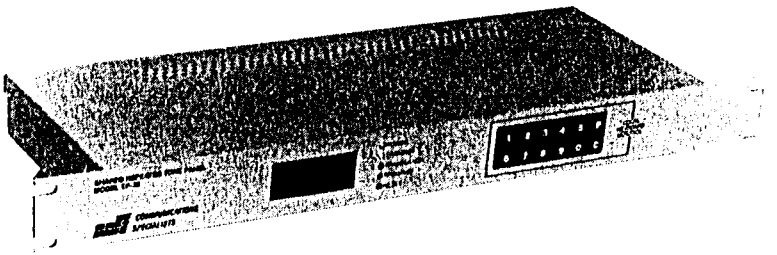
COMMUNICATIONS SPECIALISTS MODEL TP-38 SHARED REPEATER TONE PANEL



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FEATURES

- Complete control interface between repeater transmitter and receiver.
- Microprocessor controlled for excellent frequency accuracy and stability.
- Non-volatile memory retains programming if power loss occurs.
- No tone cards are required, all 38 EIA standard CTCSS tones and up to 38 subscribers are included at one low price.
- Built-in time and hit counters record the activity of all CTCSS tones on the repeater channel.
- Regenerated tone can be the same or different for all 38 tones.
- Static and lightning protected.
- Immune to RF.
- Automatic self-test.
- Ultra low current drain for solar or battery powered repeater sites.
- COS input can be used if desired.
- LED display shows all received sub-audible tones on channel as they occur, even if they are not active in the panel.
- Test procedure to set all repeater levels is built-in.
- Will not false on adjacent tones, even those with REVERSE-BURST.
- Regenerated tone can be programmed to turn off at the beginning or end of the carrier delay.
- Discriminator audio, P.T.T., Repeat audio, Regenerated sub-audible tone, and 12VDC are the only connections required for operation.
- Any tone can be initiated from the repeater to call down to a customer for test purposes.
- LED display can be turned off to conserve power.
- All connections and adjustments are available on the rear panel.
- Wall power supply is supplied for optional 110VAC operation.
- Full 1 year warranty when returned to the factory for repair.
- One day delivery.

$595.00

An optional DTMF Module may be added to allow offsite remote control of the TP-38. All of the 38 tones can be remotely turned on or off or the security code changed by using a standard DTMF encoder hooked to a transmitter on the repeater input channel. If a standard 16 button DTMF pad is used, the security code will not be addressable with a 12 button pad that might be used for telephone interconnect on the channel.

$59.95

SPECIFICATIONS

ENCODER

Frequency accuracy	better than 0.1 Hz.
Frequency stability	crystal controlled
Distortion	1% nominal
Amplitude	adjustable 0-4.2 V, sinewave
Impedance	2.3K ohms AC coupled
Output change	flat or de-emphasized

DECODER

Tone decode threshold	20 Mv. RMS
Bandwidth	1.5% nominal
Pick-up time	less than 120 Ms.
Drop-off time	300 Ms. w/o COS
Coupling	100 K ohms AC coupled

PROGRAMMING

Security code	5 digit field programmable
Mode	by local keyboard or DTMF signalling (with optional DTMF Module)
Carrier delay timer	programmable 0 to 9 seconds in 1 second steps
Time-out timer	programmable 1 to 9 minutes in 1 minute steps
Tone translation	any tone to any tone
Subscriber Time counter	up to 37 hours per tone
Subscriber Hit counter	up to 9999 hits per tone
Accumulated repeater time	100 hours max.
Level adjustments	encode tones, send DTMF (with optional DTMF Module), key tx, enable audio path

GENERAL

Subscriber capacity ..... up to 38 (programmable)

Frequency range ..... 67.0 Hz.-250.3 Hz.

EIA tones (Hz.): (All are included)

67.0	XZ	107.2	1B	167.9	6Z
71.9	XA	110.9	2Z	173.8	6A
74.4	WA	114.8	2A	179.9	6B
77.0	XB	118.8	2B	186.2	7Z
79.7	SP	123.0	3Z	192.8	7A
82.5	YZ	127.3	3A	203.5	M1
85.4	YA	131.8	3B	210.7	M2
88.5	YB	136.5	4Z	218.1	M3
91.5	ZZ	141.3	4A	225.7	M4
94.8	ZA	146.2	4B	233.6	M5
97.4	ZB	151.4	5Z	241.8	M6
100.0	1Z	156.7	5A	250.3	M7
103.5	1A	162.2	5B	OTHER TONES AVAILABLE ON SPECIAL ORDER	

Repeat audio processing ..... flat, or de-emphasized @ −6 db/oct

Repeat audio filtering ..... 6 pole hi-pass filter

Automatic PTT keying ..... dry contact pull to ground or to +V.

Connections and adjustments .. back panel

Temperature range ..... −30 °C. to +70 °C.

Operating Voltage ..... +12.6 VDC ± 20% @ 150 ma. or 120 VAC 50/60 Hz. with supplied wall power supply.

Size and Weight ..... 19″ x 6″ x 1.7″ 4.0 lbs.

Warranty ..... 1 year when returned to factory.

TP-38 Shared Repeater Tone Panel $595.00

DTMF Module $59.95

Specifications are subject to change without notice.

GENERAL DESCRIPTION

The Communications Specialists Model TP-38 is a compact 19" rack mount Shared Repeater Tone Panel for use on shared repeater stations that utilize CTCSS signalling for access and control. It is the complete repeater control interface between the repeater transmitter and receiver. The microprocessor based design uses the latest state of the art non-volatile memory chips for data retention and uses a proprietary digital algorithm for CTCSS tone detection. This eliminates adjacent tone falsing, provides superior tone decoding response time and permits up to 38 subscriber capacity.

The TP-38 processes the repeat audio signal with a 6 pole high pass filter to eliminate the received CTCSS tone and regenerates the same or a different tone (tone translation) on the output channel of the repeater station. The TP-38 provides PTT keying, programmable carrier-delay and time-out timers, and a four digit LED display for CTCSS tone readout.

Since the TP-38 Shared Repeater Tone Panel is field programmable, the technician can program the individual repeater subscribers from the front panel keyboard or by DTMF signalling from any base station if the DTMF Module is installed. A five digit security code insures that only authorized personnel may re-program the unit. The TP-38 has built-in time and hit counters which record the activity of all CTCSS tones on the repeater channel. This data is stored in the non-volatile memory chips and can be recalled for observation at any time by Local Keyboard Control or DTMF signalling using the Communications Specialists Model DI-16 DATA INTERROGATOR. Repeater subscribers may be placed on any EIA CTCSS tone frequency from 67.0 Hz. to 250.3 Hz. Conventional repeater panel tone cards have been eliminated resulting in a very compact and efficient design.

The TP-38 operates from 12.6 VDC obtained from the repeater power supply and its low power consumption is ideal for solar site applications. The supplied wall power supply allows the TP-38 to operate from 120 VAC. All connections are made through the 8 position terminal block on the rear side of the unit. The TP-38 is enclosed in a RF tight metal enclosure and is protected against static and lightning discharges that are common to mountain top sites. All this guarantees unmatched performance and a quality product, with a one year factory warranty, backed by the leader in tone signalling products.

OPERATION

The TP-38 Shared Repeater Tone Panel is easy to use and is very user friendly in the two modes of operation. The primary mode of operation is the REPEAT MODE. The secondary mode of operation is the PROGRAMMING MODE, which is described in the PROGRAMMING SECTION of this manual. The REPEAT MODE allows the TP-38 to operate as a conventional shared repeater station. The TP-38 will decode the 38 different CTCSS tones and if a valid CTCSS tone is decoded, it will display the tone as well as key the repeater transmitter. If the CTCSS tone is not enabled, then the TP-38 will still display the tone frequency, however, it will not key the transmitter. If the tone is enabled, then the TP-38 will pass the repeat audio and re-generate a new CTCSS tone for transmission. The TP-38 provides the carrier-delay timer and the time-out timer. While the TP-38 is monitoring a channel, it will accumulate time and hit data for all 38 CTCSS tones. Since the TP-38 controls all repeater operations, repeater control cards are not required. The TP-38 will always operate in the REPEAT MODE upon power up. Access to the PROGRAMMING MODE can only be accomplished by entering in the Security Code from the front panel keyboard, or by DTMF signalling on the input channel of the repeater if the DTMF Module is installed.

FRONT PANEL CONTROLS AND INDICATORS

The TP-38 uses a 12 button keyboard for local on-site control. The keyboard is used only in the PROGRAMMING MODE. The "#" key is used to instruct the TP-38 to execute a particular parameter. The "*" key is used to reset the TP-38, or to exit out of any programming sequence and revert the TP-38 back to the REPEAT MODE.

