Z E T R O N

Model 5 Encoder
INSTRUCTION MANUAL

#025-9099L.2

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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.

TRADEMARKS

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1. INTRODUCTION

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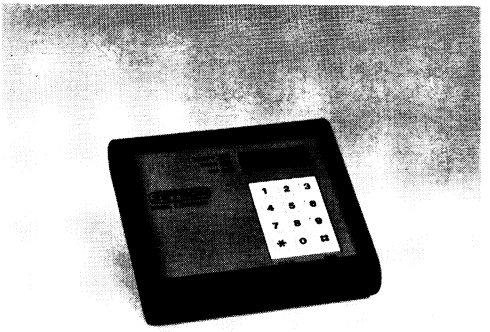

GENERAL

The Zetron Model 5 Encoder is a desktop tone format encoder specifically designed for manually activated selective calling of two-tone and five-tone sequential radio pagers or mobiles. The keypad has 12 keys, labeled 0-9, CLEAR, and PAGE. The display is a four digit LED readout, with individual "Transmit", "Paging", and "Talk" LEDs. Simple connection to a transmitter is accomplished through the "microphone" input connector on most radios. Since the Model 5 has a built-in microphone, both Tone-Only and Tone+Voice pagers may be alerted, and in most cases a separate desk microphone is not required.

The Model 5 can be configured as a single-format or multi-format operation. For multi-format, the use of "leading digits" (the first digit entered) determines the paging format and other operational characteristics. This makes the Model 5 capable of ten (0-9) leading digits which can be set to any format, codeplan, tone group, etc. All settings are keypad programmable and are stored in nonvolatile memory. The programmable items include:

- Paging format (two-tone, five-tone, alert tone only, or disable)
- Tone series, codeplans, tone groups
- Call capacity and leading digit straps
- Diagonal tone or group call
- Diagonal on tone A or B
- Tone timing
- Alert tones (none, 5 beep, warble)
- Programmable voice time for Tone+Voice paging
- Internal or external microphone
- Autopage

FEATURES

* Single or multi-format
  - Ten leading digits for multi-format

* Two-tone paging
  - Selectable call size: 100, 1000
  - Selectable tone timing
  - Selectable group/diagonal, diagonal placement
  - 25 codeplans supported
  - All Motorola/GE tone groups included (14)

* Five-tone paging
  - EIA, CCIR, and ZVEI tones
  - Preamble selectable
  - Selectable strap digits for call size
  - Dual address selectable (none, odd capcodes, or extra digit)
  - Multiple repeats selectable

* Alert tones selectable per leading digit
  - none, 5-beep, warble

* Autopage selectable

* Key-up delay selectable

* Internal microphone with AGC for tone+voice paging
  - Manual PTT for dispatch operation
  - Voice time may be extended via PAGE key

* User-friendly prompts show how many digits to enter

* User programmable from keypad
  - Nonvolatile memory without batteries
  - User friendly prompts

* High quality keypad

* Four-digit LED display

* Transmit, Paging, and Talk indicators

* Busy channel input with indication

* One year warranty

* Optional 240 VAC operation (external transformer)

2. SPECIFICATIONS

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SYSTEM FORMATS	Single format, two-tone or five-tone Multi-format, 10 leading digits Alert tones Disable leading digit
TWO-TONE CAPACITY	100 or 1000 calls per leading digit
FIVE-TONE CAPACITY	2- to 6-digit 100 to 1 million calls per leading digit
AUTO-PAGE	Off or on
KEY-UP DELAY	0 to 2 seconds
ALERT TONES	Five-beep or warble selectable per format
TALK TIME	0 to 59 seconds selectable on/off per leading digit may be extended by holding PAGE key
TALK AUDIO	From internal mic or external source
SYSTEM TESTS	Test tone sequences for transmit setup
LOCAL PTT/MIC	Replaces local microphone AGC for good quality audio
DISPLAY	4-digit 7-segment readout "Transmit", "Paging", and "Talk" indicators
RE-PAGE	Unit holds prior pager number in display for paging again by simply pressing PAGE.

TWO-TONE

TONE GROUPS	Motorola-1,2,3,4,5,6,10,11,A,B,Z GE-ABC
CODEPLANS	Motorola-BCDEFGHJKLMNPQRSTUVWXSTUVWY MT GE-XYZ
TONE TIMING	1st /Gap/ 2nd / Group Call 1.0 / 0 / 3.0 / 8.0 (GE std, Mot std Tone+Voice) 0.4 / 0 / 0.8 / 8.0 (Motorola Tone Only) 1.0 / 0 / 3.0 / 6.0 (NEC-B) 1.0 /.25/ 3.0 / 6.0 (NEC-A) 1.0 / 0 / 1.0 / 4.0 (NEC-C) 0.4 / 0 / 0.8 / 4.0 (NEC-M) 0.5 / 0 / 0.5 / 3.0 (NEC-L) 0.4 / 0 / 0.4 / 3.0 (NEC-D)
DIAGONAL TONE	None (group call), 569.1, 979.1, 742.5
DIAGONAL PLACEMENT	1st Tone or 2nd Tone

