

Model 37 Serial Number _____ Software Version _____

NOTE: This manual covers circuit board 702-9384.

Z E T R O N
INSTRUCTION MANUAL
Model 37 Repeaterman

#025-9180F.2

Please check for change information at the end of this manual.

QUICK! --- GET ME ON THE AIR!

If this is your first Model 37 Repeater Tone Panel, your first questions probably are, "What do I have to do to enable a tone?" and "Do I have to understand all the features just to make it work?" Here are the answers:

Before you can work with the Model 37, it must be installed. FOLLOW THE INSTALLATION INSTRUCTIONS (installation section.) Installation should be accomplished by a qualified radio service technician. Then get your transceiver (on the repeater frequency with a touch-tone keypad) ready to enable some tones.

ACCESS THE PROGRAM MODE

To access the program mode, key up and press "12137". The "go-ahead" beeps should be heard coming back from the repeater. If the program mode is not accessed, check the STATUS LED on the front panel to see if it changes with every key pressed.

PROGRAM MODE PROMPT TONES

During programming, the Model 37 will issue prompt tones to indicate how it's doing. A "warble" or "dee-doo dee-doo ... tone indicates that an invalid command or error condition exists. A "go-ahead" tone indicates proper completion of a command and ready for the next command. A double "bip" indicates that the Model 37 is ready for more digits. When exiting the program mode, a ringing sound will be sent to verify exit from the program mode. If a key is not pressed within 60 seconds, the Model 37 will exit automatically.

ENABLE A TONE AND COURTESY BEEP, TURN OFF CARRIER REPEAT

- 1.) Access the program mode.
Enter "12137#" (5-beep "go-ahead" tone heard)
- 2.) Enable 199.5 decode with 100.0 encode.
User 1 Decode: Enter "52#" (bip bip) "40#" ("go-ahead")
User 1 Encode: Enter "53#" (bip bip) "13#" ("go-ahead")
- 3.) Disable Carrier Repeat Users.
Enter "50#" ("go-ahead")
- 4.) Enable Courtesy Beep.
Enable User 1's Courtesy Tone: Enter "41#" ("go-ahead")
- 5.) Exit Program Mode.
Enter "99#" ("ringing")
- 6.) Test the repeater!

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CUSTOMER FEEDBACK FORMS

CHANGE INFORMATION

WARRANTY STATEMENT

Zetron's warranty is published in the current Zetron *United States Price Book*.

FEDERAL COMMUNICATIONS COMMISSION (FCC) REGULATIONS

To comply with FCC regulations, the following requirements must be met:

1. This device complies with Part 15 of the FCC rules for a Class A digital device. Operation is subject to the following two conditions:
 - a. This device may not cause harmful interference.
 - b. This device must accept any interference received, including interference that may cause undesired operation.
2. Repair work on this device must be done by Zetron, Inc. or a Zetron authorized repair station.

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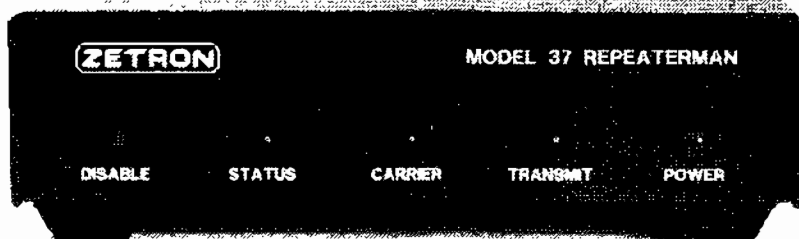
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1. INTRODUCTION

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INTRODUCTION

The Zetron Model 37 RepeaterMan is a repeater controller that provides all of the functions necessary to convert a full duplex radio, a pair of mobiles, or a single user repeater into a one- or two-user repeater. The Model 37 panel includes such features as ToneLock[™] CTCSS decoding, transmitter timeout timer, and automatic station identification. The Model 37 supports one or two distinct CTCSS tones, or can be programmed to repeat based on carrier alone. A courtesy tone can be enabled or disabled for each user independently. The unit can be programmed on-site or remotely from a DTMF radio, making it easy to change the Model 37's operation.

FEATURES

- * Carrier controlled repeat
- * Supports one- or two-user CTCSS encode and decode
- * Super repeat audio with hi-pass CTCSS filter
- * Programmable CTCSS cross tone, or no CTCSS encode
- * Programmable CTCSS encode during transmit hold time
- * Programmable courtesy tone
- * Programmable transmit hold time
- * Programmable transmit timeout time (for stuck mics)
- * Programmable Morse code station ID
- * Internal squelch circuit

2. SPECIFICATIONS

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GENERAL SPECIFICATIONS

Power	11-16V DC 70 mA Standby, 100 mA Operating
Temperature	0 to 65 degrees Celsius
Size	5.5" W x 6.25" D x 1.4" H
Weight	1.0 pound

RADIO INTERFACE SPECIFICATIONS

PTT	FET pull to ground
COR	Noise detector or External COR input
TX output	-40 to +6 dBm. Hi/Lo selector. 1K ohm output.
RX input	-40 to +10 dBm. Hi/Lo selector. 50K ohm input.
	25 mV to 6 V P-P
CTCSS output	-40 to +6 dBm. Hi/Lo selector. 600 ohm output.
CTCSS	
Frequency	67.0 to 254.1 Hz
Tones	50 tones, including all EIA standard CTCSS tones
Sensitivity	3 dB SINAD or better with ToneLock [™] software
Bandwidth	1.5%

ADDITIONAL SPECIFICATIONS

Indicators	Power, Carrier, Transmit, Status
Station ID	Morse code, fixed 1200 Hz frequency and selectable call sign
Programming	Programmable via DTMF mobile or portable.
Data retention	EEPROM - data retention for more than 10 years without power

PROGRAMMABLE FUNCTIONS

Disable	Enable/disable repeat function
Carrier Repeat	Carrier only repeat enable/disable
TX Hold Time	0 to 9 sec in 1 second steps
TX Timeout	1 to 9 minutes in 1 minute steps
Morse ID	0 to 8 characters programmable per user
CTCSS tail	Enable/disable CTCSS during transmitter hold time
CTCSS RX tone	CTCSS receive tone, selectable per user
CTCSS TX tone	CTCSS transmit tone, selectable per user
Courtesy Tone	Enable/disable per user
Courtesy Tone Freq.	500, 1000, 1500 Hz selectable

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REPEAT CONTROL

The Model 37 may be configured for repeat based on carrier, CTCSS decode of one or two CTCSS tones, or a combination of both carrier and CTCSS tone. When programmed for carrier repeat control (factory default), the Model 37 looks for a valid carrier indication from the repeater receiver squelch circuit. If using the internal carrier detector, the Model 37 waits for a reduction in noise on the discriminator audio input. When a valid carrier is recognized, the Model 37 keys the associated transmitter.

If using CTCSS control, both a valid carrier indication and a CTCSS tone are required to activate PTT. One or two CTCSS tones may be programmed into the Model 37. The Model 37 can also provide carrier based repeater control with CTCSS decode and encode. This makes conversion of older carrier squelch repeaters to CTCSS a simple task.

SYSTEM TIMERS

The Model 37 includes a programmable transmitter hold or "hang" timer. The hold time is programmable in 1 second increments from 0 seconds to 9 seconds. This timer keeps the repeater transmitter in transmit for a timed period after the mobile, portable, or control station has stopped transmitting. This reduces the on-off cycling of the repeater transmitter and improves conversation "flow."

The Model 37 also includes a programmable transmitter timeout timer which limits the amount of time that the Model 37 can be activated without the received carrier dropping out. This feature prevents the Model 37 from being continuously keyed by a mobile with a stuck PTT switch or a defective transmitter. A warning tone is sent immediately before the repeater transmitter is unkeyed, alerting listening users that the repeater has timed out.

OTHER FEATURES

A Morse code identifier makes station identification easy. Each user can be assigned his own CW ID sequence, eliminating the need for manual voice identification. A programmable user courtesy tone helps to smooth conversation flow, and encourages users to wait their turn to respond to a call. The courtesy tone pitch is also programmable, making it easy to differentiate between multiple repeaters on a single channel. The courtesy tone is particularly useful on repeaters that have very fast squelch action, making it easy for listening radios to tell when they can begin speaking.

The Model 37 may be programmed to encode user CTCSS tone during the transmitter hang time. This feature allows the repeater to "hold-open" the CTCSS decoders of listening radios, eliminating the decoding delays in the radios. This capability should not be used in systems where telephone interconnects will be used through the repeater. Immediately before the Model 37 unkeys, it turns off its CTCSS encoder, muting the CTCSS decoders of listening radios and providing effective squelch tail elimination.

SECTION 3 - OPERATION

The Model 37 may be disabled or enabled by simply pressing the DISABLE button located on the front panel. The STATUS LED will turn on solidly when the Model 37 is disabled. The LED will blink on or off when a DTMF tone is decoded. The Model 37 may also be remotely enabled or disabled using any DTMF-equipped radio.

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PROGRAM MODE ACCESS

The programming mode can be accessed by entering the Program Mode Access Code. The default value for the program mode access code is 12137, but can be changed to any 5-digit code. The Model 37 will respond with a "go-ahead" tone consisting of 5 short beeps indicating that the unit is prepared to accept programming commands.

If for any reason programming mode access is unsuccessful, the unit can be reset by holding the DISABLE button down while turning on the Model 37, and waiting until the STATUS LED starts to blink on and off. The LED will turn on continuously after 2 seconds for a few seconds. After 10 seconds, the LED will start flashing, indicating that all of the program settings are erased, returning the Model 37 to its factory default configuration.

ENTERING A PROGRAM COMMAND

To execute a program command, a DTMF number is entered followed by the "#" key. Once the '#' has been entered, the Model 37 will respond with the 5 beep "go-ahead" indicating that the command was accepted or a high-low "error tone" sequence indicating that an invalid command was received. Some commands require additional numbers, as in the case of a CTCSS tone. For these commands, the Model 37 will send two fast beeps indicating that additional digits are required. Commands should be entered one at a time (do not try to "string" programming commands together) until the go-ahead or error tones are sent. While in program mode, a command must be entered within 60 seconds, or the Model 37 will automatically exit the program mode, and return to normal operation.

CLEARING PROGRAMMED SETTINGS

The Model 37 offers no method of viewing the programmed settings (there is no RS-232 port for CRT or printer). As such, it is important to be careful during programming and to keep track of all programmed settings. If the Model 37 is in an unknown programming state, the settings may be reset to the factory defaults entering the command "91#".

EXITING PROGRAM MODE

Enter "99#" to exit program mode. The Model 37 will automatically exit the program mode 60 seconds after the last command, returning the Model 37 to normal operation.

SECTION 4 - PROGRAMMING

PROGRAMMABLE ITEMS

Repeater Disable

The Model 37's repeat function can be completely disabled. This will keep the Model 37 inactive until either the Program Mode Access Code is entered, or the DISABLE button is pressed. The Model 37 can also be disabled or enabled locally by pressing the DISABLE button on the front panel of the unit.

- 01# - DISABLE REPEATER.
- 02# - ENABLE REPEATER. (Default)

Transmitter Hold Time

The transmitter hold time is the amount of time the repeater transmitter will remain keyed after mobile activity is no longer detected. The transmitter hold time may be set from 0 to 9 seconds in 1 second increments.

- 10# - Disable Transmitter Hold Time.
- 11# - 1 Second Transmitter Hold Time.
- 12# - 2 Second Transmitter Hold Time. (Default)
- 13# - 3 Second Transmitter Hold Time.
- 14# - 4 Second Transmitter Hold Time.
- 15# - 5 Second Transmitter Hold Time.
- 16# - 6 Second Transmitter Hold Time.
- 17# - 7 Second Transmitter Hold Time.
- 18# - 8 Second Transmitter Hold Time.
- 19# - 9 Second Transmitter Hold Time.

Transmitter Timeout Timer

The transmitter timeout timer sets the maximum amount of time that the mobile may continuously transmit before the Model 37 deactivates the repeater transmitter. This "stuck mic" timeout feature resets each time carrier detection, or if programmed for CTCSS users, CTCSS decode stops. It may be set from 1 to 9 minutes, in 1 minute increments. An 800 Hz alert tone will be sent once for 2.5 seconds, and the repeater transmitter will unkey when the timer expires.