The four digit LED display and indicators show the current operating status of the TP-38. In the REPEAT MODE, the four digit display shows the CTCSS tones that are decoded by the TP-38. The five LEDs to the right of the four digit display indicate the following:

POWER LED —	Indicates that power is supplied to the unit.
TRANSMIT LED —	This LED indicates when the TP-38 is keying the repeater transmitter.
TRANSLATION LED —	When this LED illuminates, it indicates that the re-generated CTCSS tone is different from the CTCSS tone that is currently being decoded (tone translation).
PROGRAM LED —	This LED illuminates when the TP-38 is in the PROGRAMMING MODE.
RESET LED —	This LED will turn on if the supply voltage to the TP-38 is below the minimum specification or if the "*" key is pressed.

POWER UP

Upon application of the proper DC voltage to the TP-38, the POWER LED will illuminate. All other LEDs should be off, including the four digit display. The TP-38 is now ready to operate in the REPEAT MODE. Upon power up, the TP-38 goes through an automatic test of various parts of the circuit. If it finds any problems in the system, then an error number will be displayed. Please refer to the end of this section for the error number listing.

When the TP-38 is first received from the factory, the non-volatile memories are initialized to a predetermined state. The table at the beginning of the PROGRAMMING SECTION lists all of the pre-programmed states. The memory contents can be modified to suit the particular requirements of the system by following the instructions in the PROGRAMMING SECTION of this manual.

DATA INTERROGATION

The TP-38 has the capability to transpond data to and from a control station on the repeater channel using DTMF signalling if the DTMF Module is installed. Instructions can be sent to the TP-38, via the input channel of the repeater, in order to recall data which is stored in the non-volatile memory chips. This data comes back to the control station, by DTMF, on the output channel of the repeater station.

In order to receive data from the TP-38, the Communications Specialists Model DI-16 DATA INTERROGATOR can be used. The DI-16 is a microprocessor controlled DTMF encoder and DTMF decoder in a desk top unit. Optionally, any DTMF display decoder could be used in conjunction with a 12 or 16 button DTMF encoder. The DI-16 has a serial printer output which allows the recalled data to be listed out on a printer (Radio Shack Model TP-10, 26-1261).

Data is recalled from the TP-38 by first entering in the 5 digit Security Code from a control station on the repeater channel that is equipped with a DTMF encoder. This changes the operating mode from the REPEAT MODE to the PROGRAMMING MODE as indicated by the PROGRAM LED. Now enter in the proper parameter code from the PROGRAMMING SECTION of this manual for recalling data. Within a few seconds after the last keystroke is entered, the TP-38 will start sending the DTMF data down the repeater output channel. This information will be shown on the LED display of the DTMF display decoder. Please refer to the PROGRAMMING SECTION and the DI-16 instructions for more detailed information on recalling data from the TP-38. Please note that the transponding feature is only activated when the TP-38 is controlled by DTMF signalling, and not by the Local Control Keyboard. To terminate the programming session, and to return to the REPEAT MODE, press the "*" key. The TP-38 will now operate as a conventional shared repeater.

ERROR NUMBERS

The TP-38 will display error numbers on the LED display under two different conditions. First, while in the REPEAT MODE, the TP-38 will display an error number if there is a problem with the TP-38 circuitry. This will normally occur upon power-up or if there is a chip failure in the system.

Second, while in the PROGRAMMING MODE, the TP-38 will display an error number if improper data is entered on the keyboard. If this should occur, look at the list of error numbers to determine what data was entered incorrectly.

ERROR NUMBER	CAUSE
A01	Sumcheck number error in EPROM, U12. Replace.
A02	Defective microprocessor chip, U16. Replace.
A03	Defective non-volatile RAM, U11. Replace.
A04	Defective non-volatile RAM, U10. Replace.
A05	Keyboard or DTMF decoder problem.
A08	Non-volatile chips, U10 and U11, have been re-initialized.
A11	An improper CTCSS tone frequency was keyed in. Check the list of available CTCSS tones to make sure you are entering the proper one.
A12	The parameter number, or data entered, is is not valid or allowed.

INSTALLATION

Installation of the Communications Specialists Model TP-38 Shared Repeater Tone Panel should be done by qualified service personnel. All connections to the TP-38 are made to the 8 position terminal block on the rear panel. All audio lines to and from the TP-38 should use coaxial type shielded wires, such as RG-174 or equivalent, to reduce any RF interference. Shields should be terminated at the TP-38 terminal block. All audio lines should be kept as short as practical for the installation. If the AC wall power supply is used for 120 VAC operation, be sure to connect one of the ground pins on the TP-38 terminal block to the repeater power supply main ground.

If the TP-38 is retrofitted to an existing repeater, remove or disable all repeat audio cards, time-out timers, and any other repeater control cards, since these will no longer be needed.

The first step in the installation procedure is to configure the internal jumpers for your application. Although the TP-38 is protected against static damage, the technician should be grounded to the TP-38 through a 1 Megohm resistor while making any internal modifications. All modifications should be made with the POWER OFF to the TP-38. Please read over the jumper options to see if any internal jumpers require modification.

JUMPER OPTIONS

The TP-38 contains 5 different jumpers on the main circuit board which provide additional flexibility for various installation requirements. The jumpers are installed at the factory for the most common applications. Therefore, altering the jumper options will probably not be necessary for your installation. Please read over the jumper options to verify that they are correctly installed.

JP1 — CTCSS DECODER GAIN

This jumper is installed at the factory to allow the TP-38 to decode CTCSS signals which are in the range of 100 millivolts to 2.0 volts. With JP1 removed, the TP-38 will decode tones in the range of 20 millivolts to 100 millivolts. The proper jumper location can be verified by modulating a carrier with a 123.0 Hz. CTCSS tone on the repeater input channel and checking to see if the TP-38 will decode that tone down to a deviation level of 200 Hz. Do this by modulating the carrier with a normal CTCSS deviation of .75 to 1.0 Khz., then slowly reduce the deviation level until the TP-38 no longer displays the tone. If the TP-38 will not decode a tone down to this 200 hz. deviation level, then remove JP1. JP1 is located near U3.

JP2 — REPEAT AUDIO PROCESSING

The audio signal from the repeater receiver discriminator is normally pre-emphasized. JP2, which is installed at the factory, will de-emphasize the discriminator signal resulting in a flat audio response. This audio is then properly processed to be injected into the repeater transmitter. If for some reason the

JP3 — REGENERATED CTCSS OUTPUT RESPONSE

If the repeater transmitter uses a phase modulator, then JP3 should be installed. JP3 is installed at the factory. If the repeater transmitter uses a direct FM modulator, then remove JP3. This can be tested by programming the TP-38, using the LEVEL ADJUSTMENT procedure at the end of this section, to generate various CTCSS tones. Check to see if there is any output variation as measured on a service monitor tuned to the repeater transmitter channel. If a variation in the deviation of the CTCSS tone of more than 300 Hz. is noted, then remove JP3. JP3 is located near U4.

JP4 — PTT OUTPUT POLARITY

This jumper is normally installed at location JP4A which provides a ground to transmit. If +V is required for PTT, as in the case of some RCA transmitters, then move JP4A to JP4B. JP4 is located near the PTT relay, K1.

JP5 — DTMF MODULE ENABLE

If the DTMF MODULE is ordered, then this jumper will be removed. If the DTMF MODULE is not ordered, this jumper will be installed. If the DTMF MODULE is field installed, then remove JP5 before powering up the TP-38 after it is installed. JP5 is located near U17.

REAR PANEL TERMINAL BLOCK CONNECTIONS

TB1-1	DC POWER INPUT — Power input to the TP-38 should be 12.6 VDC ± 20% regulated or un-regulated obtained from the repeater power supply. If the AC wall power supply is used, connect the wire with the white stripe to TB1-1. Connect the other wire (ground) to TB1-5.
TB1-2	COS INPUT — This pin is used to control the length of the squelch tail that is heard when the mobile stops transmitting. If this pin is left unconnected, then the length of the squelch tail after the mobile stops transmitting will be 250 Ms. To reduce the squelch tail duration, connect this pin to the collector of the squelch switch transistor in the repeater receiver. The collector should be less than .4 volts when no signal is received and at least 2.0 volts when a carrier is present. It is recommended that the COS INPUT be utilized.
TB1-3	TRANSMITTER PTT OUTPUT — This pin will provide PTT keying for the repeater transmitter. A relay contact will pull this pin to ground or to +V to transmit depending on the location of JP4.
TB1-4	RECEIVER DISCRIMINATOR — Connect the repeater receiver discriminator to this pin. Please note that this connection should be made in the receiver before any de-emphasis circuit so that the TP-38 can process unfiltered audio.