FIVE-TONE

TONE SERIES	EIA, CCIR, ZVEI
CALL SIZE	2- to 6-digit entry
PREAMBLE STRAP	0 - 9, or no preamble
FIRST DIGIT STRAP	0 - 9
SECOND DIGIT STRAP	0 - 9
THIRD DIGIT STRAP	0 - 9
DUAL ADDRESS	none, odd capcodes, or enter extra digit
REPEATS	0 to 3

ELECTRICAL SPECIFICATIONS

Frequency Range	250-3500 Hz, ±1.5 dB max. with pre-emphasis compensation
Frequency Accuracy	±0.1%
Audio Output	Ground referred, impedance 600/6 kΩ selectable
Audio Level	Adjustable, -30 dBm to +12 dBm (0-4.4 V pk-pk, adjustable into 600 Ω)
Tone Distortion	2% typical from pure sinewave
Built-in Mic	Low distortion electret
Automatic Gain	Correct transmit level over 30 dB speaking range
PTT Output	Relay contact to ground; 1 A at 48 VDC
Channel Busy input	DC voltage or closure to ground (10 K pull-up); lo < 1.0 volt, hi > 2.5 volts, selectable polarity
Power Supply	DC supply: 11-18 VDC at 350 mA max. Wall transformer: 105-135 VAC, 60 Hz (P/N 815-9015) Wall transformer: 180-250 VAC, 50/60 Hz (P/N 815-9027)
Memory retention	Nonvolatile EEPROM
Operating Temperature	0 to +60 degrees Celsius
Size	2.5"H x 5.5"W x 4.8"D Desktop high impact plastic case
Weight	10 oz.

3. OPERATION

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POWER-ON

Following installation by qualified radio service personnel, turn on power to the encoder. The display should show from one to four dashes (-) starting from the left.

DISPLAY

The display is used to prompt the operator during pager capcode entry. After power-on or pressing the CLEAR key, some dashes will be displayed. The number of dashes indicate the following:

Display	Meaning
--	Prompts for two digits, single format, two-tone, 100-call
---	Prompts for three digits, single format, two-tone, 1000-call
----	Prompts for four digits, single format, five-tone
-	Prompts for leading digit, multi-format

Whenever a dash is shown, additional digits are required before the Model 5 will allow paging.

KEYBOARD

A rugged, conductive rubber, 12-key keypad is built into the Model 5. The buttons are labeled 0-9, *, # with front-panel silkscreening 'CLEAR' next to the * key; and 'PAGE' next to the # key. The 0-9 buttons are used to key in the pager capcode. PAGE will send the paging tones, and CLEAR will clear a partially entered capcode or stop a page in process.

AUTOPAGE

The Model 5 is programmable to start the paging sequence either automatically after the last digit of the pager capcode has been entered (autopage=ON), or only after the PAGE key has been pressed (autopage=OFF). The encoder is shipped with the autopage function OFF to allow the operator to review the pager capcode in the display before sending the page.

AUTOTALK/TALK TIME

After the paging tones have been sent, the encoder can keep the transmitter ON and activate the internal microphone or an external desk microphone may be used in order to send a voice message to a tone+voice pager. The Model 5 is configured for either internal or external microphone. For external microphone talk time, the transmitter will unkey but the "TALK" LED will still light to indicate tone+voice operation.

Autotalk is selected on/off for each format. The duration of talk time (0 to 59 seconds) is set with system programming.

With autotalk ON, the talk time may be extended by holding the PAGE key during the talk time. Shorter voice messages can be terminated by pressing the CLEAR key (the pager capcode will still remain in the display). With [redacted] the transmitter is turned off immediately after sending the paging tones.

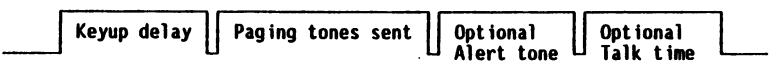
ALERT TONES

After the paging tones have gone out, an optional alert tone may be sent. This is helpful for tone+voice systems where a prompt tone is necessary to allow the user time to get the pager up to ear level before the voice message is sent. [redacted]

PLACING A PAGE

Enter a pager capcode on the keypad. As the digits are entered, they roll to the left, filling in the display. When the last digit is entered, press the PAGE key to send the page (with autopage ON, the PAGE key is not needed). The encoder will automatically

* Turn on the transmitter by closing the push-to-talk (PTT) relay contact outputs.
* Wait the key-up delay (for transmitter power-up)
* Send the paging tones with the "PAGING" LED lit.
* Send alert tone if selected.
* Prompt for talk time if selected (TALK LED lights). Speak your voice message at this time.
* Turn off the transmitter by opening the PTT relay.
* Repaging may be done just by pressing the PAGE key.



REPAGE

To send to that pager again (repage), just press the PAGE key. The Model 5 will automatically go through the entire paging cycle again.

BUSY CHANNEL

The Model 5 has provision for automatically monitoring whether the radio channel is busy or not before sending the page. If the busy channel input is connected, the Model 5 will wait for 3 seconds of clear channel before transmitting the page. If the channel is busy when the page key is pressed, the display will show a moving decimal point. To abort the page, simply press the CLEAR key.

DISPATCH OPERATION

The Model 5 may be used in place of a desk microphone for dispatch operation (normal voice communications). To use the Model 5 as a microphone, press the CLEAR key if any numbers are present in the display (only dashes should be shown), then simply use the PAGE key for push-to-talk. The built-in electret microphone incorporates automatic gain control for quality talk audio even when speaking many feet away from the encoder.