- 20# - Disable Transmitter Timeout.
- 21# - 1 Minute Transmitter Timeout Time.
- 22# - 2 Minute Transmitter Timeout Time.
- 23# - 3 Minute Transmitter Timeout Time. (Default)
- 24# - 4 Minute Transmitter Timeout Time.
- 25# - 5 Minute Transmitter Timeout Time.
- 26# - 6 Minute Transmitter Timeout Time.
- 27# - 7 Minute Transmitter Timeout Time.
- 28# - 8 Minute Transmitter Timeout Time.
- 29# - 9 Minute Transmitter Timeout Time.

Station ID Mode

Several modes of CW station identification exist for the Model 37. The USER ID mode individually identifies each of the CTCSS users independently only when they are using the system. The system ID identifies the system, rather than the individual users. Voice communications may continue during the ID since the ID is sent at 30 percent deviation.

The USER ID mode identifies each CTCSS user independently. Each user's ID interval timer will be reset after sending his ID. A user's ID will be transmitted anytime he is using the repeater when his timer expires.

Two modes of system ID are available. Both modes will activate the repeater transmitter to send the station ID. The "ID after activity" mode will ID only when the repeater has been activated during the last time interval. In contrast, the continuous mode will ID regardless of system usage, automatically transmitting the ID every interval.

The Model 37 can only support one method of station ID at a time. It cannot send both the station ID and user ID concurrently.

- 30# - Disable Morse Code Station ID (Default)
- 31# - Enable User ID mode
- 32# - Enable System ID after activity only.
- 33# - Enable System ID continuously.

Morse ID Interval

The interval is selectable from 10 to 90 minutes, with the default being 15 minutes. Each user has his own interval timer which is reset when the ID is sent. The user's ID will be transmitted during the first dispatch message after his timer has expired.

- 34# - ID every 10 Minutes.
- 35# - ID every 15 Minutes. (Default)
- 36# - ID every 30 Minutes.
- 37# - ID every 45 Minutes.
- 38# - ID every 60 Minutes.
- 39# - ID every 90 Minutes.

SECTION 4 - PROGRAMMING

User Courtesy Tone

Whenever a user unkeys the courtesy tone may be sent. When a group of mobiles are close to the repeater with strong, full quieting signals, it is sometimes difficult to tell when a mobile unkeys. The courtesy beep will assist in conserving air time so that each mobile doesn't wait for the repeater transmitter to drop between transmissions. Carrier users share User 1's Courtesy option.

40# - Disable User 1's, Carrier Courtesy Tone. (Default)

41# - Enable User 1's, Carrier Courtesy Tone.

42# - Disable User 2's Courtesy Tone. (Default)

43# - Enable User 2's Courtesy Tone.

Courtesy Tone Frequency

The courtesy tone is programmable in three frequency increments from 500 to 1500 Hz. This feature makes it easy to differentiate between different repeaters on the same channel.

44# - 500 Hz Courtesy Tone.

45# - 1000 Hz Courtesy Tone. (Default)

46# - 1500 Hz Courtesy Tone.

Carrier Only Repeat (Open Repeater)

The Model 37 can be programmed to repeat based on carrier, sometimes called "carrier controlled repeat", "carrier squelch repeat", or "open repeater." The repeater will be keyed without CTCSS whenever carrier is detected. Users that have valid CTCSS tones operate normally with CTCSS encode. This allows a mix of CTCSS tone users with open repeat capability and is ideal when adding tone users to an existing open repeater. Only valid CTCSS tone users will repeat when Carrier Repeat is disabled.

50# - Disable Carrier Repeat Mode.

51# - Enable Carrier Repeat Mode. (Default)

User CTCSS Encode/Decode

Each of the users can receive and transmit any of the 50 CTCSS tones. By keeping the transmit and receive codes separate, cross coding can be accomplished easily. The Model 37 will cross code CTCSS even when Carrier Repeat Mode is active. This feature can be disabled by entering 0 as the receive CTCSS code. Carrier users will have User 1's tone encoded when User 1's decode tone is 0.

- 52# XX# - User 1's decode CTCSS tone. (Default = 00)
 53# XX# - User 1's encode CTCSS tone. (Default = 00)
 54# XX# - User 2's decode CTCSS tone. (Default = 00)
 55# XX# - User 2's encode CTCSS tone. (Default = 00)

50 CTCSS TONE CODES							
##	Freq	##	Freq	##	Freq	##	Freq
1	67.0	14	103.5	27	159.8	40	199.5
2	69.4	15	107.2	28	162.2	41	203.5
3	71.9	16	110.9	29	165.5	42	206.5
4	74.4	17	114.8	30	167.9	43	210.7
5	77.0	18	118.8	31	171.3	44	218.1
6	79.7	19	123.0	32	173.8	45	225.7
7	82.5	20	127.3	33	177.3	46	229.1
8	85.4	21	131.8	34	179.9	47	233.6
9	88.5	22	136.5	35	183.5	48	241.8
10	91.5	23	141.3	36	186.2	49	250.3
11	94.8	24	146.2	37	189.9	50	254.1
12	97.4	25	151.4	38	192.8		
13	100.0	26	156.7	39	196.6		

Example:

Set User 1's decode to 100.0 Hz:

Enter DTMF --> 52# 13#

CTCSS Encode During Transmit Hold Time

The CTCSS encode may be left on during the transmit hold time if desired. Normally the repeater encode signal follows the mobile encode. Leaving the encode on during tx-hold time eliminates the decode time in the mobiles between transmissions. Do not enable the encode during tx-hold time when using a control station telephone interconnect!

- 60# - Disable User 1's CTCSS Encode during Transmit Hold Time.
 61# - Enable User 1's CTCSS Encode during Transmit Hold Time.
 62# - Disable User 2's CTCSS Encode during Transmit Hold Time.
 63# - Enable User 2's CTCSS Encode during Transmit Hold Time.

SECTION 4 - PROGRAMMING

Morse ID Call Signs

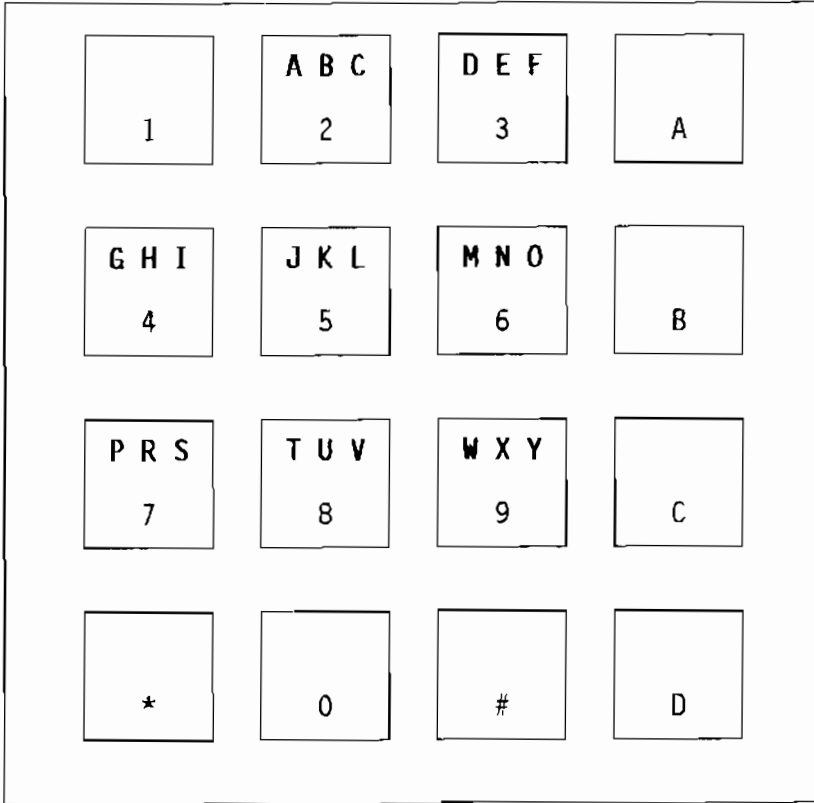
Each user may have a Morse code ID programmed. Each user also has his own ID interval timer. The Morse ID is sent the first time the user keys. Voice communications may continue during the ID since the ID is only transmitted at 30 percent of full deviation.

- 70# XXXX# - USER 1's MORSE ID CALL SIGN
- 71# XXXX# - USER 2's MORSE ID CALL SIGN
- 72# XXXX# - SYSTEM ID CALL SIGN
- 73# - 22 WPM CW ID RATE (Default)
- 74# - 11 WPM CW ID RATE

Station ID Cross Reference

Digit Letter Code			Digit Letter Code			Digit Letter Code		
00	0	-----	12	A	.-	26	N	-. .
01	1	.-----	22	B	-..-. .	36	O	--- .
02	2	. .-----	32	C	-.-.-.	17	P	-. -- .
03	3	. . .-----	13	D	-.-.-	10	Q	-. -- . -
04	4-----	23	E	-. -	27	R	. - . -
05	5-----	33	F	.-. -.	37	S	. - . .
06	6	------	14	G	-- .	18	T	---
07	7	-- . . .-----	24	H	.-.-.-	28	U	.-.-
08	8	--- . . .-----	34	I	.-.-	38	V	.-.-.-
09	9	---- . .-----	15	J	.- --	19	W	.-.-.-
		-----	25	K	-.-.-	29	X	-. -.-
30	/	- . . . - .	35	L	.-.-.-	39	Y	-. -.-
	#	(done)	16	M	---	20	Z	-- .- .

Example:
Set call sign WNCR-414:
Enter DTMF --> 70# 19 26 32 27 04 01 04 #
Comments --> ID= W N C R 4 1 4 done

DTMF Keypad with Letters Shown**Program Mode Access Code**

The DTMF access code required to place the Model 37 into the program mode is user programmable for added security. The number must be 5 digits in length, with a factory default of 12137. To change the access code, enter "90#", followed by any 5 digit code after the double beep is transmitted. Example: to change the code to 12345, enter "90#, (wait for double beep) 12345 #"

Reset All Programmable Settings To Factory Defaults

Enter "91#" to erase ALL previous settings in the Model 37, and return them to factory defaults. THERE IS ABSOLUTELY NO WAY OF RESTORING PREVIOUSLY PROGRAMMED SETTINGS ONCE THIS COMMAND HAS BEEN ISSUED.

SECTION 4 - PROGRAMMING

Transmitter Gain Test

The transmit audio level must be properly adjusted to obtain maximum performance from the system. Enter "92#" to activate PTT and transmit a 1 kHz sine wave. Adjust the "TRANSMIT LEVEL" to obtain +/- 3 kHz of deviation. This test sets the level of transmitted audible tones including courtesy tone, Morse ID, and DTMF signaling. It does not set the level of repeat audio. Enter "#" to exit this test.

Pre-Emphasis Test

The Model 37 can test the pre-emphasis slope of the transmitter. Enter "93#", the unit will key up, and transmit a tone. The frequency of the tone will change from 400 Hz to 1000 Hz to 2000 Hz and back each time a DTMF digit is entered. The pre-emphasis of the transmitter can be determined by examining the output deviation at each frequency. Enter "#" to exit.

Repeat Audio Test

The audio repeat path may be tested by entering "94#". This test can verify that the "RECEIVE LEVEL" is set correctly, and is used to adjust the Model 37 for linear repeat audio levels. Enter "#" to exit this test.

CTCSS Gain Test

Enter "95#" to key the transmitter and begin sending a 136.5 Hz CTCSS tone over the channel. Adjust the "CTCSS LEVEL" pot on the back panel for +/- 750 Hz of signal deviation. Enter "#" to exit this test.

CTCSS Pre-Emphasis Test

Enter "96#" to test the CTCSS pre-emphasis. The tone will change from 67.0 to 136.5 to 250.3 Hz each time a DTMF digit is entered. By examining the deviation of the output, jumper JP1 can be moved to change the CTCSS pre-emphasis. Enter "#" to exit this test.

Exit The Program Mode

Enter "99#" to exit program mode.

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INSTALLATION WARNING

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause interference to radio communications. Installation of the Model 37 should only be attempted by qualified radio service personnel.

GENERAL

Connections to the transmitter, receiver, and power are grouped on a detachable connector on the rear for ease of installation. The Model 37 includes installation test modes to aid in installation. Adjustments are made on the rear of the Model 37.