TB1-6 TRANSMIT REPEAT AUDIO OUTPUT — This pin can be connected to the microphone input or repeat audio input on the repeater transmitter. If during the modulation adjustment you find that the adjustment of the repeat audio is very sensitive, it may be necessary to install a 100 K resistor in series with this line to increase the output Z of the TP-38.

TB1-8 CTCSS OUTPUT — This pin outputs the regenerated CTCSS tone for transmission and should be wired to the CTCSS tone input on the repeater transmitter. This connection is usually near the modulator circuit and is after any voice processing circuits in the repeater transmitter.

LEVEL ADJUSTMENTS

The LEVEL ADJUSTMENT procedure is used for setting the transmit modulation levels on the TP-38 while interfaced to the repeater station. By proper keyboard input, or by DTMF signalling, if DTMF Module is installed the TP-38 can be instructed to generate any CTCSS tone, a DTMF tone, key the repeater transmitter, and enable the repeat audio path for modulation level setting. The LEVEL ADJUSTMENT procedure is used for setting all repeat levels during installation but can be used for testing and measurement from the radio shop as well. The LEVEL ADJUSTMENT procedure can be used to key the repeater transmitter from a customer's site so that a beam antenna can be properly aligned. The LEVEL ADJUSTMENT procedure can also be used to generate a CTCSS tone for a particular subscriber so that the technician can contact that subscriber from the repeater site.

To begin the LEVEL ADJUSTMENT procedure, apply power to the TP-38 and access the PROGRAMMING MODE by entering in the five digit security code on the front panel keyboard. The security code can be found in the table at the beginning of the PROGRAMMING SECTION. The PROGRAM LED will illuminate and the four digit display will show two dashes (- -).

STEP 1. Set a service monitor to the output channel of the repeater station and instruct the TP-38 to key the repeater transmitter by entering the numbers "31#" on the keyboard. When this is done, the TP-38 will illuminate the TRANSMIT LED on the front panel. To unkey the transmitter at any time, enter the numbers "32#" on the keyboard.

STEP 2. An unmodulated carrier should be observed on the service monitor. To set the level of the transmitted CTCSS tone, enter in the numbers: "34#1035#." This will generate the CTCSS frequency of 103.5 Hz. on the output channel of the repeater. Now adjust the CTCSS OUTPUT adjustment, R19, on the rear panel for .75Khz to 1.0Khz of tone deviation as indicated on the service monitor. Other CTCSS tones can be generated in order to check the output variation of the repeater transmitter. This will also aid in the installation of jumper option JP3. Generate the tone 203.5 Hz. by entering in the following numbers: "34#2035#." The deviation level of 203.5 Hz. should be approximately the same as 103.5 Hz.

STEP 3. Generate a signal modulated with a test tone on the input channel of the repeater and enable the TP-38 repeat audio path by entering in the following numbers: "35#." The repeat audio path is now enabled and the REPEAT AUDIO adjustment, R18, on the rear panel can be adjusted for the proper voice level deviation on the repeater transmitter.

STEP 4. If the TP-38 is equipped with the DTMF MODULE, then proceed to Step 5. Otherwise proceed to Step 6.

STEP 5. Enter in the numbers "36#" to set the level of the DTMF signalling tone that is used for transponding data to the radio shop. This level is set by the DTMF OUTPUT adjustment, R2, on the rear panel of the TP-38. Set this deviation level to 3 Khz.

STEP 6. Unkey the repeater transmitter by entering the code "32#."

This completes the installation and level setting adjustments for the TP-38. If you have completed the programming session, press the "*" key to return the TP-38 to the REPEAT MODE.

LEVEL ADJUSTMENT SUMMARY CHART

31#	Keys repeater transmitter.
32#	Unkeys repeater transmitter.
34#1035#	Generates 103.5 Hz. on the CTCSS OUTPUT pin that is connected to the transmitter.
35#	Enables the transmit repeat audio path.
36#	Generates a DTMF tone.
* KEY	Exits the LEVEL ADJUSTMENT procedure and returns to the REPEAT MODE.

PROGRAMMING

The Communications Specialists Model TP-38 Shared Repeater Tone Panel is a very user friendly device. It is a new concept in repeater tone panels which provides superior features and performance. We encourage you to spend some time getting familiar with the TP-38 by connecting DC power to the unit on the test bench and running the TP-38 through its paces.

Programming the TP-38 is accomplished by using the Local Control Keyboard on the front panel of the unit. If the DTMF Module is installed, a control station on the repeater channel equipped with a 12 or 16 bottom DTMF encoder or the Communications Specialists Model DI-16 DATA INTERROGATOR may be used. A standard DTMF encoder will allow the radio shop to control all programmable features in the TP-38, however, in order to recall data from the TP-38, the DI-16 DATA INTERROGATOR or a DTMF display decoder must be used. By using the DI-16, data can be recalled from the TP-38 regarding time and hit counter data and the enabled CTCSS subscribers on the repeater. This data is very useful for locating new CTCSS tones for new repeater subscribers, since the TP-38 records all the activity on the channel. This data can also be used for subscriber time billing.

The TP-38 operates in two different modes. These two modes are called the REPEAT MODE and the PROGRAMMING MODE. This section describes the PROGRAMMING MODE and how to program the different parameters available. The different parameters are summarized in the following table. Please note the current default values that are pre-programmed in the TP-38 when you first receive the unit from the factory.

PARAMETER	FUNCTION	DEFAULT
01	Enable CTCSS subscribers	all disabled
02	Disable CTCSS subscribers	
03	Programming the TX carrier-delay timer	2.0 seconds
04	Programming the TX time-out timer	3.0 minutes
05	Tone translations	none
06	Recalling time and hit counter data	
07	High speed time and hit counter recall	
09	Altering the program security code	set to 12840
12	Recalling the repeater time counter	
13	Display off (low power)	
14	Display on	display on
16	Recall enabled CTCSS subscriber tones	
17	Reset and clear time and hit counters	
18	TX CTCSS delay on (Busy Channel Lockout)	
19	TX CTCSS delay off	delay off
20	High Sensitivity on	high sens. off
21	High Sensitivity off	
31	Key repeater transmitter	
32	Unkey repeater transmitter	
34	Generate a CTCSS tone	
35	Enable transmit repeat audio path	
36	Generate a DTMF tone	
37	Send and generate different DTMF tones	

SECURITY CODE = 12840

All of these parameters will be described in detail in the pages to follow. Since all of the CTCSS tones are disabled when you first receive your TP-38, the TP-38 will not key the PTT line of the repeater transmitter until the CTCSS tones are enabled. However, the TP-38 will still display any tone received, as well as record any time usage data for the 38 CTCSS tones.

PARAMETER PROGRAMMING

The first step in programming the TP-38 is to enter in the Security Code on the front panel keyboard or use DTMF signalling on the repeater input channel if the DTMF Module is installed. As soon as the proper code is received, the TP-38 will display two dashes (- -) on the front panel and the PROGRAM LED will illuminate. The TP-38 is now in the PROGRAMMING MODE. Signals received by the repeater receiver will not be repeated in this mode of operation. To revert the TP-38 back to the REPEAT MODE, press the "*" key. The TP-38 will now operate as a conventional repeater. If the TP-38 is left in the PRO-

Now use the following instructions to program the different parameters that are available. Always terminate the parameter number with the "#" key. This tells the TP-38 to execute the parameter number shown on the display. If the parameter requires data to be entered after the parameter number is keyed in, then terminate the data with the "#" key as well. If improper data is entered on the keyboard, the TP-38 will display an error number. Refer to the end of the OPERATION SECTION of this manual for the meaning of the different error numbers. When you have completed the programming session, press the "*" key to revert the TP-38 back into the REPEAT MODE. As soon as the "*" key is pressed, all of the new programming data will be transferred into the EEPROM.

PARAMETER — 01# ENABLE CTCSS SUBSCRIBER TONES

This parameter number "01#," will enable the different CTCSS tones for the repeater subscribers. For example, a new subscriber, using 203.5 Hz., is placed on the repeater channel. This subscriber can use the repeater by having the CTCSS tone 203.5 Hz. enabled. This is done by entering in the parameter number "01#," followed by the tone frequency that is to be enabled. Terminate the tone frequency with the "#" key.

EXAMPLE: 01# 2035#

The repeater subscriber on 203.5 Hz. can now use the repeater.

PARAMETER — 02# DISABLE CTCSS SUBSCRIBER TONES

This parameter number "02#," will inhibit repeater subscribers from using the repeater station. To deny a particular subscriber from using the repeater, enter in the parameter number "02#," followed by the tone frequency that is to be disabled. Terminate the tone frequency with the "#" key.