4. INSTALLATION

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INSTALLATION WARNING

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with this manual and commonly used radio practices, it may cause interference to radio communications. Installation of the Zetron Model 5 Encoder should be accomplished by personnel with experience in radio and paging systems.

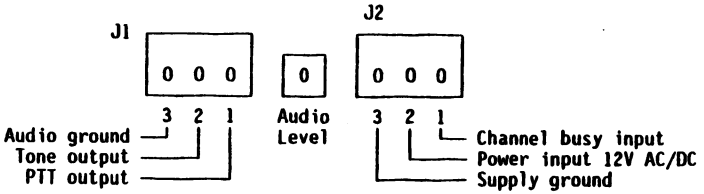
REQUIRED EQUIPMENT

Required equipment for proper Model 5 installation include: communications service monitor, dummy load, VOM, soldering iron, and assorted hand tools.

INTERFACE CONNECTOR

Connections between the encoder and customer's radio equipment are made with the screw terminal strips inside the case of the encoder. Each connection on the terminal strip is numbered and described below. For desk mount operation, the connections can be made without opening the case. For wall mount operation, remove the bottom cover and give it a one half turn. Mounting holes are available inside the bottom cover for wall hanging. For most applications the Model 5 may be interfaced through the microphone connector on the transmitter (except the power connection).

Screw terminals (from bottom side):



Point	Signal	Function
J1-3	AUDIO GROUND	System ground for terminating all cable shields and signal grounds.
J1-2	TONE OUTPUT	Tone output from encoder tone generator, open circuit when not in transmit.
J1-1	PTT OUTPUT	Dry contact, closure to ground during transmit.
J2-3	SUPPLY GROUND	AC pair or DC ground.
J2-2	POWER INPUT	Fused power supply input 12 volts AC/DC paired with pin 3.
J2-1	CHANNEL BUSY	Input from receiver carrier indicator

INSTALLATION PROCEDURE

1. Plug in the wall transformer (main supply) and verify the Model 5 powers up properly with TRANSMIT, PAGING, and TALK LEDs off, and at least one dash (-) in the display. The rightmost decimal point should light with each key depression.

2. After verifying proper operation, remove power and continue with cable connections (following). It is recommended that shielded cabling be used on all audio connections between the encoder and radio. It is advisable that one primary point be chosen as a system ground point and that all signal grounds be returned to this 'unipoint' ground to reduce ground-loop noise. This is especially important when low-level non-preamp microphone circuitry is being used. Connect the encoder ground, J1 pin 3, to the system ground point.

3. Locate the push-to-talk connection in the radio transmitter. When this wire is shorted to ground the transmitter should activate. Connect this lead to J1 pin 1. The Model 5 has a relay contact closure to ground to key up the transmitter.

4. Locate the transmit audio connection in the radio transmitter. Connect a shielded wire to J1 pin 2, Model 5 audio output. Connect the shield to J1 pin 3. This connection is open circuit when the Model 5 is not transmitting, to prevent loading of external microphone or other audio.

5. If monitor before transmit is required, connect a wire from the receiver carrier indicator, sometimes called CAS, RUS, or BUSY, to J2 pin 1. The busy signal must switch from lower than 1.0 volt DC to higher than 2.5 volts DC for proper operation. The polarity of this signal can be either active high or low. Set internal jumper JP2 to position "A" if channel busy goes low (less than 1 volt), or position "B" if channel busy goes high (2.5 to 12 volts).

   * * * * * * * * * * * * * * * NOTE * * * * * * * * * * * * * * *

   Channel busy (the Model 5 is waiting to page) is indicated by a moving decimal point.

   *

6. The Model 5 can be used with an optional external 9 volt AC wall transformer. If 12 volt DC operation is preferred, remove the 12 volt AC connection on J2 pins 2 and 3, then connect +12 volts DC to J2 pin 2, and Ground to J2 pin 3.

ADJUSTMENT PROCEDURE

1. To adjust the Model 5, first power on the unit. Then enter the programming mode by pressing and holding the * key, then also pressing and holding the 3 key continuously until the display indicates program mode access by showing the first two dashes and three decimals lit. The fourth decimal lights after the * and 3 are released (display shows [-.-. . .]).

2. Enter 93 and press the PAGE key. If the display shows a moving decimal point, either the channel is busy, or the channel busy jumper is in the wrong position.

3. The transmitter should key and the display should show [A.1.1..], then [A.7.7..], and then [A.9.9..]. Verify that the transmitter keys on and off after the "TRANSMIT" LED lights on the Model 5 front panel.

4. Monitor the channel deviation with a service monitor or deviation meter. Using the audio level adjustment control on the bottom of the Model 5, set the channel deviation to seventy percent of the maximum allowable deviation (3.5 kHz for most systems).

   If the level seems too high, remove JP1 (next to the audio level adjustment), then readjust the level.

