CSI-SUPER 32 without display. When the panel is powered-up again, it will be in the Program Mode. Turn off the DTMF generator in the CSI-12. At this point, it is recommended that the system operator enter a new Program Access Code (see Section 4.61).

4.57 Initialize All Variables to Factory Defaults

Warning: This command will reset all programmable functions to their factory defaults and all accumulators to zero (see Section 4.65 for factory default settings). Before clearing the memory, interrogate the panel for any data accumulation. (See Data Retrieval Commands, Sections 4.25 - 4.37)

To initialize the panel and leave the Tone Table empty of any tone or Digital Code, enter the keystrokes 91#, followed by 90#.

To Initialize *Without* Rebuilding the Tone Table: 91# 90#

To initialize the panel and rebuild the factory default Tone Table, enter the keystrokes 91#, followed by 91#.

To Initialize and Rebuild the Tone Table: 91# 91#

4.58 DTMF Regeneration Mode On/Off

DTMF signalling can be significantly affected by twist when passed through a repeater. To prevent this from happening, the panel has a DTMF regeneration mode. When off, the receiver passes all DTMF signals directly through the panel and into the transmitter, thereby passing any distortion that may have occurred. When on, immediately upon detecting DTMF, the panel opens the Audio Gate, preventing the received audio (DTMF) from passing. The panel then regenerates the DTMF audio and passes it to the transmitter. To initiate this feature, enter the keystrokes 92#. The default setting from the factory is off.

DTMF Regeneration On: 92# 1#

DTMF Regeneration Off: 92# 0#

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4.61 Change Program Access Code

This command is used to change the Program Access Code. Be sure to record the new access code for future reference. The 5-digit access code can contain numbers from 0 to 9. The DTMF digits A, B, C and D cannot be used in the access code.

To change the Program Access Code, enter the keystrokes 95#, followed by a new five digit code. When programmed remotely, the panel will transmit the new Program Access Code upon completion of the command sequence.

To Change Program Access Code: 95# (new access code)#

Example: 95# 67890#

The example above would set the Program Access Code to 67890.

4.62 Store Repeater Frequency

The CSI-12 is capable of printing reports, and date-stamping and labeling these reports with the repeater frequency for identification purposes. The panel, when interrogated remotely, will transmit the repeater frequency as a seven-digit number, along with the requested information.

To change the repeater frequency, enter the keystrokes 96# followed by the repeater frequency. In order to accomodate offset frequencies, seven digits must be entered. Therefore, if the repeater frequency to be input is 468.400, add an extra zero to the end of the number (for example, 468.4000).

To Store Repeater Frequency: 96# 4684000#

The above example would store the repeater frequency of 468.4000 in the tone panel.

4.65 Factory Default Settings

The CSI-SUPER 32 Tone Panel is shipped with the following default settings:

- The Tone Table contains the 32 standard EIA tones from 67.0 to 250.3 Hz.
- All CTCSS Tones and Digital Codes are inactivated.
- No Digital Codes are in the Tone Table.
- The Courtesy Tone on all tones is disabled.
- Busy Channel Lockout on all tones is disabled.
- Community Station ID on all tones is disabled.
- Community CW-ID to follow Receiver is set to not follow COS.
- CW-ID Time Interval is set for every 15 minutes.
- No Cross Tone or Crisscross Encoding set.
- Private Carrier CW-ID is not set.
- Private Carrier CW-ID Operation is set With Activity.
- Air Time Traffic Controller is not set.
- Maximum Access Timer is set for 180 seconds.
- Standby Timer is set for 20 seconds.
- Penalty Timer is set for 60 seconds.
- Audio Gate Delay Timers are set for 0 delay.
- The Transmitter Carrier Delay Timer is set for 3 seconds.
- The Transmitter Time Out Timer is set for 3 minutes.
- The Data Transpond Timing is set to 10 digits per second.
- The Display is on.
- The Programming Acknowledgement Transponder is on.
- The Tone/Code Switch is in the Tone position.
- The Digital Polarity Switches are disabled.
- Program Access Code Security Tone is set to 000.0
- All Time and Hit Accumulators are set to zero.
- TX Hold delay is disabled.
- Tone Reserve and Tone Reserve Masking Tone are disabled.
- Tone Encode Extension Timer is disabled.
- Pre-pay User Time Block is disabled.
- Audio Delay Time is set for 70 milliseconds.
- Courtesy Tone Pitch is code 6, or 1336 Hz.
- Warning Tone Pitch is code 2, or 770 Hz.
- CW-ID Tone Pitch is code 4, or 941 Hz.
- DTMF Tone Regeneration is disabled.
- The Site Alarm Address is set to 0000.
- The Site Alarm Tone is set to 000.0 Hz.
- The Program Access Code is set to 12345.
- Auxiliary Functions on all tones are disabled.
- Repeater Frequency is set to 000.0000.