EQUIPMENT REQUIRED FOR INSTALLATION**Required equipment includes:**

- Communications service monitor
- DTMF mobile or handheld transceiver
- Soldering iron, and solder
- Shielded Audio Cable
- Wire
- Volt Meter

Recommended Equipment:

- Oscilloscope

SECTION 5 - INSTALLATION

INSTALLATION PROCEDURE

1. **POWER SUPPLY:** Locate and verify the voltage of the power supply for the radio receiver and transmitter. With a voltmeter, measure the DC voltage. It should be between 10.5 Volts and 15.0 Volts. Connect the power supply ground lead to pin 2 "GND", and the positive supply lead to pin 1 "+12VDC" of the Model 37.

2. **GROUND CONNECTION:** Connect a chassis ground wire from pin 2 "GND" of the Model 37 to the chassis ground of the transmitter/receiver.

3. **TRANSMITTER PTT:** Connect a wire from pin 7 "PTT" of the Model 37 to the PTT input of the transmitter. This output is a FET and "pulls to ground" when PTT is activated.

4. **TRANSMITTER AUDIO OUTPUT:** Connect pin 5 "TX AUD" of the Model 37 to the microphone input of the transmitter. Shielded cable must be used for this connection. Connect the braid to pin 6 "GND" of the Model 37.

5. **DISCRIMINATOR INPUT:** Connect pin 3 "DISC" of the Model 37 to the receiver discriminator output. Shielded cable must be used for this connection, connect the braid to pin 4 "GND" of the Model 37. **NOTE:** Unfiltered, unsquelched, discriminator audio **MUST** be used for proper operation of Model 37's internal squelch circuitry.

6. **CTCSS ENCODE:** Connect pin 10 "TONE OUT" of the Model 37 to the direct modulation or CTCSS tone input of the transmitter. Shielded cable must be used for this connection. Connect the braid to pin 8 of the Model 37.

7. **COR INPUT:** The COR input's use is recommended. To use the Radio's Carrier detection circuitry, connect pin 9 "COR" to a carrier indication point in the receiver. The signal must be between 0 and 11.5 Volts DC, and change at least 1 Volt between carrier and no-carrier conditions. A built in squelch detector can be used if a carrier indication from the receiver is not readily available.

TESTS AND ADJUSTMENTS**1.) RECEIVER AUDIO GAIN**

Open the cover to the Model 37. Connect and turn on the repeater and the Model 37. Key up on the repeater receive frequency, and generate all the DTMF tones. Adjust the "RECEIVE LEVEL" potentiometer so the STATUS LED blinks for each digit. If necessary, change the position of JP3.

2.) ACCESS PROGRAM MODE

Connect the service monitor to the transmitter, set it to the transmit channel. Using a DTMF equipped mobile or portable, enter the program mode access code. It is initially set to "12137." When the program mode is accessed, the transmitter will key and transmit a five-beep "go-ahead" tone.

3.) TRANSMIT AUDIO GAIN

Enter "92#" to key the transmitter with a 1 kHz tone. Adjust the recessed potentiometer labeled "TRANSMIT LEVEL" located on the back panel for +/- 3 kHz of signal deviation. If it is difficult to adjust the gain correctly, move jumper JP4 and readjust. Enter "#" to exit the transmit audio gain test.

4.) REPEAT AUDIO GAIN:

Supply a full quieting test tone of known deviation on the receiver's channel. Note: during this test, adjust R42 so the CARRIER LED is on continuously, and move jumper JP7 to position A. The carrier detector operates on audio **after** the receive gain setting, so it will interact with the RECEIVE LEVEL adjustment.

Enter "94#" to key the transmitter and repeat the audio. Adjust the "RECEIVE LEVEL," NOT "TRANSMIT LEVEL" potentiometer for unity gain (input deviation = output deviation.) If the level cannot be adjusted enough, move jumper JP3 to position B and readjust. Note: If using a DTMF test tone, do not hold the digit for greater than 8 seconds or a reset may occur. If the signal is not being repeated, check the receiver to be sure it is operating properly. Some duplex capable radios disable the receiver when transmitting. If this is the case, modify the radio before continuing. Insert a 500 Hz, 1000 Hz, and 2000 Hz signal while monitoring the output deviation. The output deviation should be flat. If not, move jumper JP6 to the other position. Readjustment of the Audio Input Gain may be necessary. Enter "#" to exit this test.

SECTION 5 - INSTALLATION

5.) CARRIER DETECT

If you are using a carrier indication from the receiver's squelch circuit, skip to the EXTERNAL CARRIER DETECT. If using internal carrier detection, be sure that jumper JP7 is in position A. After the receive level has been set, supply then remove a 6 dB SINAD quieting signal to the receiver. Adjust potentiometer R42 until the CARRIER LED illuminates whenever carrier is present, and goes out when carrier drops. The adjustment should be set just like the "squelch" control on a receiver. If the action of the LED is reversed (Carrier = LED off, No Carrier = LED on), rotate the jumpers at JP5 a quarter turn. Readjust until the CARRIER LED is on whenever carrier is present. NOTE: The carrier detector requires unfiltered discriminator audio for proper operation.

6.) EXTERNAL CARRIER DETECT

If you are using the Model 37's carrier indication circuitry, skip this section. If using external carrier detection, move jumper JP7 to position B. Supply, then remove carrier to the radio receiver and note whether the CARRIER LED is on with a received signal and off when the signal is absent. Adjust potentiometer R35 to switch the CARRIER LED on and off with the signal. If the action of the LED is reversed (Carrier = LED off, No Carrier = LED on), rotate the jumpers at JP5 a quarter turn. Readjust until the CARRIER LED is on whenever carrier is present.

7.) CTCSS ENCODE OUTPUT GAIN

Enter "95#" to key the transmitter and generate 136.5 Hz CTCSS tone. Adjust the potentiometer labeled "CTCSS LEVEL" to obtain +/- 750 Hz of signal deviation. If it is difficult to obtain adequate deviation, move JP2 and readjust. Enter "#" to exit the CTCSS gain test.

8.) CTCSS PRE-EMPHASIS TEST

Enter "96#" to access the CTCSS pre-emphasis test mode. Each time a DTMF digit is depressed, the CTCSS frequency will change from 67.0 Hz to 136.5 Hz to 250.3 Hz and back again. Switch jumper JP1 so the transmitted CTCSS tones are "flat" on the channel. Enter "#" to exit this test.

9.) EXIT THE PROGRAM MODE

Enter "99#" to exit program mode, and return the Model 37 to its operational mode. Replace the top cover, and test the operation.

ALTERNATE TEST AND ADJUSTMENT PROCEDURE

There is another way to set up the Model 37 on a new radio system that doesn't require a DTMF encoder.

1.) Connect the Model 37 to the radio using the installation instructions on the previous pages. Connect the communications service monitor to the antenna, set for receive deviation display on the repeater transmit frequency.

2.) Cycle power on the Model 37 while holding the DISABLE button down. Hold the button down for at least 2 seconds until the STATUS LED turns on. Release the button after the STATUS LED turns on to begin the alternate test procedure.

3.) The following test sequence will advance each time the button is depressed. Turn off the power to exit this mode. The unit will return to normal operation 30 minutes after the test began.

Key the transmitter, and Output a 1 kHz tone.
Output a 136.5 Hz CTCSS tone.
Output a 67.0 Hz CTCSS tone.
Output a 250.3 Hz CTCSS tone.
Enable Repeat Audio Mode.

4.) Set the 1 kHz tone deviation to +/- 3 kHz with the potentiometer labeled "TRANSMIT LEVEL", and jumper JP4 position.

5.) Set the 136.5 Hz CTCSS tone for 750 Hz of deviation, switching jumper JP2 as necessary. Set jumper JP1 so the transmitted CTCSS tone are "flat" on the channel.

6.) Supply a full quieting test tone of known deviation on the receiver's channel. Note: during this test, adjust R42 so the CARRIER LED is on continuously. The carrier detector operates on audio **after** the receive gain setting, so it will interact with the RECEIVE LEVEL adjustment.

Adjust the "RECEIVE LEVEL," NOT "TRANSMIT LEVEL" potentiometer for unity gain (input deviation = output deviation.) If the level cannot be adjusted enough, move jumper JP3 and readjust. Note: If using a DTMF test tone, do not hold the digit for more than 8 seconds or a reset will occur. If the signal is not being repeated, check the receiver to be sure it is operating properly. Some duplex capable radios disable the receiver when transmitting. If this is the case, modify the radio before continuing. Insert a 500 Hz, 1000 Hz, and 2000 Hz signal while monitoring the output deviation. The output deviation should be flat. If not, move jumper JP6 to the other position. Readjustment of the Audio Input Gain may be necessary.

7.) If the radio's carrier circuit is used, skip to EXTERNAL CARRIER DETECT. Adjust the potentiometer R42 so the CARRIER LED illuminates whenever a mobile is transmitting. Be sure that jumper JP7 is in position A. The adjustment should be set just like the "squellch" control on a receiver. NOTE: The carrier detector requires unfiltered discriminator audio for proper operation. NOTE: Some duplex radios disable the receiver while transmitting, in which case modify the radio before continuing.

SECTION 5 - INSTALLATION

8.) EXTERNAL CARRIER DETECT

If you are not using the radio's carrier detection circuitry, skip this section. First move jumper JP7 to position B. Supply, then remove a signal to the receiver. Adjust potentiometer R35 to switch the CARRIER LED on and off with the signal. If the polarity of the LED is wrong, rotate the jumpers at JP5 a quarter turn. Readjust until the CARRIER LED illuminates whenever a mobile is transmitting. NOTE: Some duplex radios disable the receiver while transmitting. If this is the case, modify the radio before continuing.

9.) Cycle power, to restore the Model 37 to normal operation.

CONNECTION TO A GE EXEC II BASE

For: Zetron Model 37
 To: GE Exec II base
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	H20 (A+)
Ground	2	Black	Chassis ground
Discriminator in	3	White	J907, pin 8 (vol hi)
Ground	4	Braid	No connection
Tx audio	5	Blue	H36 (Tone hi)
Ground (spare)	6	---	
PTT	7	Orange	J907, pin 10 (PTT)
Ground	8	Brown	Ground trace
COR input	9	Yellow	J913, pin 4 (CAS)
CTCSS encode	10	Green	J907, pin 6 (CG hi)

GE EXEC II CONFIGURATION:

To modify the radio for full-duplex (repeater) operation, follow the steps below:

1. Remove Q905 and Q908 on the System Audio Squelch board (SAS board).
2. Install a wire jumper from Q908 emitter solder pad to Q908 collector solder pad.
3. Care should be taken not to damage the transmitter PA due to continuous duty operation.

SECTION 5 - INSTALLATION

CONNECTION TO A GE MASTR II BASE/REPEATER

For: Zetron Model 37
To: GE MASTR II base/repeater
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Station supply +12 VDC
Ground	2	Black	Station supply ground
Discriminator in	3	White	J606 on IF/audio/Sq. board
Ground	4	Braid	No connection
Tx audio	5	Blue	J933, pin 6 old, Cntrl brd P2, pin 4 new IDA
Ground (spare)	6	---	
PTT	7	Orange	J931, pin 14 (local PTT)
Ground	8	Brown	J933, pin 2 (CG lo)
COR input	9	Yellow	J932, pin 18 (CAS)
CTCSS encode	10	Green	J933, pin 3 (CG hi)

MASTR II CONFIGURATION:

Two versions of the GE Repeater Control Panel exist. The "Earlier" version is identified by multiple plug-in cards, the 10 volt regulator card being on the far right. The "Later" version is a single panel (no plug-in cards), and is identified by the local mic connector, speaker and volume knob on the front. All connections are the same except the for TX AUDIO. On "Late" models, the audio is connected to the "battery alarm audio" point.

Follow the steps below:

1. Remove the jumper between H16 and H17 (if installed) on the 10-volt regulator card.
2. Discriminator audio may be connected to Volume Squelch Hi (J932 Pin 3).
3. Remove any existing repeater tone panel (card-per-tone), and "Repeater Audio" and/or "Repeater Control" cards (if installed).

CONNECTION TO A GE CUSTOM MVP

For: Zetron Model 37
To: GE Custom MVP
Using: 709-7179 Generic radio cable

ZETRON END			RADIO END
Function	Pin	Color	Connection / notes
12 volts DC	1	Red	Inside front panel, S701 (switched side)
Ground	2	Black	Chassis ground
Discriminator in	3	White	IF detector board, junction of R606/R608/C622
Ground	4	Braid	No connection
Tx audio	5	Blue	Exciter board, P902, pin 4 (mic hi)
Ground (spare)	6	---	
PTT	7	Orange	System audio squelch board, J911 (PTT)
Ground	8	Brown	Exciter board, P902, pin 5 (mic lo)
COR input	9	Yellow	System audio squelch board, J912 (CAS)
CTCSS encode	10	Green	Exciter board, P902, pin 9 (CG hi)

GE MVP CONFIGURATION:

Follow the steps below:

1. Cut circuit trace on top of System Audio Squelch board which runs from U902 pin 6 toward R11. Cut trace close to U902. This disables receiver muting on PTT.
2. Install a jumper between J904 pin 2 (rx osc control) and J904 pin 1 (10v reg) on the System Audio Squelch board. This provides a source of unswitched 10 V to the receiver oscillator at all times.