EXAMPLE: 02# 2035#

The subscriber using 203.5 Hz. is now disabled. Even though this tone will not activate the repeater, the tone will still be displayed if it is decoded. Also, the time and hit counters will still record any activity of that tone.

PARAMETER — 03# TRANSMIT CARRIER-DELAY TIMER

This parameter programs the carrier-delay timer in one second steps, ranging from 0 seconds to 9 seconds. This delay is the amount of time that the repeater transmitter will stay on the air after the input carrier disappears. Program the carrier-delay timer by entering the parameter number "03#," followed by the time, in seconds, for the carrier delay. Terminate the time with the "#" key.

EXAMPLE: 03# 3#

The transmit carrier-delay timer is now set to 3 seconds.

PARAMETER — 04# TRANSMITTER TIME-OUT TIMER

This parameter programs the maximum time that the repeater transmitter will

EXAMPLE: 04# 2#

The transmit time-out timer is now set to 2 minutes.

PARAMETER — 05# TONE TRANSLATION

This parameter tells the TP-38 to re-generate a different CTCSS tone than the one currently being received on the input channel of the repeater. Tone translation is programmed by first entering in the parameter number "05#," followed by the decoded tone received by the repeater receiver, followed by the new tone to re-generate on the repeater transmitter. Follow each tone frequency by the "#" key. Notice that the TRANSLATION LED on the front panel of the TP-38 will illuminate if a tone translation is programmed for any particular CTCSS tone frequency.

EXAMPLE: 05# 1148# 670#

This instruction will tell the TP-38 to regenerate the frequency 67.0 Hz. when the tone frequency of 114.8 Hz. is decoded. To cancel a tone translation, enter in the same tone frequency for both tones.

EXAMPLE: 05# 1148# 1148#

PARAMETER — 06# RECALLING TIME AND HIT DATA

This parameter will recall the time and hit counter data for any of the 38 CTCSS tones that are in memory. The non-volatile memory chips record the data and display it on the 4 digit display. To recall time and hit data, enter in the parameter number "06#," followed by the CTCSS tone frequency that you want to observe.

EXAMPLE: 06# 2035#

The TP-38 will now display the total accumulated time for 203.5 Hz., in hours and minutes, then the total accumulated number of hits for that tone. Please note that the decimal point separates the hours from the minutes.

EXAMPLE: display reads 03.45 ---- 4051

This example shows that 3 hours and 45 minutes as well as 4051 hits have accumulated for the tone 203.5 Hz. If this parameter is entered by DTMF signalling and the DTMF Module is installed, then the TP-38 will display and send the data for the time and hit counters down the repeater output channel, using DTMF signalling. This data can then be displayed on the DI-16 DATA INTERROGATOR or a DTMF display decoder. If a printer is connected to the DI-16, this information will be available in printed form also.

PARAMETER — 07# HIGH SPEED TIME AND HIT RECALL

This parameter is used for high speed recall of time and hit accumulation counter data for all 38 CTCSS tones. The DTMF Module must be installed so this data can be sent to the DI-16 DATA INTERROGATOR for printing out all counter data on a Radio Shack TP-10 printer (26-1261). Recall time is approximately 40 seconds. The recall can be terminated by pressing the "#" key. This

PARAMETER — 09# ALTERING THE PROGRAM SECURITY CODE

This parameter allows the radio shop to alter or change the Security Code required for entry into the PROGRAMMING MODE. This code is most commonly changed when more than one TP-38 shares the same RF channel. The code can be changed by entering the parameter number "09#" followed by the new 5 digit Security Code number. Be sure to write down the new Security Code if you do decide to change it. All 16 buttons can be utilized in the Security Code except the "*" key and the "#" key. Please note that if digits other than 0 through 9 are used for the Security Code, the PROGRAMMING MODE cannot be accessed by Local Keyboard Control. This is because the Local Keyboard Control only has numbers 0 through 9.

EXAMPLE: 09# 12345#

The new security code is now 12345.

NEW PROGRAM SECURITY CODE _____

PARAMETER — 12# RECALLING THE REPEATER TIME COUNTER

This parameter will display the total accumulated time for the repeater transmitter. Please note that the time accumulated for the individual CTCSS tones will not add up to the same number as the time for the repeater transmitter, since the individual time counters do not include the carrier delay time duration. This data is useful for doing loading studies on different repeaters and calculating their duty cycles. This data can be recalled by entering in the parameter number "12#" and observing the four digit LED display for the results.

EXAMPLE: display reads 75.59

This means that the repeater transmitter has been on the air in the transmit mode for 75 hours and 59 minutes. If the DTMF Module is installed and this data is recalled using DTMF signalling, then the TP-38 will transpond the data down the output channel of the repeater using DTMF signalling and it will be displayed on the DI-16 DATA INTERROGATOR.

PARAMETER — 13# — 14# DISPLAY DISABLE/ENABLE

These parameter numbers will disable or enable the LED display in the REPEAT MODE. The display can be disabled to reduce the power consumption of the TP-38 when the repeater site is unattended. Enter in the parameter "13#" to disable the LED display, and "14#" to re-activate the display. Please note that the TRANSMIT LED is not affected by this parameter and the LED display will always be operational in the PROGRAMMING MODE.

PARAMETER — 16# DISPLAY ENABLED CTCSS SUBSCRIBERS

This parameter will display all of the CTCSS subscriber tones that will activate the TP-38. To display the tones that are enabled, enter in the parameter code "16#" and the TP-38 will display all enabled tones. If this is done by DTMF

PARAMETER — 18# — 19# TRANSMIT CTCSS DELAY ON/OFF

This parameter programs the TP-38 to stop sending the regenerated CTCSS tone when the input tone disappears (transmit CTCSS delay off), or to continue to send the regenerated tone until the transmit carrier delay times out (transmit CTCSS delay on). To turn on the transmit CTCSS delay, use the parameter number "18#," and the parameter number "19#," to turn off the transmit CTCSS delay. "Busy Channel Lockout" is also ENABLED with the transmit CTCSS delay on ("18#"). A second mobile on the channel with a different CTCSS tone can not access the repeater until the first mobile using the channel is done talking.

EXAMPLE: 18#

The transmit CTCSS delay is on, and the regenerated tone will continue to be sent until the repeater carrier delay time is up.

PARAMETER — 20# — 21# HIGH SENSITIVITY ON/OFF

This parameter increases the tone sensitivity of the TP-38 for very weak signals. For most applications, it will not be necessary to use this parameter. This parameter should NOT be activated if the COS INPUT is not used but may be used if the COS INPUT is connected.

PARAMETER — 31# KEY REPEATER TRANSMITTER

This parameter will key the repeater transmitter.

PARAMETER — 32# UNKEY REPEATER TRANSMITTER

This parameter will unkey the repeater transmitter.

PARAMETER — 34# GENERATE A CTCSS TONE

The parameter "34#" followed by the desired tone frequency will command the TP-38 to send that CTCSS tone. This feature can be used to check the CTCSS tone level for flatness across the audio band.

EXAMPLE: 34#1035#

The CTCSS frequency of 103.5 Hz will now be modulating the repeater transmitter.

PARAMETER — 35# ENABLE REPEAT AUDIO PATH

This parameter will enable the repeat audio path.

PARAMETER — 36# GENERATE A DTMF TONE

This parameter will generate a DTMF tone on the repeater transmitter if the DTMF Module is installed.

PARAMETER — 37# SEND DTMF TONES

This parameter will allow the transmission of different DTMF tones on the REPEAT AUDIO output of the TP-38. Activate this parameter by entering the

TROUBLESHOOTING

This section of the TP-38 instruction manual describes some of the possible difficulties that may be encountered during the installation and operation of the TP-38. If you do encounter difficulty during installation or operation, start by looking down the following list of headings to see if one of them refers to the problem that you are experiencing. If this manual does not cover your problem, please contact the service department for additional assistance.

RESET LED STAYS ILLUMINATED

This problem is caused by the DC voltage input to the TP-38 being below the minimum specification. A new voltage source must be obtained which is within the range of proper operation.

LEVEL ADJUSTMENTS ARE DIFFICULT

The CTCSS OUTPUT and the REPEAT AUDIO adjustments can be very sensitive to minor changes in level if the impedance of the circuits being interfaced do not match. The output of the TP-38 is about 2.2 K ohms, which is considered a low impedance. Some transmitters have high impedance inputs which require the addition of a resistor in series with the output of the TP-38. A typical value to use would be 100 K ohms. This will reduce the drive to the transmitter and allow a more linear adjustment.

If for some reason the TP-38 does not have enough output drive for a particular application, then the resistor in series with the output of the CTCSS OUTPUT or the REPEAT AUDIO output on the TP-38 circuit board can be bypassed to increase the output level.