4.66 Program Command Code Summary

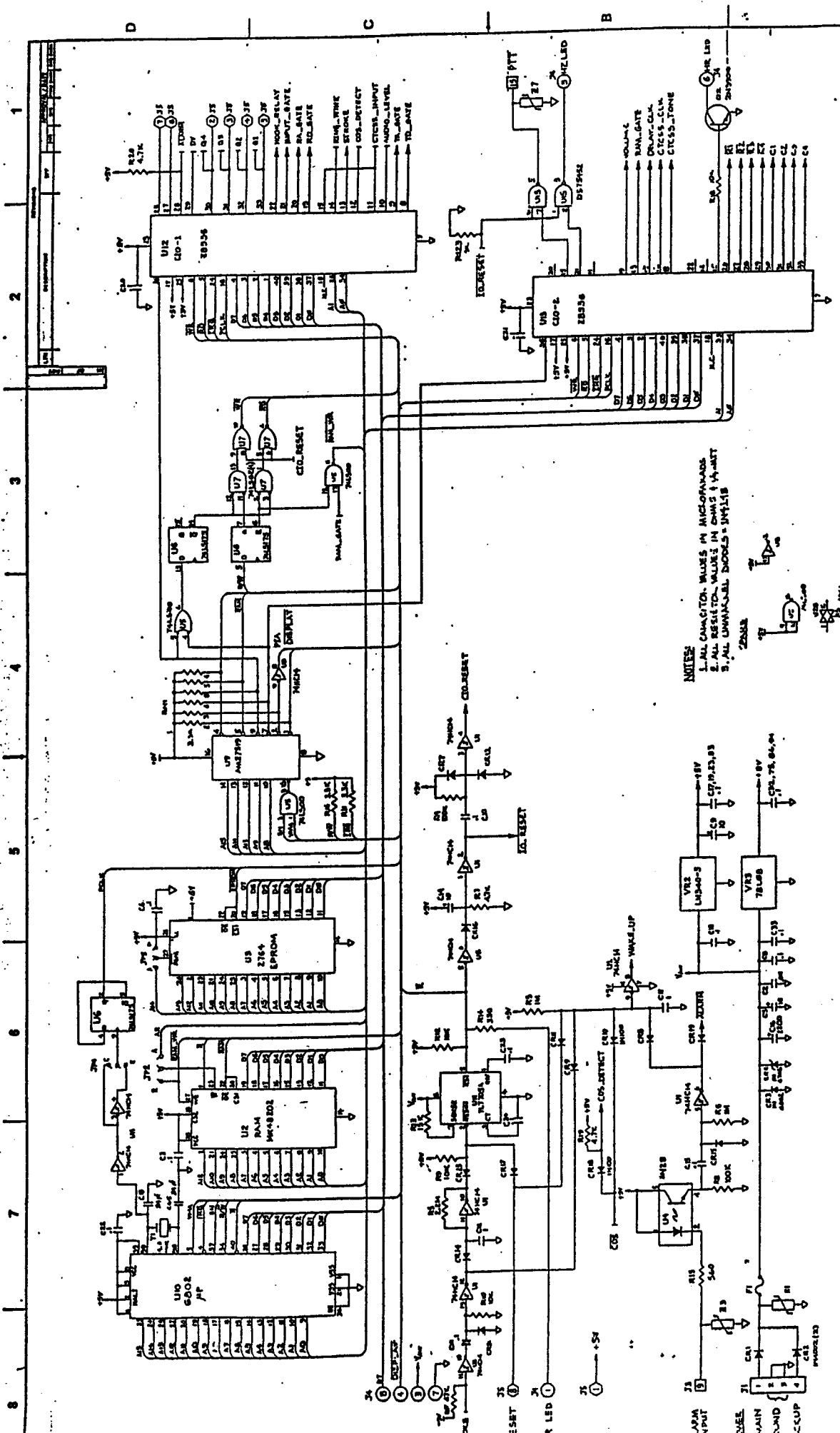
- [T/C] 41 Clear Individual Tone Time and Hit Accumulators
- 42 + 42 Clear All Time and Hit Accumulators
- 43 Clear Total Transmitter Time Accumulator
- 44 Clear Timed Out User