SECTION 5 - INSTALLATION

CONNECTION TO AN ICOM IC-RP1510 REPEATER

For: Zetron Model 37
To: ICOM IC-RP1510 repeater
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Anode DC, power bus
Ground	2	Black	J2, pin 1, ground (logic board)
Discriminator in	3	White	Negative side of C32 (logic board)
Ground	4	Braid	No connection
Tx audio	5	Blue	Junction of R49 and C20 (logic board)
Ground (spare)	6	---	
PTT	7	Orange	J2, pin 5, PTT (logic board)
Ground	8	Brown	J2, pin 3, ground (logic board)
COR input	9	Yellow	P5, pin 2, sqlsw (green wire rx unit)
CTCSS encode	10	Green	Right side of R43 (logic board)

RADIO CONFIGURATION:

Follow the steps below:

1. Remove R22 (22K) to isolate PTT indication to control logic.
2. Isolate PTT control line from control logic by cutting trace next to J2, pin 6 (PTT).
3. Remove C20 (0.1 μ f) to isolate voice audio from summing amp.
4. Change R43 to 10 k Ω , and cut trace between IC8, pin 7 and R43.
5. Remove C32 (0.47 μ f) to isolate discriminator output from logic board.

OPERATIONAL NOTES:

1. Squelch control on front panel sets COR for tone panel and speaker.
2. Front panel speaker will monitor all channel activity.
3. Microphone set on front panel will still function.

CONNECTION TO AN E.F. JOHNSON CR1000 REPEATER

For: Zetron Model 37
 To: E.F. Johnson CR1000
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Pin 21, level adjust card
Ground	2	Black	Pin 24, level adjust card
Discriminator in	3	White	Pin 11, level adjust card
Ground	4	Braid	No connection
Tx audio	5	Blue	Pin 18, level adjust card
Ground (spare)	6	---	
PTT	7	Orange	Pin 19, level adjust card
Ground	8	Brown	Ground
COR input	9	Yellow	Pin 12, level adjust card
CTCSS encode	10	Green	Pin 22, level adjust card

CR1000 CONFIGURATION:

Follow the steps below:

1. Move the wire in the receiver off of J211, connect to U201 pin 6.
This provides unfiltered receive audio to the Model 37.
2. Disconnect one side of C709 on the Level Card.
3. Set the Repeat switches to: Access=tone, Repeat=off.

SECTION 5 - INSTALLATION

CONNECTION TO AN E.F. JOHNSON CR1010 REPEATER

For: Zetron Model 37
To: E.F. Johnson CR1010
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END, LOGIC DRAWER CONNECTOR Connection / notes
12 volts DC	1	Red	Logic drawer, pin 15, +13.8 V
Ground	2	Black	Logic drawer, pin 13, ground
Discriminator in	3	White	Logic drawer, pin 5, CG audio
Ground	4	Braid	No connection
Ground (spare)	6	---	
PTT	7	Orange	Logic drawer, pin 23, PTT
Ground	8	Brown	Ground
COR input	9	Yellow	Logic drawer, pin 19, fast squelch
Tx audio	5	Blue	Logic drawer, pin 18, Tx tone CG
CTCSS encode	10	Green	

Diagram showing a connection between the Tx audio line (Pin 5, Blue) and the CTCSS encode line (Pin 10, Green) using a 56 kΩ resistor in series with a 15 kΩ resistor.

CR1010 CONFIGURATION:

Follow the steps below:

1. Remove the brown wire from receiver going to the exciter transmit audio (Pin 1).
2. Add a 10 kΩ resistor across R123 in the exciter.

NOTE: This configuration does not use the deviation limiter in the exciter. It does provide a higher quality repeat audio quality than the alternate hookup on the next page.

CONNECTION TO AN E.F. JOHNSON CR1010, ALTERNATE HOOKUP

For: Zetron Model 37
 To: E.F. Johnson CR1010, Alternate hookup
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Logic drawer, pin 15, +13.8 V
Ground	2	Black	Logic drawer, pin 13, ground
Discriminator in	3	White	Logic drawer, pin 5, CG audio
Ground	4	Braid	No connection
Tx audio	5	Blue	Exciter drawer, pin 1, Tx audio
Ground (spare)	6	---	
PTT	7	Orange	Logic drawer, pin 23, PTT
Ground	8	Brown	Ground
COR input	9	Yellow	Logic drawer, pin 19, fast squelch
CTCSS encode	10	Green	Logic drawer, pin 18, Tx tone CG

CR1010 CONFIGURATION:

Remove the brown wire from receiver going to the exciter transmit audio (Pin 1).

NOTE: This configuration uses the limiter and high-pass filter in the exciter. Since the Model 37 has a high-pass filter to remove the CTCSS from the repeat audio, as well as the exciter, two high-pass filters in series may degrade the audio quality. The repeat audio quality may be improved by deleting (bypassing) the high-pass filter in either the Model 37 or the exciter.

To delete the high-pass filter in the Model 37, lift one side of R43, add a wire jumper across C34, and add a wire jumper across C35.

SECTION 5 - INSTALLATION

CONNECTION TO A MIDLAND BASETECH REPEATER

For: Zetron Model 37
To: Midland Basetech repeater
Using: 709-7179 Generic radio cable

ZETRON END			RADIO END DB-9 connector
Function	Pin	Color	Connection / notes
12 volts DC	1	Red	Pin 1, +12.6 V
Ground	2	Black	Pin 8, ground
Discriminator in	3	White	Pin 3, Rx disc
Ground	4	Braid	No connection
Tx audio	5	Blue	Pin 2, AF
Ground (spare)	6	---	
PTT	7	Orange	Pin 5, PTT
Ground	8	Brown	No connection
COR input	9	Yellow	Pin 6, COS
CTCSS encode	10	Green	Pin 9, tone

CONNECTION TO A MOTOROLA MICOR REPEATER

For: Zetron Model 37
 To: Motorola Micor Repeater
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Power supply A+
Ground	2	Black	Power supply A-
Discriminator in	3	White	Squelch gate, pin 10
Ground	4	Braid	No connection
Tx audio	5	Blue	Station control, pin 16
Ground (spare)	6	---	IN4148
PTT	7	Orange	TB3, pin 14
Ground	8	Brown	No connection
COR input	9	Yellow	J2, pin 5 (Rx unsquelch)
CTCSS encode	10	Green	J5, pin 27

10 k Ω **MICOR CONFIGURATION:**

Follow the steps below:

1. Remove all modules except Station Control and the Squelch Gate card.
2. Modify the control modules as follows:
 - a. Station Control: Jumper the "PL Disable" switch ON.
 - b. Squelch Gate: Remove C17, in the exciter output line.
3. Modify Rx audio squelch board (TRN-6006A), and add jumper from U202 pin 10 to P903 pin 14.
4. Modify exciter board (TLE-1720A), add jumper from IDC pot wiper to P902 pin 8, and cut trace between P902 pin 8 and JU401.
5. Modify backplane board (TRN-6421A), cut trace going to J2 pin 5, and cut trace going to J5 pin 27.

SECTION 5 - INSTALLATION

CONNECTION TO A MOTOROLA MCR-100/RADIUS R-100

For: Zetron Model 37
To: Motorola MCR-100/Radius R-100
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END (DB-25P) Connection / notes
12 volts DC	1	Red	JAUX, pin 3, A+
Ground	2	Black	JAUX, pin 14, desk set ground
Discriminator in	3	White	JAUX, pin 25, uncommitted
Ground	4	Braid	No connection
Tx audio	5	Blue	JAUX, pin 5, audio from phone patch
Ground (spare)	6	---	
PTT	7	Orange	JAUX, pin 4, PTT
Ground	8	Brown	JAUX, pin 6
COR input	9	Yellow	JAUX, pin 12, audio control
CTCSS encode	10	Green	JAUX, pin 23, uncommitted

RADIO MODIFICATIONS:

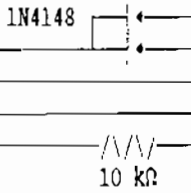
Follow the steps below:

1. Install a jumper from U601 pin 9 on the TX Command Board to JAUX Pin 23. This routes CTCSS modulation to the TX Command Board.
2. Install a jumper from U551A pin 4 on the RX Board to JAUX Pin 25. This routes unfiltered discriminator audio from the receiver to the JAUX connector.
3. Program the R-100 for carrier squelch operation and disable repeater operation using the RPTR Disable Switch on the RPT Control Board.
4. Repeated audio from the Model 37 will be heard in the local speaker if the Model 37 transmit audio is connected to JAUX Pin 5. This is because audio appearing at pin 5 is distributed to several points in the R-100 Interface Board (including the local audio amp, the exciter board, and the line output) before being applied to the TX Command Board. If desired, transmitted voice modulation may be applied directly to the TX Command Board using the emitter of Q601.

CONNECTION TO A MOTOROLA MSR 2000 BASE/REPEATER

For: Zetron Model 37
 To: Motorola MSR 2000 base/repeater
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	E12 (A+)
Ground	2	Black	Ground lug
Discriminator in	3	White	Audio squelch, pin 7
Ground	4	Braid	No connection
Tx audio	5	Blue	Audio squelch, pin 16
Ground (spare)	6	---	Squelch gate, pin 3
PTT	7	Orange	Squelch gate, pin 18
Ground	8	Brown	No connection
COR input	9	Yellow	Audio squelch, pin 20
CTCSS encode	10	Green	Coded squelch. pin 21

**MSR 2000 CONFIGURATION:**

Follow the steps below:

1. Remove all jumpers on the RF control chassis backplane except JU1, JU4, JU5, and JU9
2. Only R1 Audio and Station Control Modules are required. Make the following changes to the control cards:
 - a. R1 Audio: Install JU1 and JU101. Remove JU2, JU103, JU104, JU105, CR2 and CR106.
 - b. Station Card: Install JU2 - JU8. Remove JU9 - JU11.
 - c. Line Driver: Remove JU15 and CR3.

SECTION 5 - INSTALLATION

CONNECTION TO A MOTOROLA MSR 2000 WITH SQUELCH GATE

For: Zetron Model 37
To: Motorola MSR 2000 base/repeater with Squelch Gate card
Using: 709-7179 Generic radio cable

ZETRON END				RADIO END
Function	Pin	Color		Connection / notes
12 volts DC	1	Red	_____	E12 (A+)
Ground	2	Black	_____	Ground lug
Discriminator in	3	White	_____	Audio squelch, pin 7
Ground	4	Braid	_____	No connection
Tx audio	5	Blue	_____	Station control, pin 4
Ground (spare)	6	---	IN4148	
PTT	7	Orange	_____ ←	E16 LPTT
Ground	8	Brown	_____	No connection
COR input	9	Yellow	_____	Audio squelch, pin 20
CTCSS encode	10	Green	_____ /\\ /	Coded squelch, pin 21
			10 KΩ	

MSR 2000 CONFIGURATION:

Follow the steps below:

1. Remove all jumpers on the RF control chassis backplane except JU1, JU4, JU5 and JU9
2. Only R1 Audio, Station Control and Squelch Gate Modules are required. Make the following changes to the control cards:
 - a. R1 Audio: install JU1 and JU101. Remove JU2, JU103, JU104, JU105, CR2 and CR106.
 - b. Station Card: install JU2 - JU8. Remove JU9 - JU11.
 - c. Line Driver: Remove JU15 and CR3 (if applicable).
 - d. Squelch Gate: Remove R74. Make sure JU7 and JU12 are installed.