DTMF PROGRAMMING

The TP-38 uses a monolithic decoder for receiving DTMF signalling. This chip is designed to be used on RF channels and therefore has good sensitivity to noise and twist. However, care must be observed when sending DTMF signals to the TP-38. If the DTMF decoding seems unreliable, try changing the deviation level of the DTMF tones either up or down. The TP-38 should also be receiving a signal which is as full quieting as possible.

THE TP-38 WILL NOT OPERATE IN THE PROGRAMMING MODE

If it is not possible to enter the PROGRAMMING MODE from the Local Control Keyboard, it is very likely that you have changed the Security Code that is required for entry. If this has happened and you have forgotten the proper code, then it will be necessary to open the TP-38. Remove and switch the positions of U10 and U11 on the main circuit board. This will revert the TP-38 back to the original configuration upon receipt of the unit from the factory.

If access to the PROGRAMMING MODE is possible from the Local Control Keyboard, but is not possible from DTMF signalling, then it is most likely that

SUBSCRIBER TALK OFF

Subscriber talk off, or the chopping of voice peaks, can occur under a number of circumstances. First, the tone deviation of all mobiles, portables and base stations should be set between .75 Khz. and 1.0 Khz. Second, be sure that the TP-38 is connected directly to the discriminator of the repeater receiver. Third, connect up the COS INPUT on the TP-38 and activate the TONE SENSITIVITY parameter ("20#") as described at the end of the PROGRAMMING SECTION. These three items should eliminate any talk off that might occur.

CIRCUIT DESCRIPTION

This section describes the functions of the major circuit elements of the Communications Specialists Model TP-38 Shared Repeater Tone Panel. The elements that are described include the microprocessor system, analog circuitry, power supply, keyboard and display board, and the DTMF Module. Refer to the block and schematic diagrams for further information.

MICROPROCESSOR SYSTEM

The TP-38 uses the 6303 microprocessor chip, U16, for system control. The 6303 is configured to operate in the multiplexed bus configuration, where the data bus and the address bus share the same lines. Instructions are fetched from the memory chip, U12, and are then transferred to U16 by way of the multiplexed bus for execution. The main system clock, derived from the 4.00 Mhz. crystal, operates at 1.00 Mhz. and controls all system timing functions. This includes the internal delay loops and the encoding and decoding of all the CTCSS tones. High accuracy and stability are attained by using a quartz reference.

Address decoding is achieved by the device decoder chip, U14. The microprocessor sends the appropriate address to the device decoder and it in turn activates the proper chip enable line through one of it's outputs. This eliminates bus contention and assures that only one device is activated on the system bus at a time.

U10 and U11 provide the non-volatile memory for the TP-38 in the event of a power loss. Thus, during a power down condition, the TP-38 will retain all programming data. This includes the recorded data for the time and hit counters for each CTCSS tone, tone translations, programming values for the time-out and carrier-delay timers, the enabled and disabled CTCSS tones on the repeater, and any other parameters that are keyboard programmable. This is accomplished by the use of electrically erasable programmable read only memories (EEPROMs). These state of the art devices eliminate the need for any battery back-up.

CTCSS tone generation is derived from the VIA chip, U17. This chip has its own on-board tone generator and is instructed by the microprocessor as to which CTCSS tone to generate at any given time. The output of U17 is a square wave which is filtered through a switched capacitor filter U1, which eliminates all harmonics above the fundamental frequency. The result is a very clean and low distortion sinewave output. This sinewave is buffered and amplified by U4 and the adjustable output is accessible at TB1-8.

CTCSS tone decoding is processed through the programmable timer chip, U13. The received data is handled by the microprocessor by using a proprietary digital decoding algorithm to determine what tone is currently being received. If the microprocessor determines that a valid CTCSS tone is received, then the tone frequency will be displayed on the front panel of the TP-38.

ANALOG CIRCUITRY

The CTCSS tone recovered from the repeater receiver is fed into the TP-38 on TB1-4. This signal is buffered and fed into a switched capacitor filter, U2, which attenuates all frequencies above 260 Hz. The resultant signal is amplified and converted into a digital waveform by the op-amp, U4, and Q4. This signal is then fed into U9 and into the microprocessor system for evaluation.

The buffered discriminator signal for the repeat audio is tapped off U2 pin 10 and is fed into a 6 pole hi-pass filter to eliminate the received CTCSS tone. This repeat audio signal is de-emphasized by U3 and amplified to be fed directly into the repeater transmitter. The de-emphasis on the repeat audio signal can be removed by JP2, which rolls off the higher frequencies at 6 db/octave. Q1 provides for audio switching of the repeat audio signal. The adjustable repeat audio output is located at TB1-6.

POWER SUPPLY

DC voltage is supplied by the repeater power supply to operate the TP-38. This voltage is filtered and regulated by VR-1, VR-2, and U5 to provide the proper operating voltages for all the integrated circuits. The voltages required for proper operation are 8.0V for the op-amps, 5.0V for the logic circuits, and −5.0V for the switched capacitor filter chips.

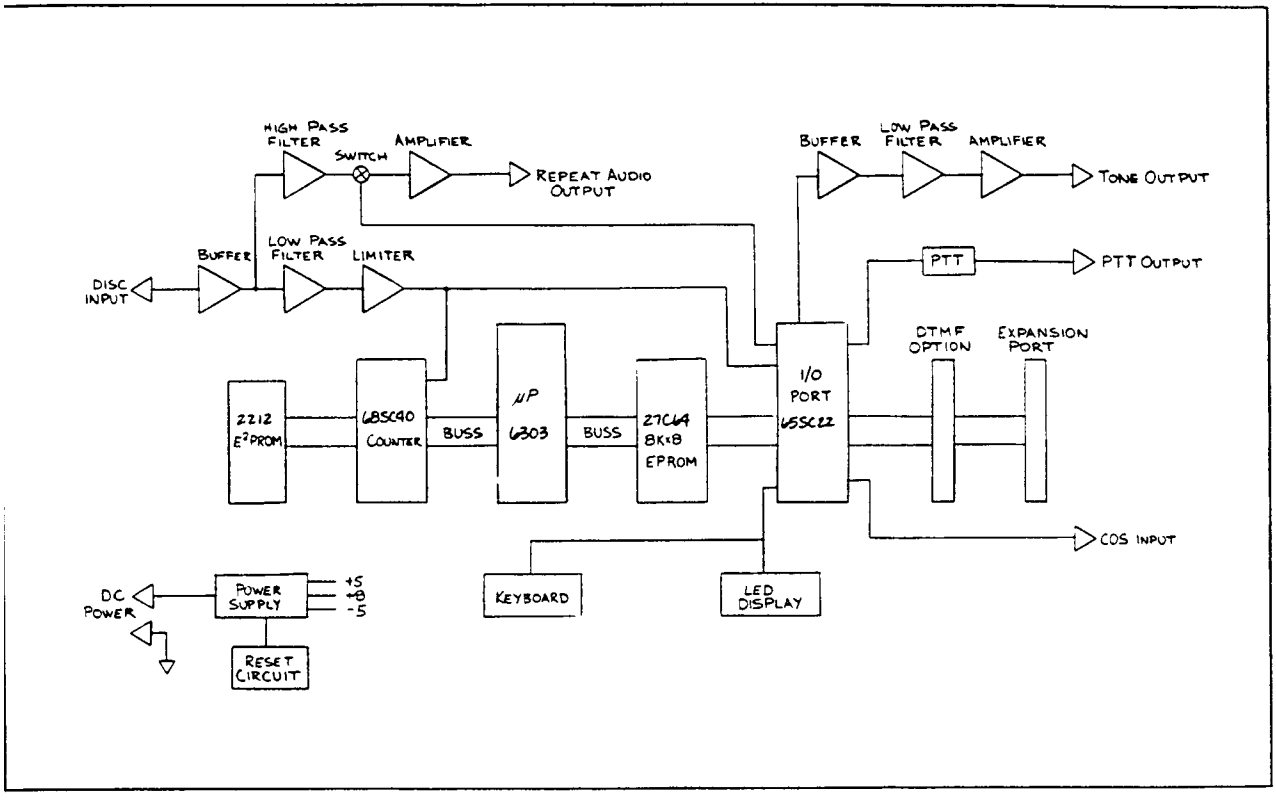
If the input voltage drops below the specified minimum operating level, a power fail condition will be detected by Q2. When this happens, Q2 will switch off, the RESET LED will illuminate, and the microprocessor will be reset. The system will then wait for the input voltage to reach the normal operating level. The watch-dog timer, U7, periodically resets the microprocessor system to a known operating point. This is a fail-safe feature which guards against improper operation of the TP-38. The rest of the reset circuitry, which includes sections of U6 and U8, provides a very short window for the microprocessor to send the STORE signal to the EEPROMs, thus periodically updating the non-volatile data.