5. Verify all three test tones (288, 1007, and 2468 Hz) are close to the same deviation.

   The Model 5 paging tone output is de-emphasized to counteract the pre-emphasis in the microphone circuit of the transmitter. This provides "flat" paging tones on the channel; low frequency paging tones should be at the same deviation as high frequency paging tones. Otherwise, pagers on low tone groups may have too low of deviation to decode, and pagers on high tone groups may cause overmodulation distortion, and also not decode. The built-in microphone audio from the Model 5 (for talk-time) is presented "flat" to the transmitter, so that it will be pre-emphasized on the channel just like normal mic audio.

6. Test the built-in microphone by pressing the CLEAR key twice, the test tones should stop, and the display should show [---]. Press and hold the PAGE key while talking. The channel deviation should be from 50 to 100 percent of maximum allowable. NOTE: The voice audio circuit incorporates an automatic gain control for high quality voice messages from up to 6 feet away from the encoder. It is not necessary to speak directly into the Model 5.

7. If channel busy is connected, supply carrier on the receiver frequency, then enter 123 and press the PAGE key. The display should show a moving decimal point. After removing the carrier for three seconds, the transmitter should key and paging tones sent.

OPENING THE ENCODER

Normally the Model 5 should not require opening. However, for some applications, a jumper may need to be moved inside the Model 5. The bottom cover of the encoder is retained by four self-tapping screws at the upper and lower edges of the case. Place the unit face down on a table top, remove the screws, and lift off the bottom cover. The component side of the circuit board including the transmitter interface connector and jumpers will be exposed.

JUMPER SETTINGS

There are user-configurable jumpers on the circuit board. Generally these are set properly at the factory and require no modification by the installer.

Jumper	Meaning	Factory Setting
JP1	IN =low output impedance OUT=high output impedance	IN
JP2	A=Channel busy active low B=Channel busy active high	A

INSTALLATION PROGRAMMING

The Model 5 is a very flexible paging encoder with operation determined by keypad programming.

Before programming the Model 5, you need to answer the following questions:

1. Do you want single format or multi-format operation?
2. Do you want pages to go out automatically after entering the last digit of the capcode?
3. How long do you want the keyup delay to be?
4. Are you doing tone+voice or tone-only paging?
5. If you are doing tone+voice paging, how long will the voice messages be?
6. Will you use the internal microphone or connect an external microphone?
7. Are you using two-tone or five-tone?
8. For two-tone, are you using 100-call or 1000-call?
9. If you want an alert tone sent out, do you want a five-beep or warble alert?
10. Which tone group(s)/codeplans have the tones you need?
11. What tone timing do you need to support?
12. Which group call format do you want?

For information about these selections, refer to the following subsections on the programming mode, commands, and factory-set defaults. The last subsection in this section presents an example of programming a Model 5.

See Section 6 for a summary of charts and programming commands. Use the Model 5 Configuration Log in Section 6 to record your unit's settings.

Program Mode
The programming is done via primary commands and sub-commands. The primary commands are entered with one- or two-digit numbers, followed by the PAGE key. The sub-commands are entered with one- or two-digit numbers which are displayed on the right-hand side of the display. A sub-command prompt is displayed on the left side of the display. After the sub-command is entered, press the PAGE key. If invalid or out-of-range data is entered, the Model 5 will flash the illegal data entry twice, then redisplay the current setting.

The CLEAR key is used to exit from a command sequence, or exit from the programming mode. If the Model 5 displays a primary command, the CLEAR key returns the unit to the enter primary command mode (display shows [-.-. . .]). If the Model 5 is in the command entry mode, the CLEAR key returns the unit to the normal operational mode.

The PAGE key will step through the programming sub-commands to view or change settings. It acts as an ENTER key: it saves your entry and moves to the next command.

To access the programming mode, power on the unit, press and hold the * key, then also press and hold the 3 key continuously until the display indicates program mode access by showing the first two dashes and three decimals lit (this takes about 3 seconds). The fourth decimal lights after the * and 3 keys are released (display shows [-.-. . .]).

There are three basic types of primary commands in the Model 5:

Set Leading Digit: The single digit commands 0 through 9 are used to assign various paging formats to the leading digits. When the encoder is set to operate in the multi-format mode, the first digit entered by the operator is used select the preset format programming for an entire block of pagers. The remaining digits entered simply fill out the rest of the cap code. If the encoder is set to single format operation, then only command 0 has any function.

System Programming: This group of five commands (01 through 05) is accessed by first entering 80 and pressing PAGE. These commands affect the overall function of the encoder. Command 01 sets the encoder for either single format or multi-format operation.

Setup Testing: This group of four commands (90 through 93) provides various types of test tones for the technician installing the encoder to use while setting transmit deviation levels.

Primary Commands
The primary commands are entered when the Model 5 prompts with [-.-. . .]. The commands are one- or two-digit numbers, followed by the PAGE key. The available commands are:

Cmd	Primary command function
0	Set function of single format encoder, or leading digit 0
1	Set function of leading digit 1, for multi-format operation
2	Set function of leading digit 2, for multi-format operation
3	Set function of leading digit 3, for multi-format operation
4	Set function of leading digit 4, for multi-format operation
5	Set function of leading digit 5, for multi-format operation
6	Set function of leading digit 6, for multi-format operation
7	Set function of leading digit 7, for multi-format operation
8	Set function of leading digit 8, for multi-format operation
9	Set function of leading digit 9, for multi-format operation
80	System programming items that alter total operation
90	Setup test tone, 288 Hz (displays [A.1.1. .])
91	Setup test tone, 1007 Hz (displays [A.7.7. .])
92	Setup test tone, 2468 Hz (displays [A.9.9. .])
93	Setup test sequence; 288, 1007, 2468 Hz + PTT cycle

When a primary command is entered, the Model 5 will prompt with a sub-command number on the left side of the display. This informs the user as to which sub-command is being selected. System programming sub-commands are 01 through 05. Single format and multi-format sub-commands are 10 through 12. Two-tone paging format sub-commands start with 20 (2 as in two-tone), and five-tone paging format sub-commands start with 50 (5 as in five-tone).