Set Up Commands

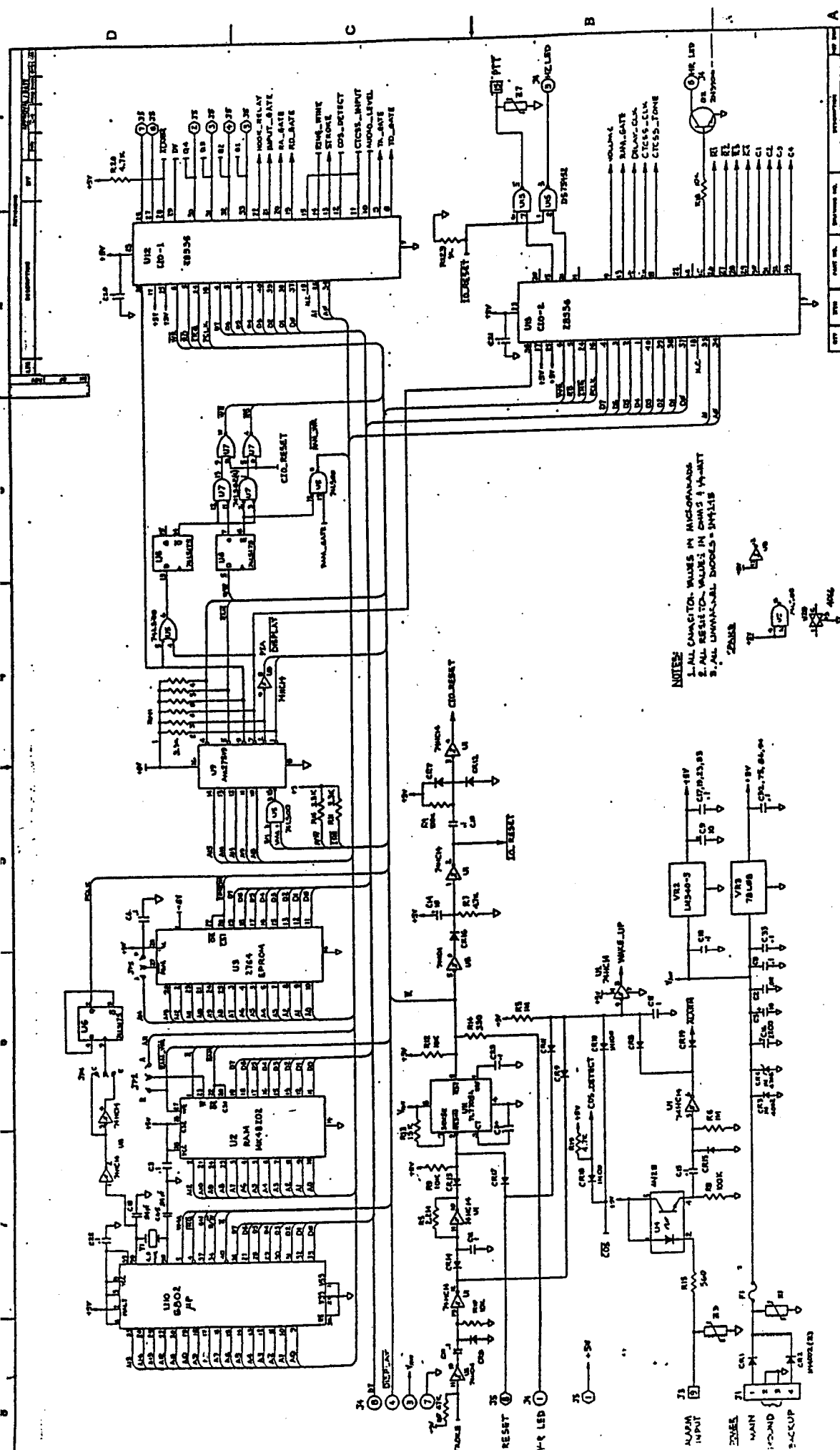
- 45 Access Set Up Commands
 - 01 Transmitter On/Off
 - 03 Audio Gate On/Off
 - [T/C] 07 Generate CTCSS Tone On/Off
 - 08 Generate DTMF Tone (D) On/Off
 - 09 DTMF Keypad Mode On/Off (Optional)
 - 10 Courtesy Tone On/Off
 - 11 Set COS Level
 - 99 Exit to the Program Mode