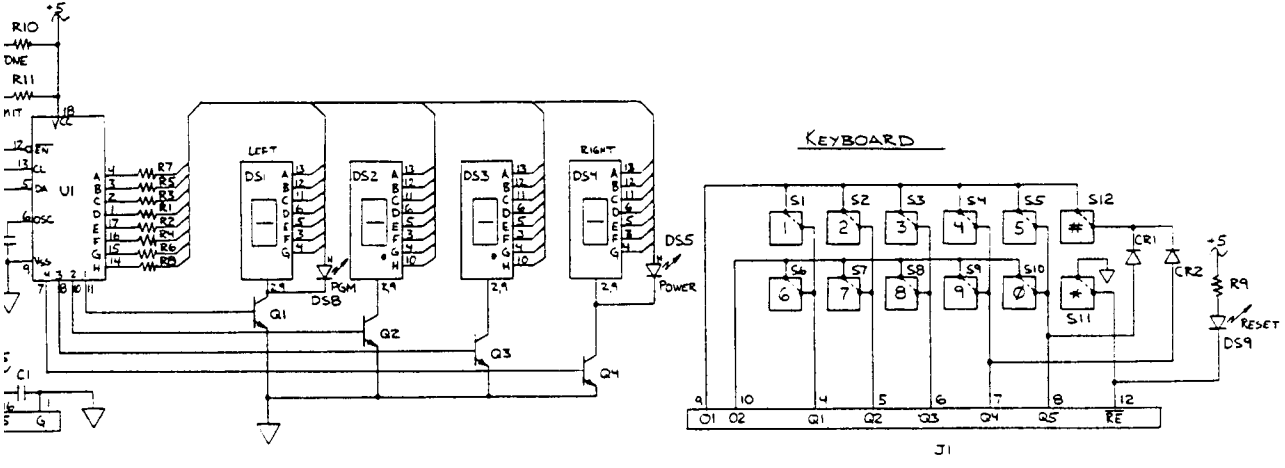
KEYBOARD AND DISPLAY

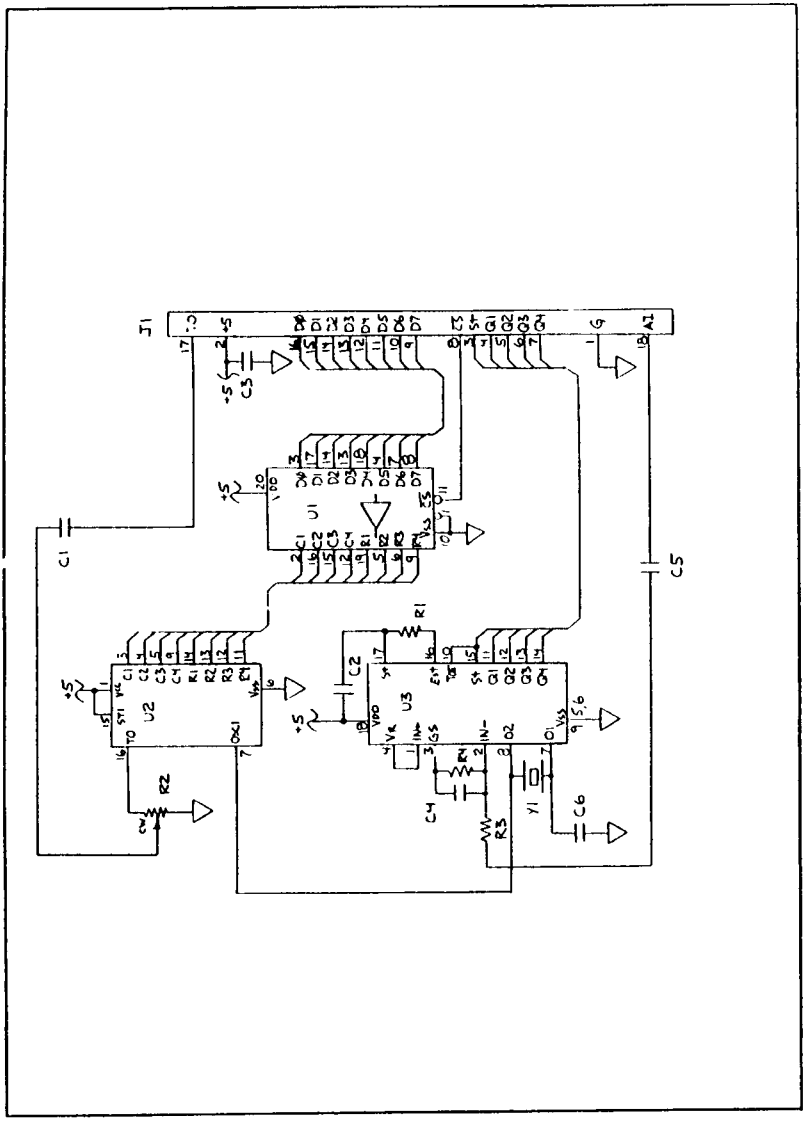
The keyboard and display are controlled directly by the microprocessor and the VIA chip. When the microprocessor has data ready to be displayed, it is sent in a serial format to the display driver chip, U1, on the keyboard/display circuit board. The microprocessor routinely checks the keyboard switches to detect any key closure. If a key closure is determined to be valid, then the data received is placed in RAM for later manipulation. The keyboard is wired in a X-Y matrix which is common to microprocessor based designs.

DTMF MODULE

The DTMF Module is for encoding and decoding DTMF signals for the purpose of remote programming and data transponding. The DTMF encoder chip, U1, is a 16 number DTMF generator. The DTMF generator is interfaced to the microprocessor bus by the transparent latch, U1. The crystal reference is provided by Y1, a 3.579 Mhz. color burst crystal. Y1 is connected to U3, which is

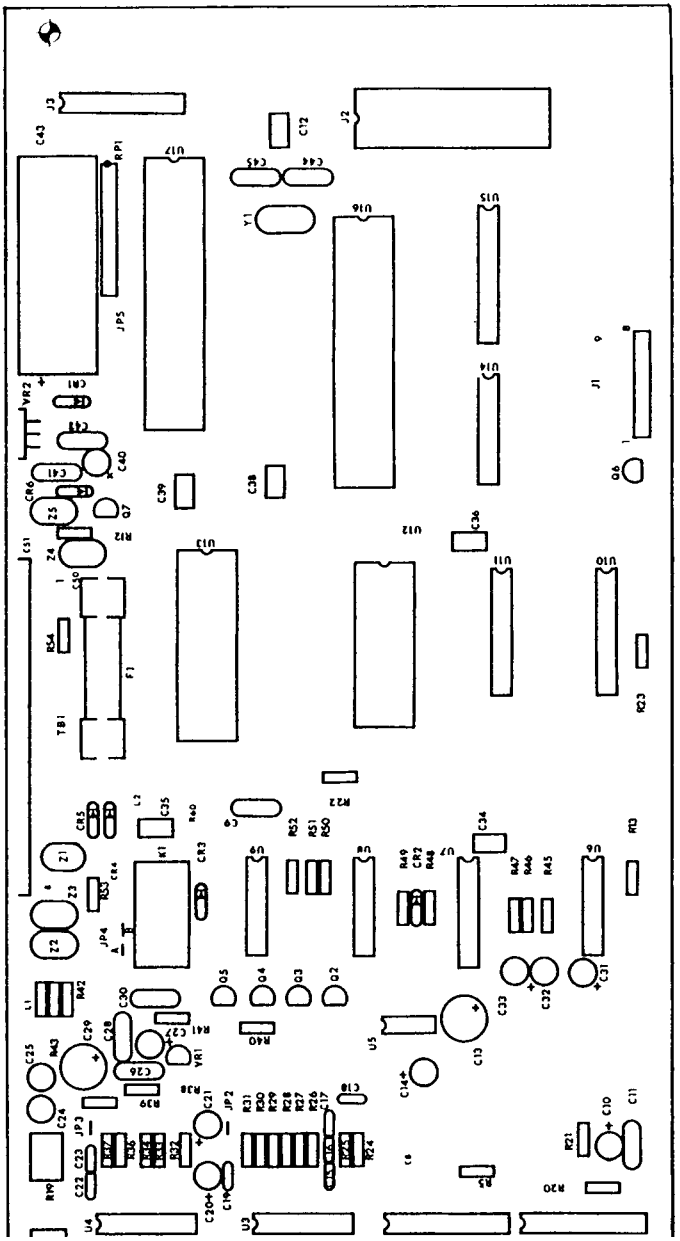

HIGH PASS FILTER
SWITCH
AMPLIFIER
REPEAT AUDIO OUTPUT
BUFFER
LOW PASS FILTER
AMPLIFIER
TONE OUTPUT
BUFFER
LOW PASS FILTER
LIMITER
DISC INPUT
PTT
PTT OUTPUT
DTMF OPTION
EXPANSION PORT
2212 E²PROM
68SC90 COUNTER
BUSS
µP 6303
BUSS
27C64 8K×8 EPROM
I/O PORT 65SC22
COS INPUT
DC POWER
POWER SUPPLY
+5
+8
-5
KEYBOARD
LED DISPLAY
RESET CIRCUIT