System Programming Command 80
To program the system, access the following system sub-commands by first entering the primary command "80" followed by pressing the PAGE key. The command prompts, 01. through 05., will be displayed in sequence as shown below:

Cmd	Function	Data (n)
01. n	Single or multi-format	0 = Single format 1 = Multi-format (leading digit 0-9)
02. n	Autopage	0 = Off 1 = On
03.nn	Keyup delay	0 - 20, x 0.1 seconds (e.g., 12=1.2 sec)
04.nn	Talk time duration	0 - 59, seconds
05. n	Talk audio source	0 = Use built-in microphone 1 = Use external desk mic

To program a sub-command, first make sure the display shows the correct prompt for the sub-command, then enter a legal data entry and press the PAGE key. If the value on the right-hand side of the display does not need to be changed, just press the PAGE key.

With the autopage function on, the page will go out after the last digit of the capcode. With the autopage function off, the page will go out when the PAGE key is pressed.

The keyup delay should be set to at least 1 second (enter 10 and press the PAGE key) to allow the transmitter to come to full power before sending the pager tones.

After programming the system sub-commands, the display again shows
[-.-. . .]

Single Format and Multi-Format Programming
If you are installing the Model 5 to work in conjunction with or to replace other encoders, refer to the Encoder Format Cross-Reference table in Section 6.

At this point (the display still shows [-.-...]), enter 0 for single format operation, or enter 0 through 9 (this digit is called a leading digit and tells the Model 5 which format to use) for multi-format operation. Then press the PAGE key.

* * * * * * * * * * * * * * * N O T E * * * * * * * * * * * * * * * * * *

The following sub-command prompts and legal data entries depend on previous entries.

* *

Cmd	Function	Data (n)
10. n	Format select	0 = Disable leading digit 1 = two-tone, 100 call (tone groups) 2 = two-tone, 1000 call (codeplans) 3 = five-tone 4 = alert tone only
11. n	Talk enable	0 = Off, no talk time, Tone Only pager 1 = On, for Tone+Voice pagers
12. n	Alert tone	0 = No alert tone after paging tones 1 = five-beep 2 = warble

To program a sub-command, first make sure the display shows the correct prompt for the sub-command, then enter a legal data entry and press the PAGE key. If the value on the right-hand side of the display does not need to be changed, just press the PAGE key.

The following prompts will depend upon what format has been selected with sub-command 10 above.

Two-Tone, 100-Call Format
If sub-command 10 is set to 1 (two-tone, 100 call), the following sub-command prompts are displayed.

Cmd	Function	Data (n)
20.nn	First tone group	1 - 14, Zetron Group No. from Table 4-1
21.nn	Second tone group	1 - 14, Zetron Group No. from Table 4-1
22. n	Tone timing	0 - 7, Timing from Table 4-2
23. n	Group call	0 = Group call, extended tone 1 = Diagonal tone for first tone "A" 2 = Diagonal tone for second tone "B"

Table 4-1. Two-Tone, 100-Call Tone Group Chart

Zetron Group No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Manufacturer Tone Group	Mot 1	Mot 2	Mot 3	Mot 4	Mot 5	Mot 6	Mot A	Mot B	Mot Z	GE A'	GE B'	GE C'	Mot 10	Mot 11
Tone Number 0	330.5	569.1	1092.4	321.7	553.9	1122.5	358.9	371.5	346.7	682.5	652.5	667.5	1472.9	1930.2
1	349.0	600.9	288.5	339.6	584.8	1153.4	398.1	412.1	384.6	592.5	607.5	712.5	1513.5	1989.0
2	368.5	634.5	296.5	358.6	617.4	1185.2	441.6	457.1	426.6	757.5	787.5	772.5	1555.2	2043.8
3	389.0	669.9	304.7	378.6	651.9	1217.8	489.8	507.0	473.2	802.5	832.5	817.5	1598.0	2094.5
4	410.8	707.3	313.0	399.8	688.3	1251.4	543.3	562.3	524.8	847.5	877.5	862.5	1642.0	2155.6
5	433.7	746.8	953.7	422.1	726.8	1285.8	602.6	623.7	582.1	892.5	922.5	907.5	1687.2	2212.2
6	457.9	788.5	979.9	445.7	767.4	1321.2	668.3	691.8	645.7	937.5	967.5	952.5	1733.7	2271.7
7	483.5	832.5	1006.9	470.5	810.2	1357.6	741.3	767.4	716.1	547.5	517.5	532.5	1781.5	2334.6
8	510.5	879.0	1034.7	496.8	855.5	1395.0	822.2	851.1	794.3	727.5	562.5	577.5	1830.5	2401.0
9	539.0	928.1	1063.2	524.6	903.2	1433.4	912.0	944.1	881.0	637.5	697.5	622.5	1881.0	2468.2
Diagonal	569.1	979.9	569.1	569.1	979.9	979.9	979.9	979.9	979.9	742.5	742.5	742.5	none	none

For sub-commands 20 and 21, enter a Zetron Group Number (1 through 14) from Table 4-1.