Programming Commands Continued

- 47 CW-ID Time Interval
- 48 Private Carrier CW-ID set
- [PAT] 41 Set Private Carrier CW-ID Operation
- [PAT] 50 TX Hold Delay
- [PAT] [T/C] 51 Tone Reserve (Soft Off)
- [PAT] [T/C] 52 Tone Reserve Masking Tone
- [SYS] 53 Tone Encode Extension Timer
- 54 Prepaid User Time Block
- 55 Set Audio Delay Time
- 56 Set Courtesy Tone Pitch
- 57 Set Warning Tone Pitch
- 58 Set CW-ID Tone Pitch
- 59 CSI-12/Super Programming Mode
- [PAT] [T/C] 62 Hot Standby Group Assignment
- 63 Hot Standby On/Off
- 64 Display Group Tones
- 91 + 90 Initialize all Variables to Defaults Without Rebuilding the Tone Table
- 91 + 91 Initialize all Variables to Defaults and Rebuild the Tone Table
- [PAT] 92 DTMF Regeneration Mode On/Off
- [T/C] 93 Site Alarm Address
- 94 Site Alarm Tone
- 95 Change Program Access Code
- 96 Store Repeater Frequency
- 97 Display Version Number
- 99 Exit Program Mode
- [T/C] Tone/Code Switch required for Digital Codes.
- [RDU] Original CSI Remote Display Unit Only.
- [SYS] System Level Parameters or Per Tone Parameters.
- [PAT] Programming Acknowledgement Transponder (And On/Off Status Polling)