KEYBOARD
LEFT
RIGHT
DS1
DS2
DS3
DS4
DS5
DS8
DS9
PGM
POWER
RESET
U1
R10
R11
R1
R2
R3
R4
R5
R6
R7
R8
R9
C1
Q1
Q2
Q3
Q4
CR1
CR2
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
J1



DTMF MODULE SCHEMATIC DIAGRAM

BOARD LAYOUT



PARTS LIST

COMPONENTS PARTS LIST FOR SHARED REPEATER TONE PANEL MODEL TP-38 PART NUMBER 84-3800-2 REVISED 4-16-85

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
U16	51-6303	8 BIT MICROPROCESSOR	HIT	HD6303RP	1	14.71 ea.
U17	51-6522C	PROG. INTERFACE PORT	GTE	G65SC22P	1	10.15 ea.
U13	51-6840	PROG. TIMER	MITEL	MD68SC40AE	1	16.95 ea.
U12	51-2764A	8K x 8 EPROM	FUJITSU	MBM27C64-30	1	25.00 ea.
U10,U11	51-2212	256 x 4 EEPROM	ZICOR	X2212AP	2	15.45 ea.
U15	51-4373C	TRANSPARENT LATCH	MOT	MC74HCT373N	1	1.80 ea.
U14	51-4138	DEVICE DECODER	GTE	G74LS138N	1	1.10 ea.
U9	51-7474	DUAL FLIP FLOP	MOT	MC74HC74N	1	.63 ea.
U8	51-7403	QUAD NAND GATE OD	MOT	MC74HC03N	1	.45 ea.
U6	51-4584	HEX SCHMITT TRIGGER	MOT	MC14584BCP	1	.68 ea.
U7	51-40 0	14 STAGE COUNTER	NAT	CD4060BC	1	4.38 ea.
U1,U2	51-3528	LOW PASS FILTER	AMI	S3528P	2	13.50 ea.
U3,U4	51-4444	FET QUAD OP-AMP	NAT	LF444CN	2	3.75 ea.
U5	48-7660	VOLTAGE CONVERTER	INTERSIL	ICL7660CPA	1	5.13 ea.
VR1	48-3636	8.0 V REGULATOR TO-92	MOT	MC78L08CP	1	.75 ea.
VR2	48-4011	5.0 V 5% REGULATOR TO-220	MOT	MC7805CT	1	2.19 ea.
Q1	48-0201	N CHANNEL FET TO-92	MOT	J201	1	.48 ea.
Q2-Q7	48-4401	TO-92 NPN TRANSISTOR	MOT	2N4401	6	.21 ea.
CR2-CR4	48-4002	SILICON DIODE	MOT	1N4002	3	.09 ea.
CR1	48-4735	6.2 V 1 WT. 5% ZENER	MOT	1N4735A	1	.15 ea.
CR5	48-5237	8.2 V 1/2 WT. 5% ZENER	MOT	1N5237B	1	.12 ea.
CR6	48-4746	18 V 1 WT. 10% ZENER	MOT	1N4746	1	.15 ea.
Z1-Z5	06-3310	TRANSIENT PROTECTOR 7 MM	GE	V33ZA1	5	1.50 ea.
K1	80-1003	DPDT 2 A 12 V RELAY	ITT	RZ-12C	1	5.10 ea.
Y1	48-4000	4.00 MHZ. CRYSTAL	FOX	FOX040	1	2.01 ea.
F1	65-1006	1/2 A. SLOW BLOW FUSE	BEL FUSE	3SB500	1	.87 ea.
	65-1004	PCB FUSE HOLDER	BEL FUSE	FC-101	2	.10 ea.
T1	25-1011	12V .5A DC WALL POWER SUPPLY	SHOGYO		1	7.95 ea.
C51	19-1051	1 UF TANT. CAP 10% 35V			1	.21 ea.
C1	19-4750	4.7 UF-16V TANT.			1	.87 ea.

PARTS LIST (Continued)

COMPONENTS PARTS LIST FOR SHARED REPEATER TONE PANEL MODEL TP-38 PART NUMBER 84-3800-2 REVISED 4-16-85

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
C3,C25	23-1013	10 UF NP RADIAL ELECT. 25V	PACCOM	EVN10M25AA	2	.13 ea.
C20	23-1051	1 UF RADIAL ELECT. 50V			1	.33 ea.
C10,C14, C27,C31, C32,C40 C21	23-1001	10 UF RADIAL ELECT. 25V	PAN	ECEA1EV100S	9	.15 ea.
C8,C12, C34,C35, C36,C38 C39	21-2240	.22 UF MONO CAP Z5U	CENTRALAB	CZ20C224M	7	.23 ea.
C23	21-3330	.033 UF MONO CAP X7R	CENTRALAB	CW15C333K	1	.57 ea.
C19,C22	21-1030	.01 UF MONO CAP X7R	CENTRALAB	CW15C103K	2	.14 ea.
C2,C4,C5, C15,C16 C17,C37	21-1520	1500 PF MONO CAP X7R	CENTRALAB	CW15C152K	7	.15 ea.
C6,C18, C7	21-2710	270 PF MONO CAP X7R	CENTRALAB	CW15C271K	3	.15 ea.
C11,C26, C28,C41, C42	24-1030	.01 UF CERAMIC DISC	CENTRALAB	CK-103	5	.12 ea.
C30,C46	24-1020	1000 PF CERAMIC DISC	CENTRALAB	DD-102G	2	.14 ea.
C9,C44, C45	24-2400	24 PF CERAMIC DISC	CENTRALAB	DD-240	3	.20 ea.
C50	24-5020	.005 UF CERAMIC DISC			1	.14 ea.
R41,R48	06-6804	68 OHM 1/4 WT CAR. FILM 5%			2	.10 ea.
R42,R43	06-2224	2.2 K 1/4 WT CAR. FILM 5%			2	.10 ea.
R13,R23, R34,R40, R50,R51, R52,R53, R60	06-4724	4.7 K 1/4 WT CAR. FILM 5%			8	.10 ea.
R38	06-8224	8.2 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R39	06-9124	9.1 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R17,R35, R62	06-1034	10 K 1/4 WT CAR. FILM 5%			2	.10 ea.
R12,R32, R20,R29, R45,R49, R54	06-1534	15 K 1/4 WT CAR. FILM 5%			7	.10 ea.

PARTS LIST (Continued)

COMPONENTS PARTS LIST FOR SHARED REPEATER TONE PANEL MODEL TP-38 PART NUMBER 84-3800-2 REVISED 4-16-85

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
R44	06-5134	51 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R16	06-6834	68 K 1/4 WT CAR. FILM 5%			3	.10 ea.
R7,R24, R26	06-1044	100 K 1/4 WT CAR. FILM 5%			4	.10 ea.
R11	06-1244	120 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R8	06-1544	150 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R25,R46, R3,R15	06-1844	180 K 1/4 WT CAR. FILM 5%			3	.10 ea.
R2	06-2244	220 K 1/4 WT CAR. FILM 5%			1	.10 ea.
R33,R47	06-6844	680 K 1/4 WT CAR. FILM 5%			2	.10 ea.
R9,R10, R27,R28	06-1054	1.0 Meg 1/4 WT CAR. FILM 5%			4	.10 ea.
R5,R21	06-1064	10 Meg 1/4 WT CAR. FILM 5%			2	.10 ea.
RP1	51-1218	10 PIN 4.7K SIP NETWORK	CTS	770-10-1-R4.7K	1	.57 ea.
R18	18-3503	50K POT 3/8" CERMET	BOURNS	3386H-1-503	1	1.62 ea.
R19	18-3502	5K POT 3/8" CERMET	BOURNS	3386H-1-502	1	1.62 ea.
R61,R63	18-1044	100K POT 3/16" CERMET			2	1.35 ea.
TB1	31-0080	8 POSITION TERMINAL BLOCK	MAGNUM	A104208-NL-R26	1	3.66 ea.
J1	09-8016	16 PIN DUAL MALE HEADER	MOLEX	10-91-1161	1	2.01 ea.
	84-3800	MAIN PCB		84-3800-2	1	25.44 ea.
	15-3800	ENCLOSURE FRONT PANEL		15-3800-2	1	25.05 ea.
	15-3801	ENCLOSURE CHASSIS		15-3801-2	1	29.01 ea.
	15-3802	ENCLOSURE COVER		15-3802-2	1	15.36 ea.
	13-1003	PURPLE NON-REFLECTIVE LED LENS		61-3803-0	1	.75 ea.
	03-1002	1/4" 4-40 PHIL. P.H. MACHINE SCREW			13	.05 ea.
	03-1018	4-40 KEPS NUT			5	.05 ea.
	09-8540	40 PIN IC SOCKET	WELCON	802-7401642	2	.54 ea.
	09-8528	28 PIN IC SOCKET	WELCON	802-7281642	2	.38 ea.
	09-8520	20 PIN IC SOCKET	WELCON	802-0201642	2	.30 ea.
	09-8518	18 PIN IC SOCKET	WELCON	802-0181642	4	.24 ea.
	09-8516	16 PIN IC SOCKET	WELCON	802-0161642	2	.30 ea.