Table 4-2. Two-Tone Timing Chart (100-/1000-Call) (in seconds)

Timing	1st	Gap	2nd	Group Call	Type
0	1.0	0	3.0	8.0	GE std, Mot std Tone+Voice
1	0.4	0	0.8	8.0	Motorola Tone Only
2	1.0	0	3.0	6.0	NEC-B
3	1.0	.25	3.0	6.0	NEC-A
4	1.0	0	1.0	4.0	NEC-C
5	0.4	0	0.8	4.0	NEC-M
6	0.5	0	0.5	3.0	NEC-L
7	0.4	0	0.4	3.0	NEC-D

For sub-command 22, enter the timing number from Table 4-2. The group call time is the number of seconds that a single tone (group call) is sent out.

Two-Tone, 1000-Call Format
If sub-command 10 is set to 2 (two-tone, 1000 call), the following sub-command prompts are displayed.

Cmd	Function	Data (n)
20.nn	Codeplan	0 - 24, Zetron Codeplan No. from Table 4-3
21. n	Tone timing	0 - 7, Timing from Table 4-2
22. n	Group call	0 = Group call, extended tone 1 = Diagonal tone for first tone "A" 2 = Diagonal tone for second tone "B"

Table 4-3. Two-Tone, 1000-Call Codeplan Chart

Zetron Codeplan No.	0	1	2	3	4	5	6	7	8	9	10	11	12
Manufacturer Codeplan	Mot B Groups	Mot C Groups	Mot D Groups	Mot E Groups	Mot F Groups	Mot G Groups	Mot H Groups	Mot J Groups	Mot K Groups	Mot L Groups	Mot M Groups	Mot N Groups	Mot P Groups
Pager Capcode 0xx	2+4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4+2	4+2	4+2
1xx	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	2+3	2+3	2+3
2xx	2+2	2+2	2+2	2+2	1+3	1+3	1+3	1+4	1+4	1+5	2+2	2+2	2+2
3xx	3+3	1+2	1+2	1+2	3+3	3+3	3+3	4+1	4+1	5+1	3+3	3+3	3+3
4xx	1+2	4+4	1+5	2+1	4+4	3+1	3+1	4+4	4+4	1+6	4+4	3+2	3+2
5xx	1+3	1+4	5+5	1+6	3+1	5+5	1+6	5+5	1+6	5+5	3+2	5+5	2+6
6xx	2+1	2+1	2+1	6+6	1+4	1+5	6+6	1+5	6+6	6+6	2+4	2+5	6+6
7xx	3+1	4+1	5+1	6+1	4+1	5+1	6+1	4+5	6+1	6+1	4+2	5+2	6+2
8xx	2+3	2+4	2+5	2+6	3+4	3+5	3+6	5+4	4+6	5+6	3+4	3+5	3+6
9xx	3+2	4+2	5+2	6+2	4+3	5+3	6+3	5+1	6+4	6+5	4+3	5+3	6+3
Groups	1,2,3,4	1,2,4	1,2,5	1,2,6	1,3,4	1,3,5	1,3,6	1,4,5	1,4,6	1,5,6	2,3,4	2,3,4,5	2,3,4,6

Zetron Codeplan No.	13	14	15	16	17	18	19	20	21	22	23	24
Manufacturer Codeplan	Mot Q Groups	Mot R Groups	Mot S Groups	Mot T Groups	Mot U Groups	Mot V Groups	Mot W Groups	Mot Y Groups	Mot MT Groups	GE X Groups	GE Y Groups	GE Z* Groups
Pager Capcode 0xx	4+2	4+2	4+2	4+2	4+2	4+2	4+2	N/A	4+2	A'+A'	B'+B'	A'+A'
1xx	2+4	2+4	2+5	3+4	3+4	3+5	4+6	A+A	1+1	B'+A'	C'+B'	C'+A'
2xx	2+2	2+2	2+2	4+3	4+3	5+3	6+4	B+B	2+2	B'+B'	C'+C'	C'+C'
3xx	4+2	4+2	5+2	3+3	3+3	3+3	5+6	Z+Z	1+2	A'+B'	B'+C'	A'+C'
4xx	4+4	4+4	2+6	4+4	4+4	3+6	4+4	A+B	4+4	C'+C'	N/A	N/A
5xx	5+5	2+6	5+5	5+5	3+6	5+5	5+5	A+Z	5+5	C'+A'	N/A	N/A
6xx	2+5	6+6	6+6	3+5	6+6	6+6	6+6	B+A	2+1	C'+B'	N/A	N/A
7xx	4+5	6+2	6+2	4+5	6+3	6+3	4+5	Z+A	4+5	A'+C'	N/A	N/A
8xx	5+4	4+6	5+6	5+4	4+6	5+6	5+4	B+Z	5+4	B'+C'	N/A	N/A
9xx	5+2	6+4	6+5	5+3	6+4	6+5	6+5	Z+B	2+4	N/A	N/A	N/A
Groups	2,4,5	2,4,6	2,4,5,6	2,3,4,5	2,3,4,6	4,5,6	2,4,5,6	A,B,Z	1,2,4,5	A',B',C'	B',C'	A',C'

* G.E. 100-call plan Z is tone groups C'+C'; use 100-Call programming. For capcodes ending in double-digits using tone group twice (for example: 122 in code plan C), use diagonal as one of the tones.