SUPER 32		DIGITAL POWER CIRCUITS	
REV	DATE	REV	DATE
1	10/10/80	1	10/10/80
2	11/10/80	2	11/10/80
3	12/10/80	3	12/10/80
4	1/11/81	4	1/11/81
5	2/11/81	5	2/11/81
6	3/11/81	6	3/11/81
7	4/11/81	7	4/11/81
8	5/11/81	8	5/11/81
9	6/11/81	9	6/11/81
10	7/11/81	10	7/11/81
11	8/11/81	11	8/11/81
12	9/11/81	12	9/11/81
13	10/11/81	13	10/11/81
14	11/11/81	14	11/11/81
15	12/11/81	15	12/11/81
16	1/12/82	16	1/12/82
17	2/12/82	17	2/12/82
18	3/12/82	18	3/12/82
19	4/12/82	19	4/12/82
20	5/12/82	20	5/12/82
21	6/12/82	21	6/12/82
22	7/12/82	22	7/12/82
23	8/12/82	23	8/12/82
24	9/12/82	24	9/12/82
25	10/12/82	25	10/12/82
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27	12/12/82	27	12/12/82
28	1/1/83	28	1/1/83
29	2/1/83	29	2/1/83
30	3/1/83	30	3/1/83
31	4/1/83	31	4/1/83
32	5/1/83	32	5/1/83
33	6/1/83	33	6/1/83
34	7/1/83	34	7/1/83
35	8/1/83	35	8/1/83
36	9/1/83	36	9/1/83
37	10/1/83	37	10/1/83
38	11/1/83	38	11/1/83
39	12/1/83	39	12/1/83
40	1/2/84	40	1/2/84
41	2/2/84	41	2/2/84
42	3/2/84	42	3/2/84
43	4/2/84	43	4/2/84
44	5/2/84	44	5/2/84
45	6/2/84	45	6/2/84
46	7/2/84	46	7/2/84
47	8/2/84	47	8/2/84
48	9/2/84	48	9/2/84
49	10/2/84	49	10/2/84
50	11/2/84	50	11/2/84
51	12/2/84	51	12/2/84
52	1/3/85	52	1/3/85
53	2/3/85	53	2/3/85
54	3/3/85	54	3/3/85
55	4/3/85	55	4/3/85
56	5/3/85	56	5/3/85
57	6/3/85	57	6/3/85
58	7/3/85	58	7/3/85
59	8/3/85	59	8/3/85
60	9/3/85	60	9/3/85
61	10/3/85	61	10/3/85
62	11/3/85	62	11/3/85
63	12/3/85	63	12/3/85
64	1/4/86	64	1/4/86
65	2/4/86	65	2/4/86
66	3/4/86	66	3/4/86
67	4/4/86	67	4/4/86
68	5/4/86	68	5/4/86
69	6/4/86	69	6/4/86
70	7/4/86	70	7/4/86
71	8/4/86	71	8/4/86
72	9/4/86	72	9/4/86
73	10/4/86	73	10/4/86
74	11/4/86	74	11/4/86
75	12/4/86	75	12/4/86
76	1/5/87	76	1/5/87
77	2/5/87	77	2/5/87
78	3/5/87	78	3/5/87
79	4/5/87	79	4/5/87
80	5/5/87	80	5/5/87
81	6/5/87	81	6/5/87
82	7/5/87	82	7/5/87
83	8/5/87	83	8/5/87
84	9/5/87	84	9/5/87
85	10/5/87	85	10/5/87
86	11/5/87	86	11/5/87
87	12/5/87	87	12/5/87
88	1/6/88	88	1/6/88
89	2/6/88	89	2/6/88
90	3/6/88	90	3/6/88
91	4/6/88	91	4/6/88
92	5/6/88	92	5/6/88
93	6/6/88	93	6/6/88
94	7/6/88	94	7/6/88
95	8/6/88	95	8/6/88
96	9/6/88	96	9/6/88
97	10/6/88	97	10/6/88
98	11/6/88	98	11/6/88
99	12/6/88	99	12/6/88
100	1/7/89	100	1/7/89



NOTES:
 1. ALL CAPACITOR VALUES IN MICROFARADS
 2. ALL RESISTOR VALUES IN OHMS UNLESS NOTED OTHERWISE
 3. ALL UNUSUAL SYMBOLS - INFLIB

SUPER 32	
DIGITAL POWER CIRCUITS	
REV. 1	15.14
REV. 2	93.14
REV. 3	
REV. 4	
REV. 5	