CONNECTION TO REGENCY/WILSON MICROCOMM REPEATERS

For: Zetron Model 37
 To: Regency/Wilson Microcomm Repeaters
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	+12 VDC, power supply in repeater
Ground	2	Black	DC ground, power supply in repeater
Discriminator in	3	White	A0 on receiver shield, rec. audio
Ground	4	Braid	No connection
Tx audio	5	Blue	U1 on control board
Ground (spare)	6	---	
PTT	7	Orange	PTT, C6 on control board
Ground	8	Brown	No connection
COR input	9	Yellow	K9 or pin 15 of IC20, SQ indication
CTCSS encode	10	Green	U2 on control board

MODIFICATIONS TO RADIO:

Follow the steps below:

1. Remove jumper between A2 and A3 of P706 if present. This will break the repeat audio path if the station was configured for carrier squelch operation.
2. Remove any CTCSS tone decode boards if present.
3. Move jumper JU702 from P709 (transmit) to the NC (disable) position. This disables repeater PTT while still allowing local and M38 generated PTT.
4. Move jumper JU718 from P707 (tone) to P708 (squelch). This configures the unit as a carrier squelch repeater.
5. A series resistor may be needed in the CTCSS and TX modulation encode lines if loading is noted. Values of 10 to 50 k Ω are typical.

SECTION 5 - INSTALLATION

CONNECTION TO A REPCO DIMENSION REPEATER

For: Zetron Model 37
To: Repco Dimension Repeater
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection / notes
12 volts DC	1	Red	Pin 8, CTCSS barrier strip (13.6 VDC)
Ground	2	Black	Pin 2, CTCSS barrier strip (ground)
Discriminator in	3	White	Pin 1, CTCSS barrier strip (DISC)
Ground	4	Braid	No connection
Tx audio	5	Blue	Pin 4, CTCSS barrier strip (A IN)
Ground (spare)	6	---	
PTT	7	Orange	Pin 4, Tel barrier strip (KEY)
Ground	8	Brown	No connection
COR input	9	Yellow	Pin 7, CTCSS barrier strip (COS), active low
CTCSS encode	10	Green	Pin 3, CTCSS barrier strip (T IN)

REPCO REPEATER CONFIGURATION:

Remove factory tone boards from card slots, and set front panel switches as follows:

TONE = off
LOCAL/RPT = LOCAL

CONNECTION TO A STANDARD RPT10/RPT21

For: Zetron Model 37
 To: Standard RPT10/RPT21
 Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Connection notes
12 volts DC	1	Red	Multitone, pin 4, 13.8 V
Ground	2	Black	Multitone, pin 5, ground
Discriminator in	3	White	Multitone, pin 2, disc
Ground	4	Braid	No connection
Tx audio	5	Blue	Control, pin 9, mic hi
Ground (spare)	6	---	
PTT	7	Orange	Multitone, pin 9, PTT
Ground	8	Brown	Control, pin 6, mic lo
COR input	9	Yellow	Receiver, pin 7, COR
CTCSS encode	10	Green	Multitone, pin 3, tone

CONFIGURATION:

Set the switch on the front of the repeater to "NON-RPT".

SECTION 5 - INSTALLATION

CONNECTION TO A UNIDEN ARU 251 REPEATER

For: Zetron Model 37
To: Uniden ARU 251 repeater (*This is not for ARU 251K*)
Using: 709-7179 Generic radio cable

ZETRON END Function	Pin	Color	RADIO END Accessory jack
12 volts DC	1	Red	Pin 4
Ground	2	Black	Pin 5
Discriminator in	3	White	Pin 1
Ground	4	Braid	No connection
Tx audio	5	Blue	Pin 6
Ground (spare)	6	---	
PTT	7	Orange	Pin 3
Ground	8	Brown	No connection
COR input	9	Yellow	Pin 2
CTCSS encode	10	Green	Pin 9
			Pin 7, audio amp out
			Pin 8, speaker in

RADIO CONFIGURATION:

Follow the steps below:

1. Disconnect the tone encode lead from the exciter at FT18 on the exciter case (leave wire disconnected).
2. Attach a wire from FT18 on the exciter case to pin 9 of the accessory jack. This provides CTCSS encode from the tone panel to the transmitter.
3. Set the control board switch to "Carrier Squelch" position.
4. Set the front panel switches to "Local" and "Monitor".

CONNECTION TO A UNIDEN ARU 251K REPEATER

For: Zetron Model 37
To: Uniden ARU 251K repeater
Using: 709-7179 Generic radio cable

ZETRON END				RADIO END
Function	Pin	Color		Accessory jack
12 volts DC	1	Red	_____	Pin 6
Ground	2	Black	_____	Pin 8
Discriminator in	3	White	_____	Pin 3
Ground	4	Braid	_____	No connection
Tx audio	5	Blue	_____	Pin 7
Ground (spare)	6	---		
PTT	7	Orange	_____	Pin 1
Ground	8	Brown	_____	Pin 8
COR input	9	Yellow	_____	Pin 2
CTCSS encode	10	Green	_____	Pin 9
			<input type="checkbox"/> _____	Pin 4, audio amp out
			<input type="checkbox"/> _____	Pin 5, speaker in

RADIO CONFIGURATION:

Follow the steps below:

1. Disconnect the tone encode lead from the exciter at FT18 on the exciter case (leave wire disconnected).
2. Attach a wire from FT18 on the exciter case to pin 9 of the accessory jack. This provides CTCSS encode from the tone panel to the transmitter.
3. Set the control board switch to "Carrier Squelch" position.
4. Set the front panel switches to "Local" and "Monitor".

6. REPAIR

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IN CASE OF DIFFICULTY

In case of installation difficulty, call the Zetron Model 37 Applications Engineering Department at (206) 820-6363. Engineers are available. Please have the serial number of the unit and/or the Zetron Order number. If the call is made from the installation site by the installer or radio technician, the problem can usually be solved over the phone.

If a problem develops after a unit has been in service for some time, call the Zetron Model 37 Service Department at (206) 820-6363. If the call is made from the installation site by a radio technician, the problem can usually be solved over the phone.

The parts lists for the Model 37 are included in this section to aid installation or repair of the unit.

SERVICE NOTES:

- 1.) If a programmed value is out of range, the default value will be used instead.
- 2.) If the unit gets "locked-up" possibly due to lightening, a DTMF key may be held for greater than 20 seconds to reset the unit. This removes the need to drive to the repeater site to reset the unit.
- 3.) If the audio does not sound correct, perform an audio sweep test by generating an audio signal on the RF input of the repeater (of known deviation), and monitor the repeater output deviation. The deviation should be fairly flat from 300 Hz to 2500 Hz. Try moving jumper JP6 to flatten the response.
- 4.) The "Carrier" LED MUST follow carrier activity on the channel. If it is always off, the Model 37 will not detect CTCSS tones. If it is always on, the Model 37 will usually time out.

The Model 37 Repeaterman is a microprocessor controlled device, which means that the operation can change depending on the software the microprocessor is running. The processor controls the audio repeat path, PTT, STATUS LED, and CTCSS decode.

Microprocessor Operation

To ensure an orderly power on sequence to the microprocessor, U7, the active low Reset signal, is not brought up until the 12-volt supply has stabilized; the zener diode CR2, R44, R62, R66 accomplish this task. The delayed reset also gives crystal Y1 time to stabilize. An additional reset input comes from the long DTMF reset circuitry. This circuit is a fail safe device designed to allow the system operator to reset the unit by keying a DTMF digit for greater than 20 seconds.

SECTION 6 - REPAIR

Database Memory

Database memory includes all the User and System programming values. All of this information must be retained, regardless of how often the unit loses power. The programmable settings are stored in an Electrically Erasable Programmable Read Only Memory, or EEPROM. The EEPROM device stores the user settings.

Input Gain

The input gain from the receiver audio is adjustable by JP3 and R2. The gain amplifier is U2B, which provides the rest of the Model 37 with a known amplitude voltage signal.

CTCSS Decoding

Receiver audio is low pass filtered by U3A to remove the voice component from the CTCSS signal. U3B makes a zero crossing detector which provides the microprocessor with a digital signal. The actual decoding of the CTCSS tones is done inside the microprocessor using Zetron proprietary digital signal processing techniques.

DTMF Decoding

The receiver audio passed thru gain stage is low pass filtered by U2A to remove any high frequency noise from weak signals. Finally the signal is presented to the DTMF decoder chip U11.

CTCSS Encoding

The microprocessor outputs a CTCSS waveform to RP2 which is similar to a Digital-to-Analog converter. The signal is then low pass filtered by U1A to remove any high frequency switching noise. The output level is adjustable from JP2 and R1, and amplified by U1B before going to the radio.

Tone Encoding

Progress tones, such as Morse ID, warning beeps, etc. are generated by the microprocessor. The digital input is converted to an analog signal by RP1, and is low pass filtered by U5B before being summed at the transmit audio junction U5A.

Repeat Audio

The repeat audio is hi pass filtered by U4B to remove the CTCSS encode signal. The microprocessor controls the repeat audio with an analog gate, U10A, and is summed at the transmit audio junction U5A.

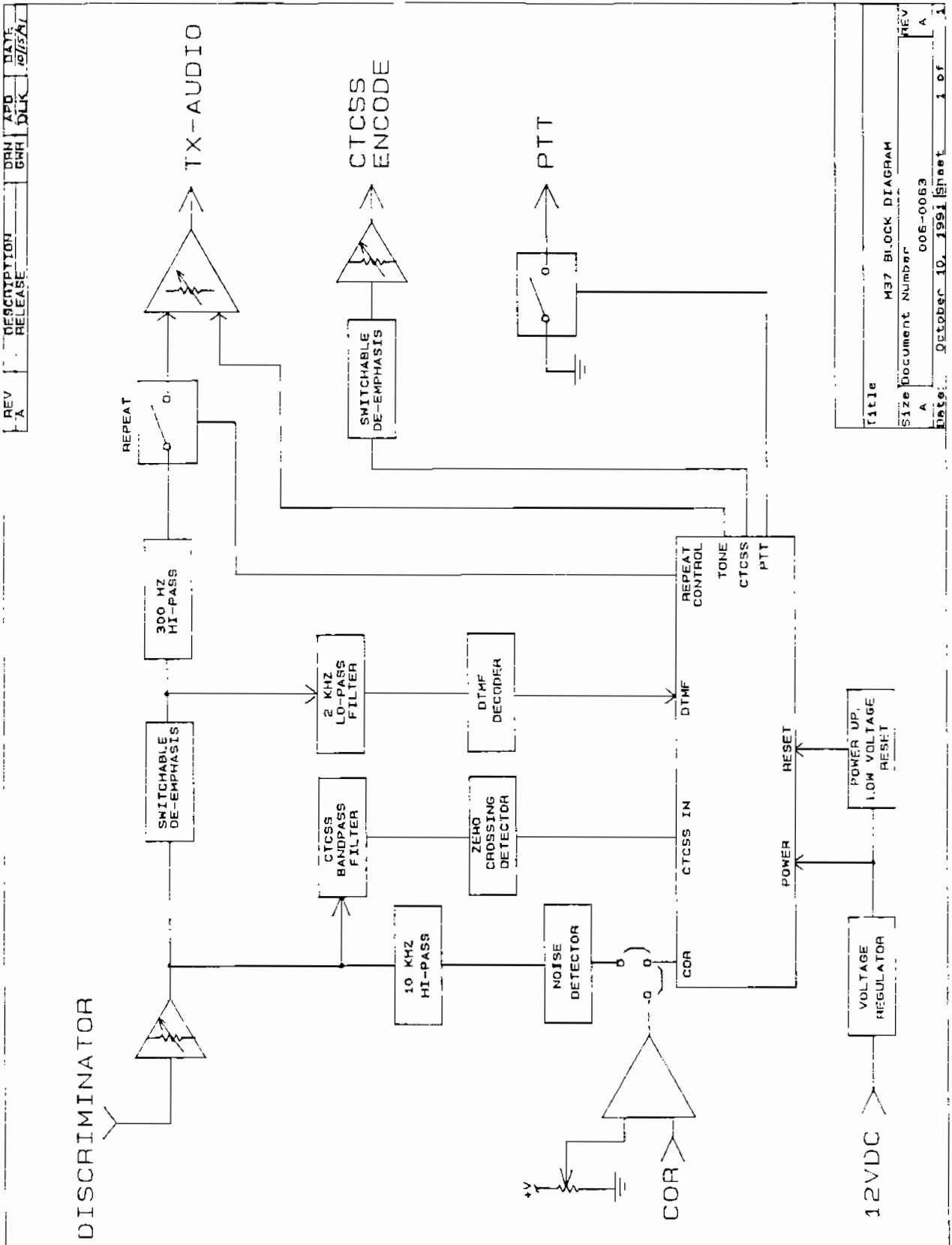
COR Input

When using external COR input, R31 provides input protection, and R30 is an optional pullup to +12 volts. R35 and jumper JP5 control the trigger threshold and polarity respectfully for the comparator, U4A.