For sub-command 20, enter a Zetron Codeplan Number (0 through 24) from Table 4-3.

Five-Tone Format
If sub-command 10 is set to 3 (five-tone format), the following sub-command prompts are displayed.

Cmd	Function	Data (n)
50. n	Tone series/timing	0 = EIA, see Table 4-4 1 = CCIR, see Table 4-4 2 = ZVEI, see Table 4-4
51. n	Call size	0 = 100 call (1-123xx) 1 = 1,000 call (1-12xxx) 2 = 10,000 call (1-1xxxx) 3 = 100,000 call (1-xxxxx) 4 = Full capcode (x-xxxxx)
52. n	Preamble strap	0 - 9, 10= don't send preamble
53. n	First digit strap	0 - 9 (1-n2345)
54. n	Second digit strap	0 - 9 (1-1n345)
55. n	Third digit strap	0 - 9 (1-12n45)
56. n	Dual address	0 = no dual address 1 = odd capcodes 2 = enter extra digit (1=1st,2=2nd)
57. n	Number of repeats	0 - 3 (0=paging tones sent once)

Table 4-4. Five-Tone Groups/Timing

Zetron Group number Tone series		0 EIA	1 CCIR	2 ZVEI
Tone number	0	600	1981	2400
	1	741	1124	1060
	2	882	1197	1160
Tone	3	1023	1275	1270
Frequency	4	1164	1358	1400
in	5	1305	1446	1530
Hz.	6	1446	1540	1670
	7	1587	1640	1830
	8	1728	1747	2000
	9	1869	1860	2200
2nd ADDR "X" tone		2010	2247	2796
REPEAT "R" tone		459	2110	2600
TIMING Preamble		690	690	690
IN Gap		65	65	65
msec Tone		33	100	70
X Tone		65	100	70

For sub-command 51, "x" indicates digits entered via the keypad during paging: 1-123xx indicates 100 calls of five-tone where the preamble tone is fixed to digit "1", and the first three tones are fixed at "123". The "xx" indicates the operator will be entering the last two digits of the capcode (100 call).

For call sizes less than full capcode, strap digits are entered via sub-commands 52-55. If the preamble tone is not desired, enter the number "10" for the preamble strap digit (sub-command 52).

If dual address (sub-command 56) is set to 1, when an odd capcode is entered, for example "1-12345", the second address capcode "1-12344" is transmitted. If dual address is set to 2, the Model 5 prompts the operator to enter a "1" if the first address of the pager is to be alerted or to enter a "2" if the second address of the pager is to be alerted.

The paging tone sequence can be repeated (sub-command 57) up to three additional times. For repeats, the preamble tone (if enabled) is not sent. For example, if two repeats are selected, the following is sent: "1-12345 12345 12345".

Factory-Set Defaults
The default factory-set configuration of the Model 5 is as follows:

1. Single format operation.
2. Pages will not go out automatically after entering the last digit of the capcode. The PAGE key must be pressed (Autopage = off).
3. The keyup delay is 1 second.
4. Tone+voice paging.
5. Voice message duration is set for 5 seconds.
6. The audio source is set for internal microphone.
7. Two-tone.
8. 1000-call.
9. Warble alert.
10. The Motorola Codeplan B is enabled.
11. Tone timing is set for 1/0/3/8.
12. Extended group call is enabled.

Programming Example
In this example, you want to program your Model 5 for single format, two-tone, 100-call, tone+voice operation, and you want to use the internal mic for audio input.

You want to use Mot A (Zetron Group No. 7) for the first tone and Mot 10 (Zetron Group No. 13) for the second tone.

You want the timing of the tones to be 1 second for the first tone, 0 seconds for the gap, 3 seconds for the second tone, and 8 seconds for group (1/0/3/8).

You also want 15 seconds of talk time and 1 second for keyup delay. You don't want any alert tone, but you want the autopage function turned on.

You have a pager with a capcode of 37: the frequencies needed to set off your pager are 489.8 Hz for the first tone and 1781.5 for the second tone.

For this example, you would follow the steps below to program the Model 5. When the display digits can vary, an "n" will be used in the explanation below.

1. Access the programming mode.

   a. Power on the unit. Press and hold the * key, and then also press and hold the 3 key until the display changes to [-.-..]. This takes about 3 seconds.

   b. Release the * and 3 keys. The display shows [-.-...]. You are now in programming mode.

2. Start the system programming.

   a. Enter 80 and press the PAGE key.

   b. The display shows [01. n]. The left-hand number (01) is the command or sub-command; the right-hand number is the value programmed for command or sub-command.

3. Set the unit for single format operation.

   a. Enter 0 and press the PAGE key.

   b. The display shows [02. n].

4. Turn on the autopage function.

   a. Enter 1 and press the PAGE key.

   b. The display shows [3.nn].