COMPONENTS PARTS LIST FOR KEYBOARD/DISPLAY BOARD PART NUMBER 84-3801-1 REVISION 4-16-85

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
U1	51-4499	DISPLAY DRIVER	MOT	MC14499P	1	5.55 ea.
Q1-Q4	48-4401	NPN TRANSISTOR TO-92	MOT	2N4401	4	.21 ea.
CR1,CR2	48-4002	SILICON DIODE	MOT	1N4002	2	.09 ea.
C2	24-1030	.01 UF CERAMIC DISC	CENTRALAB	CK-103	1	.12 ea.
C1	21-2240	.22 UF MONO CAP Z5U	CENTRALAB	CZ20C224M	1	.23 ea.
R1-R8	06-1214	120 OHM 1/4 WT. 5% CAR. FILM			8	.10 ea.
R9-R11	06-1024	1K OHM 1/4 WT. 5% CAR. FILM			3	.10 ea.
DS1-DS4	48-2003	.3" RED 7 SEG. DISPLAY	TI	TIL313	4	3.00 ea.
DS5-DS9	48-3200	RED T1 LED	PACCOM	L32RD	5	.22 ea.
J1	09-8017	16 PIN DUAL FEMALE HEADER	MOLEX	15-44-3208	1	3.24 ea.
S1-S12	40-1011	KEYBOARD SWITCHES	ITW	60-1000	12	1.11 ea.
	40-1012	NUMBERED BLACK KEY CAPS	ITW	60-4001	10	.60 ea.
	40-1013	RED KEY CAPS	ITW	60-4002	2	.96 ea.
	09-8518	18 PIN IC SOCKET	WELCON	802-0181642	1	.24 ea.
	09-8514	14 PIN IC SOCKET	WELCON	802-0141642	4	.20 ea.
	84-3801	DISPLAY PCB		84-3801-1	1	9.86 ea.
	43-1014	.400" NYLON LED SPACER	BIVAR	906-400	5	.06 ea.
	43-1013	.437" #4 NYLON SPACER	HH SMITH	4015	3	.11 ea.
	03-1018	4-40 KEPS NUT			3	.05 ea.

COMPONENTS PARTS LIST FOR DTMF MODULE
PART NUMBER 84-3802-1 REVISION 4-16-85

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
U1	51-4374	OCTAL D FLIP/FLOP	MOT	MC74HCT374N	1	1.80 ea.
U2	51-5087	DTMF ENCODER	TI	TCM5087N	1	4.50 ea.
U3	51-8870	DTMF DECODER	MITEL	MT8870BC	1	15.00 ea.
Y1	48-3579	3.579 MHZ. CRYSTAL	FOX	FOX036S	1	2.01 ea.
C1,C2,C3	21-2240	.22 UF MONO CAP Z5U	CENTRALAB	CZ20C224M	3	.23 ea.
C5	24-1030	.01 UF CERAMIC DISC	CENTRALAB	CK-103	1	.12 ea.
C6	24-2400	24 PF CERAMIC DISC	CENTRALAB	DD-240	1	.19 ea.
C4	21-1520	1500 PF MONO CAP X7R	CENTRALAB	CW15C152K	1	.15 ea.
R3,R4	06-1044	100K 1/4 WT. 5% CAR. FILM			2	.10 ea.
R1	06-1844	180K 1/4 WT. 5% CAR. FILM			1	.10 ea.
R2	18-3502	5K POT-3/8" CERMET	BOURNS	3386H-1-502	1	1.62 ea.
	09-8516	16 PIN IC SOCKET	WELCON	802-0161642	1	.30 ea.
	09-8518	18 PIN IC SOCKET	WELCON	802-0181642	1	.24 ea.
	09-8520	20 PIN IC SOCKET	WELCON	802-0201642	1	.30 ea.
	84-3802	DTMF PCB		84-3802-1	1	8.73
	03-1002	4-40 1/4" PHIL. P.H. MACHINE SCREW			4	.05 ea.
	09-8015	20 PIN DIP CONNECTOR	ANSLEY	609-M205H	2	4.05 ea.
	30-7067	20 COND. RIBBON CABLE	3M	3365/20		1.11 per foot

WARRANTY

The TP-38 is warranted to be free from defects for a period of one (1) year from the date of purchase. Just return the unit to the factory and we will repair or replace it

SUPPLEMENT TO TP-38 MANUAL
for enhanced software 51-2764A5
(51-2764C-1B for TP-DCTCSS)

Added Features

notes: All features that use a beep tone must have a TP-DTMF board installed in the TP-38. Features 2, 4, 5, & 10 do not apply to the DCTCSS units.

1. CONFIRMATION TONE generates two beeps upon entry to the Program Mode and after successful entry of each parameter (except parameter no. 31, 34, 35, and 36).

2. RESERVE TONE allows an enabled tone to be disabled, without giving it up for use by another system on the same channel. A reserved tone is identified by the lack of repeat audio, and a beep at the beginning of a transmission using that tone. To reserve a tone, use parameter no. 26#, followed by the CTCSS tone frequency to be reserved, followed by #. To re-enable a reserved tone, use parameter no. 01#. To completely disable a reserved tone, use parameter no. 02#. (Parameter no. 16#. will display a reserved tone as being valid). EXAMPLE: 26#2035#

3. COURTESY TONE generates a short beep upon release of the users P.T.T. switch. It is enabled for all repeater users by entering parameter no. 24#, and disabled with parameter no. 25#.

4. BUSY CHANNEL LOCKOUT is now enabled using parameter no. 22# (instead of no. 18#), and disabled with parameter no. 23# (instead of no. 19#). This has been separated from the "CTCSS Tone Delay" parameter.

5. CTCSS TONE DELAY (18#, 19#,) now extends beyond the transmit carrier delay, and continues to be regenerated until a new valid tone is decoded. This allows phone-patch transmissions with CTCSS controlled mobiles and bases, etc.

6. STUCK MIC. automatically generates the DTMF code of the CTCSS tone upon time-out of the offending transmitter. This DTMF signal can be read with a DTMF decoder with a readout such as the DI-16 Data Interrogator. The DTMF code is repeated every 50 minutes if the carrier remains on the channel and no other signal captures the CTCSS code that timed out the system.

7. TRANSMITTER TIME-OUT TIMER now generates a beep tone every 5 seconds when the time-out timer is within 20 seconds of time-out.

8. TONE TRANSLATION can now be used to allow access to the repeater with a valid tone, but not regenerate any tone. Use parameter no. 05#, decode tone#, and cross the CTCSS tone to "0000"#. This will inhibit regeneration of any CTCSS tone. EXAMPLE: 05#2035#0000# NOTE parameter 18# must be off.

9. PENALTY TIMER requires all customers on the repeater to wait a pre-set length of time before accessing the repeater if a set duration has been exceeded. 28# sets the allowed talk time before time-out from 1-50 minutes in one minute increments. Enter a two-digit number for the amount of time, (00# disables this function). 27# sets the lockout time from 1-99 seconds in one second increments. Enter a two-digit number for the amount of time desired (in seconds). Warning beeps will be heard just before time-out, if the TP-DTMF board is installed.

10. SECURITY CODE CHANGE parameter 09# has been modified to require reentering the previous code plus the new code. EXAMPLE: 09#1284098765# (98765 = new code)

11. PROM version 51-2764A6 increases the TP-38's resistance to "FAIR-OFF"

********** IMPORTANT NOTICE **********

TP-38's shipped after June 15, 1987 have a GAIN of TEN in the first stage of (U3). To check