Noise Detector

When external COR is not possible, the internal noise detector may be used. The unsquelched discriminator audio is hi-passed filtered by U6A then rectified by CR1. The output then charges C30 with the high frequency component of the signal, and is compared against the voltage between R56 and R57. U9D converts the signal to digital levels for the microprocessor. Jumper JP7 selects between internal COR detect, and external COR.

MODEL 37 SYSTEM BLOCK DIAGRAM (006-0063A)



SECTION 6 - REPAIR

MODEL 37 REPEATERMAN PARTS LIST (901-9241B)

LEGEND:

= NOT INSTALLED

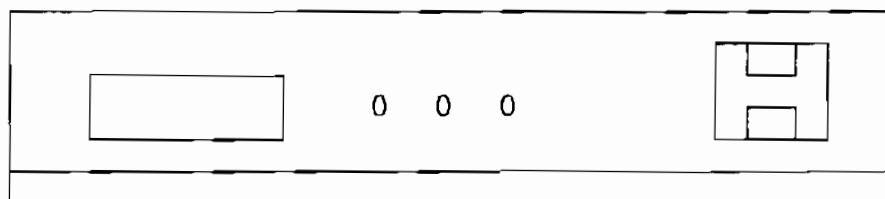
^ = INSTALLED ON HIGHER ASSY

+ = OPTION (INSTALLED PER CUSTOMER ORDER)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	025-9180	M37 MANUAL	PCB
2.	4	220-0108	440x1/4 PAN PHILLIPS	PCB TO BOTTOM
3.	4	220-0199	632x1/4 BLK PAN PHIL	CASE
4.	1	265-0001	TY-WRAP STD	
5.	1	265-0003	STRAIN RELIEF, *NOTE 2	
6.	1	401-0201	10 PIN x .156 HOUSING	BAG (ITEM 14)
7.	10	402-0012	CON PINS TRIFURCON	BAG (ITEM 14)
8.	1	415-9094	DECAL, PART 15 FCC/PN/SN	BOTTOM CENTER
9.	1	415-9523	TOP COVER	
10.	1	415-9524-2	BOTTOM CASE, FIN	
11.	4	431-0006	RUBBER FEET *NOTE 1	
12.	1	449-9000	12x12x8 BOX	
13.	1	449-9020	6x3x15 BAG	
14.	1	449-9042	2x3 PLASTIC BAG	
15.	1	702-9384	MODEL 37 PCB ASSY.	

NOTES:

1. INSTALL FEET 1/8" IN FROM CHASSIS EDGES.
2. INSTALL STRAIN RELIEF OVER PHONE HOLE IN BACK OF CASE BOTTOM.



MODEL 37 REPEATERMAN CONTROL BOARD PARTS LIST (702-9384C)

/ = NOT INSTALLED

^ = INSTALLED ON HIGHER ASSY

+ = OPTION (INSTALLED PER CUSTOMER ORDER)

ITEM	QTY	COMPONENT REFERENCE	PART NO.	DESCRIPTION	MANUFACTURE P/N
1	1	R45	101-0015	3.3 OHM 1/4W 5% CARBON FILM	
2	1	R67	101-0025	10 OHM 1/4W 5% CARBON FILM	
3	1	R23	101-0033	22 OHM 1/4W 5% CARBON FILM	
4	2	R38,R60	101-0047	47 OHM 1/4W 5% CARBON FILM	
5	1	R44	101-0049	100 OHM 1/4W 5% CARBON FILM	
6	5	R61,R64,R72,R73,R74	101-0057	220 OHM 1/4W 5% CARBON FILM	
7	1	R50	101-0059	270 OHM 1/4W 5% CARBON FILM	
8	1	R65	101-0061	330 OHM 1/4W 5% CARBON FILM	
9	3	R15,R16,R47	101-0065	470 OHM 1/4W 5% CARBON FILM	
10	2	R8,R39	101-0066	510 OHM 1/4W 5% CARBON FILM	
11	7	R6,R10,R14,R19,R51,R62, R75	101-0073	1K 1/4W 5% CARBON FILM	
12	1	R24	101-0081	2.2K 1/4W 5% CARBON FILM	
13	1	R43	101-0083	2.7K 1/4W 5% CARBON FILM	
14	1	R29	101-0085	3.3K 1/4W 5% CARBON FILM	
15	1	R22	101-0089	4.7K 1/4W 5% CARBON FILM	
16	1	R56	101-0091	5.6K 1/4W 5% CARBON FILM	
17	3	R17,R18,R59	101-0092	6.2K 1/4W 5% CARBON FILM	
18	1	R5	101-0094	7.5K 1/4W 5% CARBON FILM	
19	5	R13,R63,R66,R68,R79	101-0097	10K 1/4W 5% CARBON FILM	
20	1	R52	101-0103	18K 1/4W 5% CARBON FILM	
21	5	R21,R32,R46,R48,R49	101-0105	22K 1/4W 5% CARBON FILM	
22	3	R11,R25,R26	101-0109	33K 1/4W 5% CARBON FILM	
23	3	R7,R55,R57	101-0113	47K 1/4W 5% CARBON FILM	
24	1	R9	101-0114	51K 1/4W 5% CARBON FILM	
25	2	R36,R41	101-0117	68K 1/4W 5% CARBON FILM	
26	1	R40	101-0119	82K 1/4W 5% CARBON FILM	
27	11	R27,R30,R31,R34,R37,R53, R70,R71,R76,R77,R80	101-0121	100K 1/4W 5% CARBON FILM	
28	1	R58	101-0123	120K 1/4W 5% CARBON FILM	
29	2	R4,R20	101-0131	270K 1/4W 5% CARBON FILM	
30	3	R28,R54,R69	101-0145	1M 1/4W 5% CARBON FILM	
31	1	R78	101-0149	1.5M 1/4W 5% CARBON FILM	
32	1	R33	101-0150	2.7M 1/4W 5% CARBON FILM	
33	1	R3	107-0003	2K POT 1 TURN R/A	3386X-1-202
34	2	R1,R2	107-0015	50K POT 1 TURN R/A	3386X-1-503
35	1	R42	107-0202	2K POT 1 TURN	3386P-1-202
36	1	R35	107-0502	50K POT 1 TURN	3386P-1-503
37	2	RP1,RP2	119-0021	R/2R 100K/200K 10 PIN	RSC10L104G
38	5	C6,C12,C13,C14,C15	150-0096	1000 PF 1KV +-20% CERAMIC DISC	GE-102G
39	2	C3,C26	151-0047	470 PF 50V +-10% CERAMIC, TEMPERATURE STABLE	CW15C471K
40	8	C16,C18,C27,C29,C36,C38, C40,C41	151-0180	.1 UF 50V +-10% CERAMIC, UNSTABLE	AVXSR205E104MAA
41	1	C1	151-0199	.47 UF 50V +-5% POLYESTER	ECQVIH474JZ
42	2	C10,C22	152-0012	.1 UF 50V +-5% POLYESTER	ECQ-V1H104JZ
43	2	C7,C11	152-0050	10 UF 100V NON-POLAR ELECTROLYTIC	UVP2A100MPA

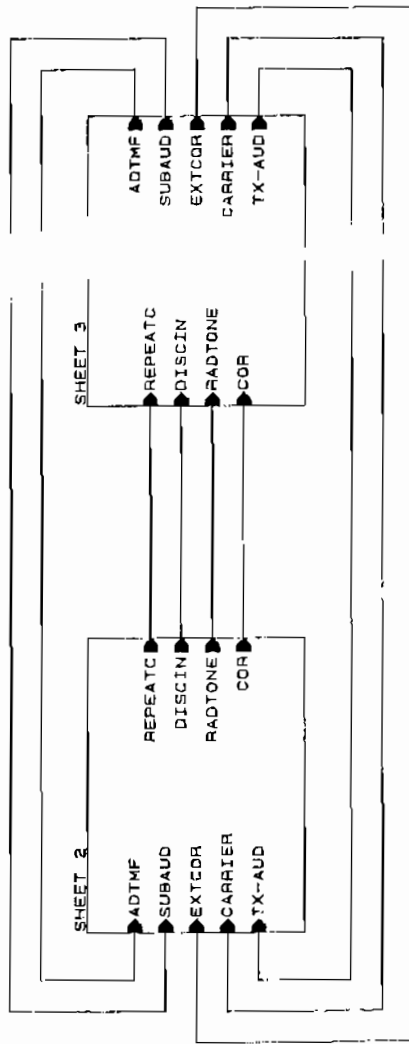
SECTION 6 - REPAIR

MODEL 37 REPEATERMAN CONTROL BOARD PARTS LIST (702-9384C) cont'd

ITEM	QTY	COMPONENT REFERENCE	PART NO.	DESCRIPTION	MANUFACTURE P/N
44	2	C24,C31	152-0080	.22 UF 50V +-5%	ECQ-VIH224JZ
45	5	C4,C9,C23,C34,C35	152-0085	.01 UF 50V +- 5% POLYESTER	ECQ-VIH103JZ
46	1	C5	152-0088	.0047UF 50V +-5% POLYESTER	ECQ-B1H472JZ
47	4	C21,C25,C43,C44	152-0089	.001 UF 50V +-5% POLYESTER	ECQBIH102JZ
48	2	C6,C20	152-0130	.033 UF 50V 5% POLYESTER	ECQ-VIH333JZ
49	2	C2,C42	152-0250	.047 UF 50V POLYESTER	ECQ-VIH473JZ
50	2	C30,C32	154-0025	1 UF 35V TANTALUM	ECS-F-35E1
51	6	C17,C33,C37,C39,C45,C46	154-0100	10 UF 16V TANTALUM	ECS-FICE106K
52	2	C19,C28	155-0083	470 UF 10 VOLT RADIAL ALUMINUM ELECTROLYTIC	ECEA-1AU471
53	4	E1,E2,E3,E4	305-0001	PERRITE BEADS W/ LEADS	11413-3B
54	3	DS1,DS2,DS3	311-0011	LED RED FLUSH	LT741R-81
55	1	DS4	311-0012	LED GREEN FLUSH	TL5G-5201
56	6	U1,U2,U3,U4,U5,U6	316-0358	OP-AMP, DUAL	LM358N
57	1	VR1	316-7805	REGULATOR, +5V 1.5A	LM340T-5
58	1	U11	321-0204	DTMF RECEIVER	75T204
59	1	U7	321-6806	8 BIT CMOS MP 40 PIN DIP	MC68HC705C8
60	1	U8	322-9306	256 BIT SERIAL EEPROM	NM93C06
61	1	U10	323-4053	3PDT SWITCH	MC144053
62	1	U9	324-7414	HEX SCHMIDT	74HC14
63	2	Q1,Q2	340-3904	NPN 40V/200MA	2N3904
64	1	Q3	340-7000	HEX FET	2N7000
65	4	CR1,CR4,CR5,CR6	342-3009	SILICON .50 SP	1N4148
66	1	CR2	343-3100	1W 8.2V +-5% .50 SP	1N4738A
67	1	CR3	343-3110	1W 20V +-5%	1N4747A
68	1	SW1*NOTE 2	371-0024	SPST RA PWB MNT MOM PB *OBSOLETE* DO NOT USE	SKHHL50002
69	1	Y1 *NOTE 1	376-0358	3.58 MHz HC 18 CASE	SKO-DS357
70	1	J1	401-0202	10 PIN X .156 R/A CONN	26-60-5100
71	6	JP1,JP2,JP3,JP4,JP6,JP7	403-0003	3 OP 401-0052	
72	0	P1	403-0004	4 OP 401-0052	
73	1	JP5	403-0202	4 OP 401-0052 [2X2]	
74	1	F1	416-1576	FUSE AGC 1 A	AGC 1
75	8	XJP3,5-7 (POS A) XJP1,2,4 (POS B)	402-3040	MINI JUMPER	
76	7	XU1,XU2,XU3,XU4,XU5,XU6, XU8	407-0008	SKT, 08 PIN DIP	
77	2	XU9,XU11	407-0014	SKT, 14 PIN DIP	
78	1	XU10	407-0026	SKT, 16 PIN DIP	
79	1	XU7	407-0040	SKT, 40 PIN DIP	
80	1	PCB	410-9384C	PCB, M37 CONTROL BOARD	
81	2	XP1	416-3040	FUSE CLIPS	
82	4	XDS1,XDS2,XDS3,XDS4	417-0010	LED MOUNT RA	

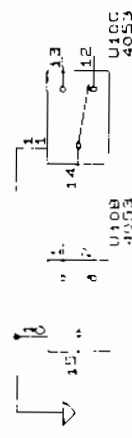
NOTES:

1. SECURE COMPONENT TO BOARD USING 22 GA. BARE WIRE OR EQUIV.
2. BEFORE SWITCH IS INSTALLED, MODIFY TABS.



- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL CAPACITORS ARE IN MICROFARADS
 2. ALL RESISTORS ARE IN OHMS, 1/4W, 5%
 3. ALL POTENTIOMETERS ARE 1 TURN.

UNUS'D PARTS



FGND:

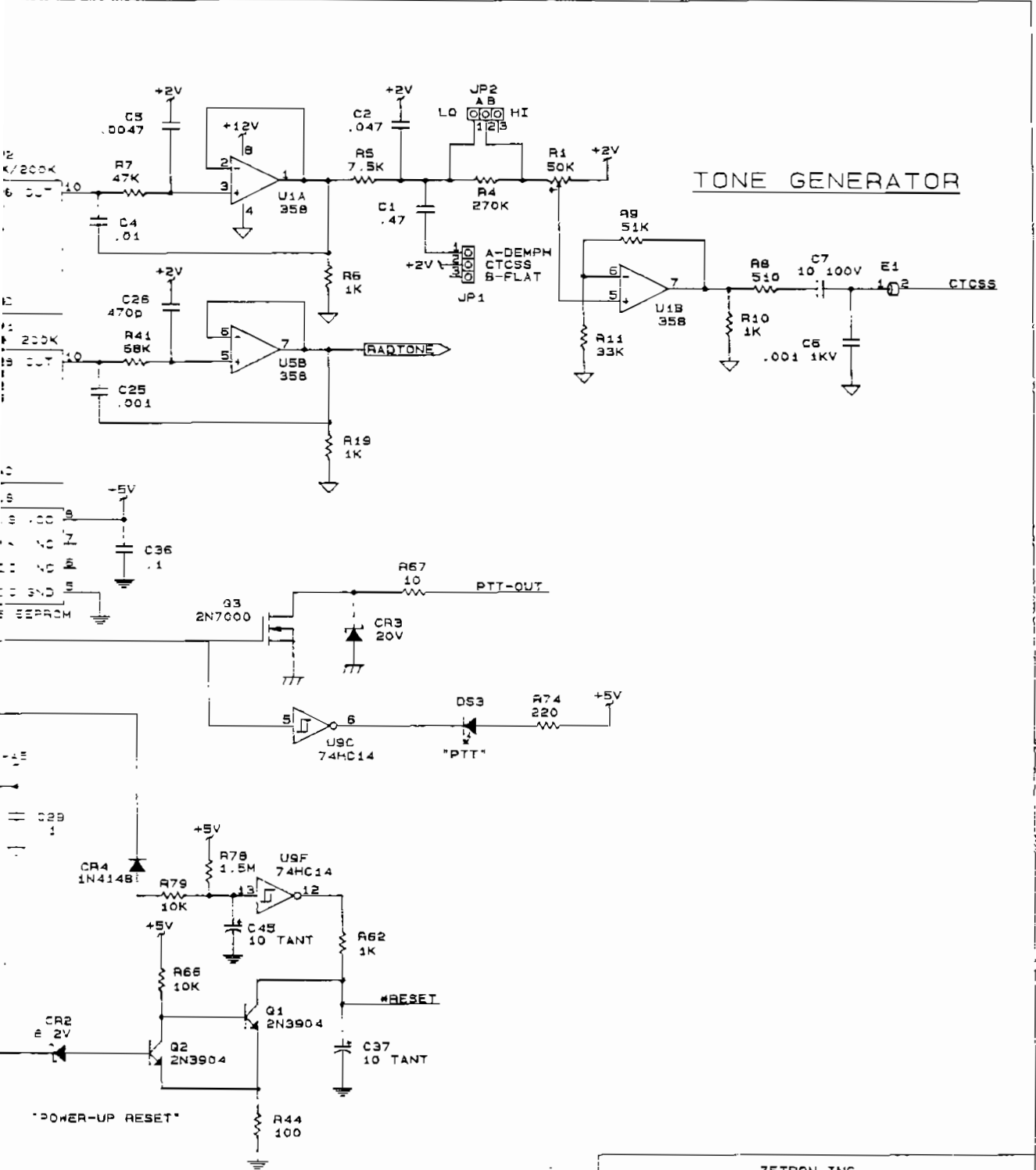
- OPTION, INSTALL PER CUSTOMER ORDER.
- INSTALLED ON MOUNTING ASSEMBLY.
- NOT INSTALLED
- CUT TRACE
- JUMPER WIRE.

ZEIMAN CO
12335 14TH AVE N E
REDMOND, WASHINGTON 98072-0001

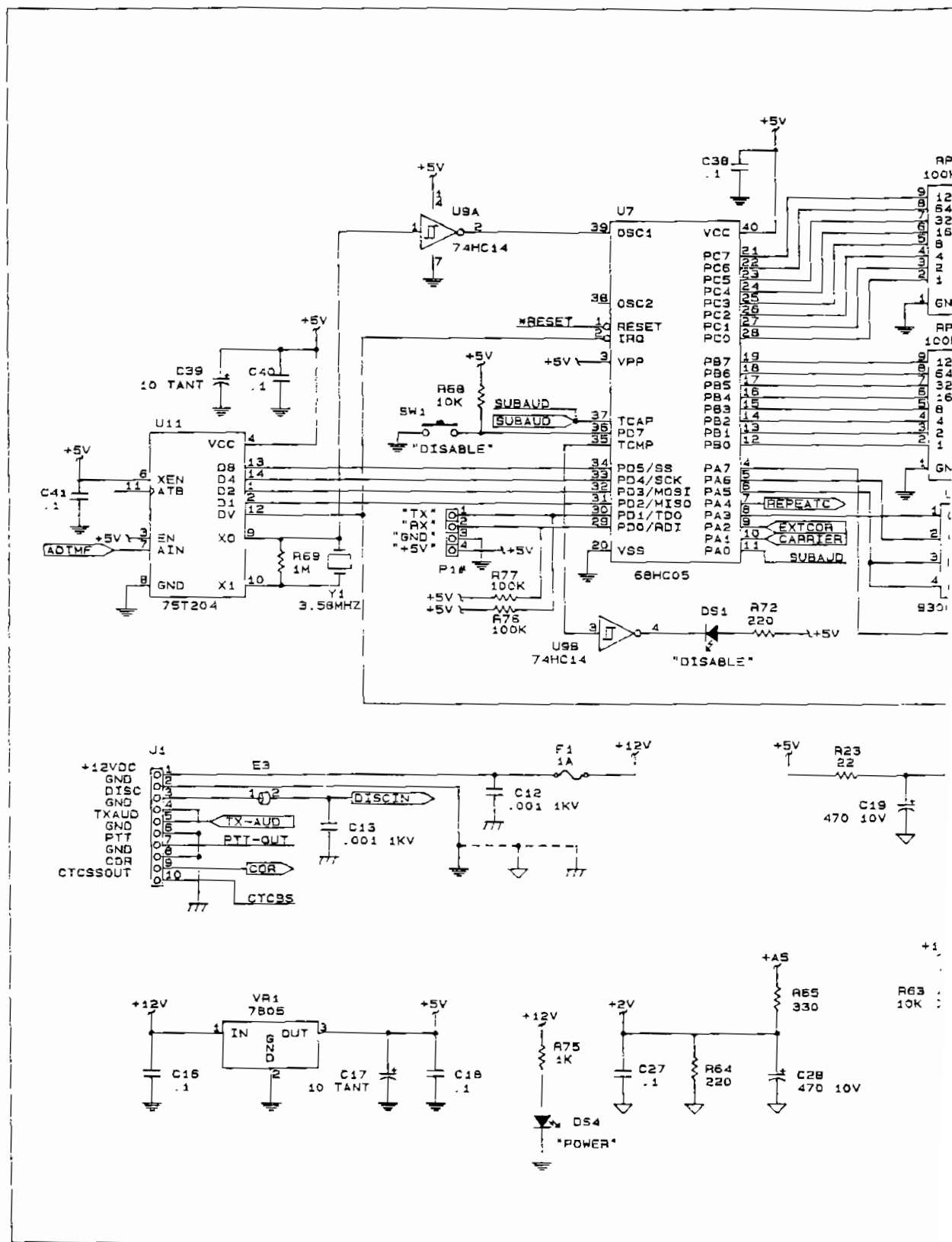
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SECTION 6 - REPAIR

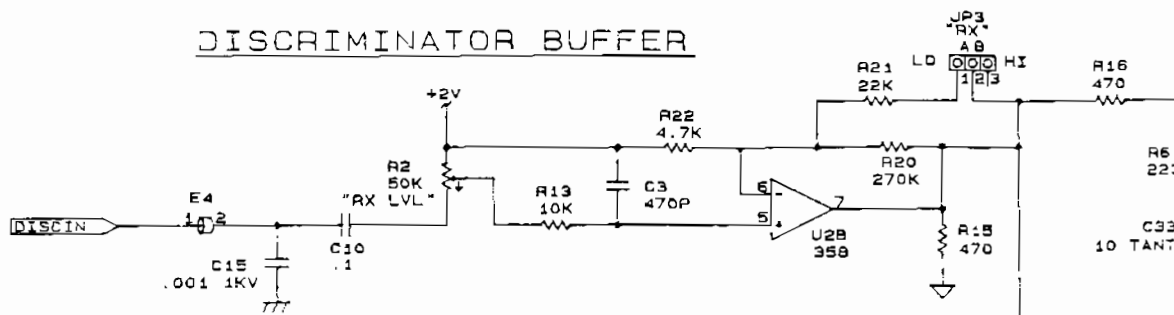
MODEL 37 REPEATERMAN CONTROL BOARD SCHEMATIC (008-9384C) Sht 2 of 3



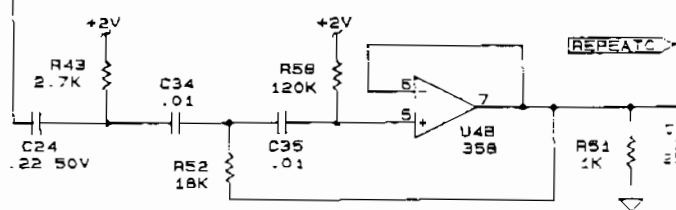
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Size: B	Document Number: 008-9384	REV: C	
Date: October 16, 1991	Sheet: 2 of 3		



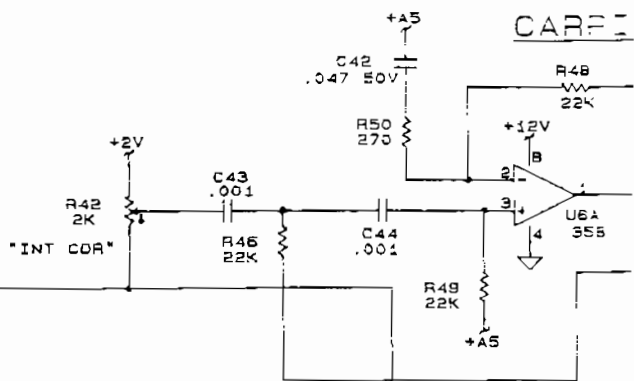
DISCRIMINATOR BUFFER



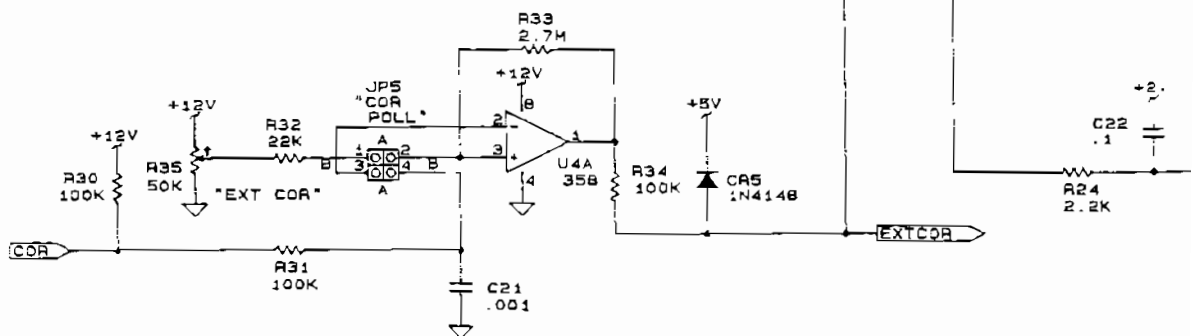
300 HZ HI PASS FILTER



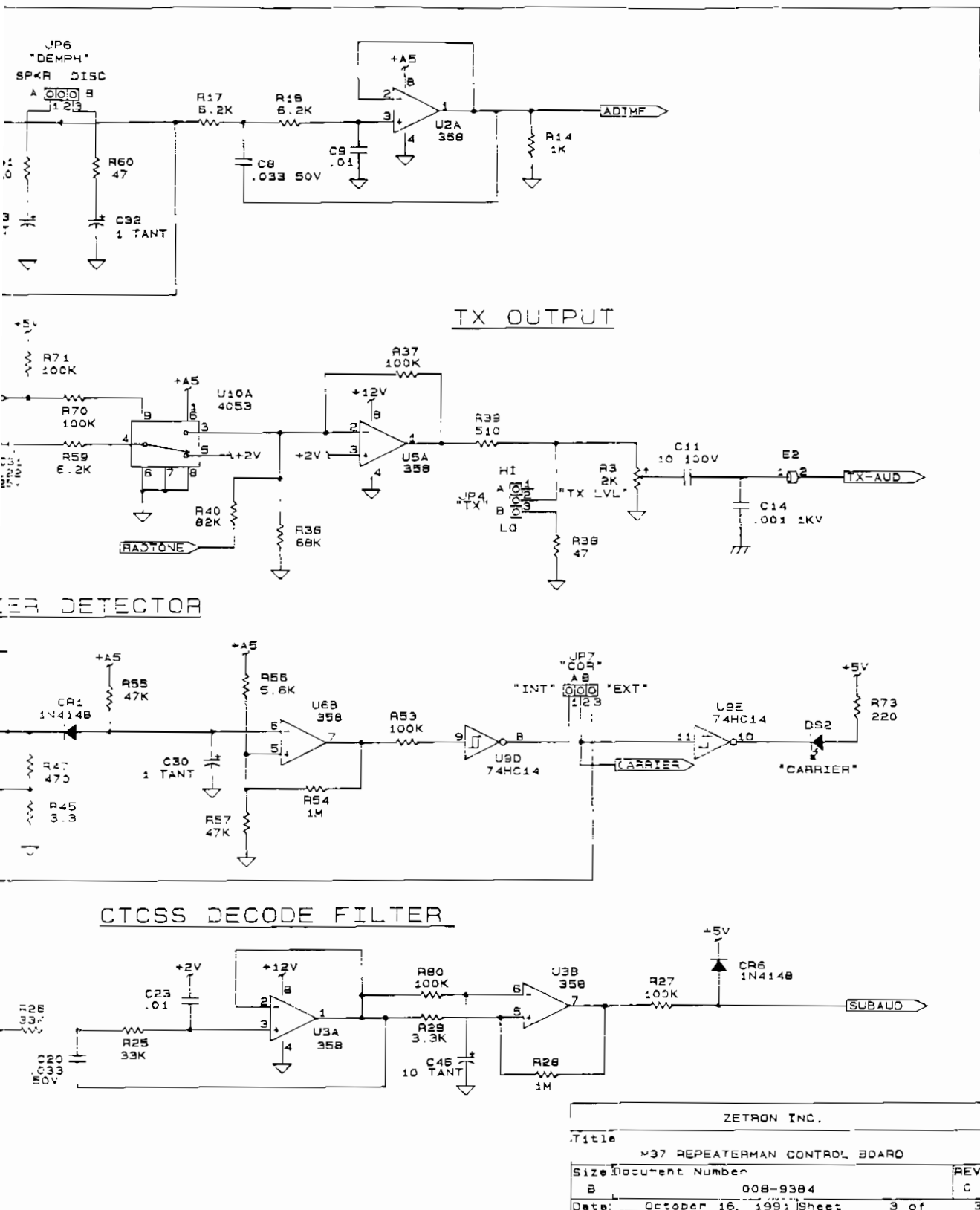
CORRECTION



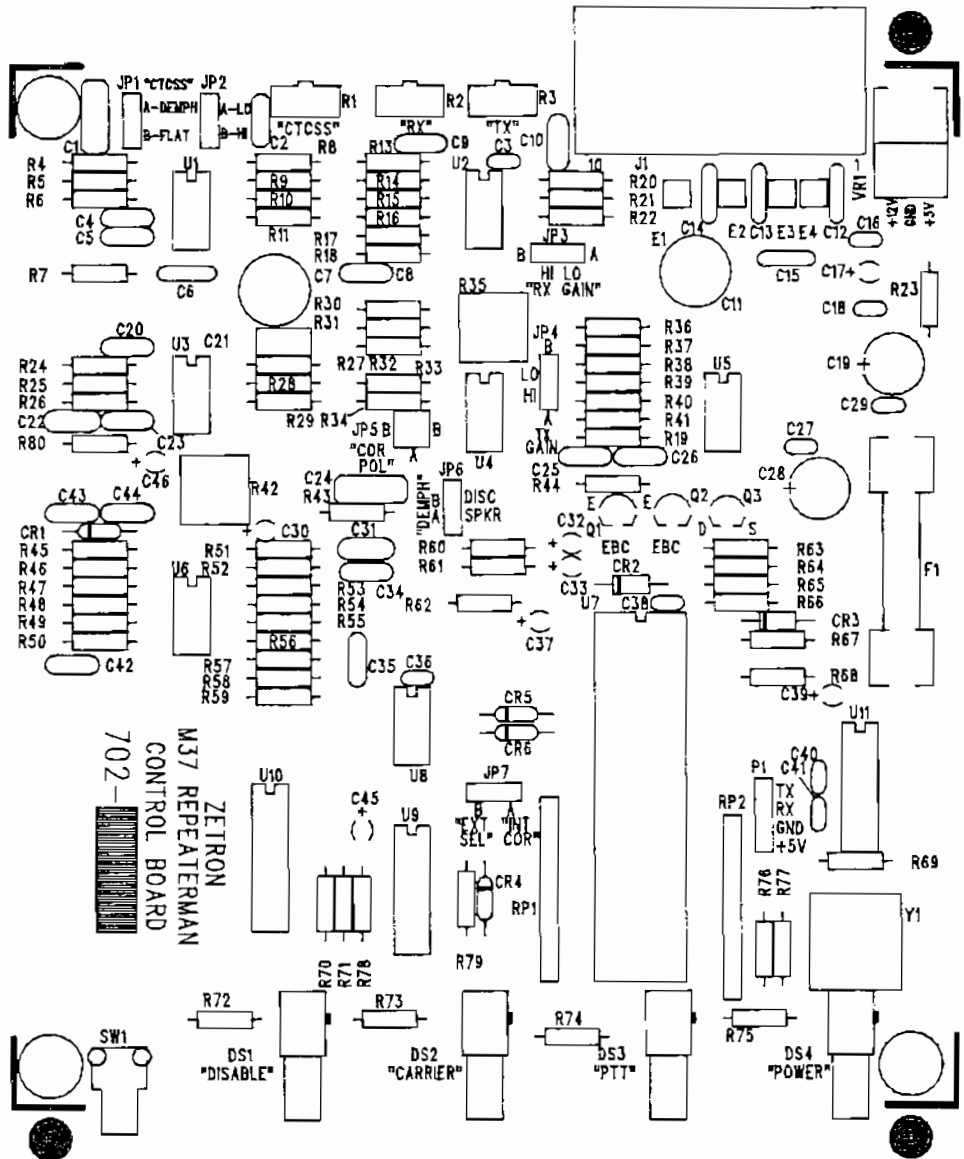
COR INPUT BUFFER



MODEL 37 REPEATERMAN CONTROL BOARD SCHEMATIC (008-9384C) Sht 3 of 3



MODEL 37 REPEATERMAN CONTROL BOARD SILKSCREEN (702-9384C)



PROGRAMMING LOG

Use the following pages as a quick reference for programming commands, and to log all programmed settings for future use. Be sure to log all commands entered into the Model 37!

PROGRAMMING LOG AND QUICK REFERENCE

- 01# [] - Disable Repeater
 02# [] - Enable Repeater (Default)

TRANSMITTER HOLD TIME

- 10# [] - Disable Transmitter Hold Time.
 11# [] - 1 Second Transmitter Hold Time.
 12# [] - 2 Second Transmitter Hold Time. (Default)
 13# [] - 3 Second Transmitter Hold Time.
 14# [] - 4 Second Transmitter Hold Time.
 15# [] - 5 Second Transmitter Hold Time.
 16# [] - 6 Second Transmitter Hold Time.
 17# [] - 7 Second Transmitter Hold Time.
 18# [] - 8 Second Transmitter Hold Time.
 19# [] - 9 Second Transmitter Hold Time.

TRANSMITTER TIMEOUT TIMER

- 20# [] - Disable Transmitter Timeout.
 21# [] - 1 Minute Transmitter Timeout Time.
 22# [] - 2 Minute Transmitter Timeout Time.
 23# [] - 3 Minute Transmitter Timeout Time. (Default)
 24# [] - 4 Minute Transmitter Timeout Time.
 25# [] - 5 Minute Transmitter Timeout Time.
 26# [] - 6 Minute Transmitter Timeout Time.
 27# [] - 7 Minute Transmitter Timeout Time.
 28# [] - 8 Minute Transmitter Timeout Time.
 29# [] - 9 Minute Transmitter Timeout Time.

MORSE CODE ID MODE

- 30# [] - Disable Morse Code Station ID. (Default)
 31# [] - Enable User ID mode.
 32# [] - Enable System ID after activity only.
 33# [] - Enable System ID continuously.

MORSE CODE ID INTERVAL

- 34# [] - ID every 10 Minutes.
 35# [] - ID every 15 Minutes. (Default)
 36# [] - ID every 30 Minutes.
 37# [] - ID every 45 Minutes.
 38# [] - ID every 60 Minutes.
 39# [] - ID every 90 Minutes.

COURTESY TONE

- 40# [] - Disable User 1's Courtesy Tone. (Default)
 41# [] - Enable User 1's Courtesy Tone.
 42# [] - Disable User 2's Courtesy Tone. (Default)
 43# [] - Enable User 2's Courtesy Tone.

SECTION 7 - QUICK REFERENCE

COURTESY TONE FREQUENCY

- 44# [] - 500 Hz Courtesy Tone.
- 45# [] - 1000 Hz Courtesy Tone. (Default)
- 46# [] - 1500 Hz Courtesy Tone.

CARRIER REPEAT MODE

- 50# [] - Disable Carrier Repeat Mode.
- 51# [] - Enable Carrier Repeat Mode. (Default)

CTCSS ENCODE/DECODE

- 52# — — # - User 1's decode CTCSS tone. (Default = 00)
- 53# — — # - User 1's encode CTCSS tone. (Default = 00)
- 54# — — # - User 2's decode CTCSS tone. (Default = 00)
- 55# — — # - User 2's encode CTCSS tone. (Default = 00)

CTCSS ENCODE DURING TRANSMITTER HOLD TIME

- 60# [] - Disable User 1's CTCSS encode during hold time. (Default)
- 61# [] - Enable User 1's CTCSS encode during hold time.
- 62# [] - Disable User 2's CTCSS encode during hold time. (Default)
- 63# [] - Enable User 2's CTCSS encode during hold time.

MORSE ID CALL SIGNS

- 70# - User 1's Morse ID call sign.
- 71# - User 2's Morse ID call sign.
- 72# - System's Morse ID call sign.
- 73# - 22 WPM CW ID RATE (Default)
- 74# - 11 WPM CW ID RATE

- 90# — — — — — # - Program access code (must be 5 digits)
(Default = 12137)

- 91# - Reset all programmable values to the factory defaults.

If for any reason programming mode access is unsuccessful, the unit can be reset by holding the DISABLE button down while turning on the Model 37, and waiting until the STATUS LED starts to blink on and off. The LED will turn on continuously after 2 seconds for a few seconds. After 10 seconds, the LED will start flashing, indicating that all of the program settings are erased, returning the Model 37 to its factory default configuration.

- 92# - Transmit audio test, keys transmitter with 1 kHz tone
- 93# - Pre-emphasis test, keys transmitter and changes test tone with every DTMF digit.
- 94# - Repeat Audio test, keys transmitter and repeat audio.
- 95# - Transmit CTCSS test, keys transmitter with 136.5 Hz CTCSS tone.
- 96# - CTCSS Pre-emphasis test, keys transmitter and changes tone with every DTMF digit.
- 99# - Exit program mode.