5. Set the keyup delay to 1 second.

   a. Enter 10 and press the PAGE key (1 = 0.1 second).

   b. The display shows [04.nn].

6. Set the talk time to 15 seconds.

   a. Enter 15 and press the PAGE key.

   b. The display shows [05. n].

7. Set the audio source to internal mic.

   a. Enter 0 and press the PAGE key.

   b. The display shows [-.-...].

8. Start the single format function programming.

   a. Enter 0 and press the PAGE key.

   b. The display shows [10. n].

9. Select the two-tone, 100-call (tone group) format.

   a. Enter 1 and press the PAGE key.

   b. The display shows [11. n].

10. Select tone+voice format (talk enable).

    a. Enter 1 and press the PAGE key.

    b. The display shows [12. n].

13. Turn off the alert tones.

    a. Enter 0 and press the PAGE key.

    b. The display shows [20.nn].

14. Select the first tone group.

    a. Enter 7 (the Zetron Group No. that corresponds to Mot A) and press the PAGE key.

    b. The display shows [21.nn].

15. Select the second tone group.

    a. Enter 13 (the Zetron Group No. that corresponds to Mot 10) and press the PAGE key.

    b. The display shows [22. n].

16. Select the tone timing.

    a. Because you want the timing to be 1 second for the first tone, 0 seconds for the gap, 3 seconds for the second tone, and 8 seconds for group (1/0/3/8), enter 0 (see Table 4-2) and press the PAGE key.

    b. The display shows [23. n].

17. Select group call, extended tone format.

    a. Enter 0 and press the PAGE key.

    b. The display shows [-.-...].

18. You have finished programming the Model 5. Test the Model 5 by sending out a page to the pager with a capcode 37 (first tone is 489.8 Hz and second tone is 1781.5 Hz).

    a. Press the CLEAR key to exit program mode.

    b. The display shows [--].

    c. Enter 37 (the pager's capcode) and press the PAGE key.

    d. The TRANSMIT LED lights, and then the PAGING LED lights. After the PAGING LED goes out, the TALK LED lights for 15 seconds allowing you to speak your message using the internal microphone.

    e. After 15 seconds, the transmitter unkeys and the TRANSMIT and TALK LEDs go out.

5. REPAIR

5. REPAIR

TROUBLESHOOTING

The Model 5 takes advantage of the latest in hardware and software techniques to minimize the complexity and parts count of the unit. This provides better reliability so that the unit should not require service. In case of a failure, first check the programming. Some problems may occur due to improper setup or programming. It is a good idea to go through the installation and adjustment procedure. Then if the unit fails, determine which installation step could not be completed. Schematic diagrams and parts lists follow in this section for troubleshooting reference.

Paging Problems
Odd-numbered five-tone pagers do not work, or second address does not work: Dual address set wrong.

Model 5 only shows PAGING and TALK indicators, no operation: Power supply voltage too low.

Unit drops TRANSMIT and only shows TALK LED during voice time: Installed for external microphone, should change to internal.

Some pagers work, others do not: Check the actual capcode or reed frequencies of the pagers that do not work. Most problems are incorrect capcode entry.

Cannot exit programming mode: No format selected, Leading Digit 0 disabled for single format encoders, or all leading digits disabled.

Unit shows a busy channel indication when channel is quiet (moving decimal point): Check diode CR1. Moving JP2 to position "B" should allow unit to work if CR1 is shorted.

Programming Problems
Unable to enter programming: To enter programming, press "*", followed by "3". If the "3" is pressed before, or at the same time as the "*", you cannot enter programming. Also, if the "3" is not pressed within 2 seconds after pressing the "*" again you will not be able to enter programming. For specific programming questions, please call Zetron at (206) 820-6363.

Too Much Background Noise When Using Internal Mic
Because the AGC gain for the microphone is high, many users notice excessive background noise. To reduce this background noise, change R32 to one of the values listed below. The suggested resistor value is 20 K, this gives 6 dB less gain thus reducing background noise while still retaining some ACG range. Note that by reducing AGC gain it is necessary for users to speak directly into the microphone.

Gain Loss	Resistor
3 dB	15 K
6 dB	20 K
9 dB	30 K
12 dB	40 K

MODEL 5 ENCODER PARTS LIST 901-9131F

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	025-9099	MANUAL	
2.	1	210-0001	440 KEPT NUT PLATED	VR1
3.	4	220-0104	440x5/8 PAN HEAD TAPPING SCREW	
4.	3	220-0108	440X1/4 PAN PHILLIPS	PCB
5.	1	305-0024	ELECTRET MIC	J4,J5
6.	1	415-9094	DECAL, PART 15 FCC/PN/SN	
7.	4	431-0012	FOOT BUMPON .312	
8.	1	449-0054	M5 BOTTOM FOAM	
9.	1	449-1001	ZMA PACKAGE BOX	
10.	1	449-1002	BIPOLAR FOAM	
11.	2	449-9041	7 X 10 BAG	MANUAL/UNIT
12.	1/4"	525-0001	INSUL.TUBE, CLEAR #11	*NOTE 2
13.	A/R	561-0001	THERMAL COMPOUND	VR1 *NOTE 1
14.	1	601-0180	MAIN CONTROLLER SOFTWARE	U4
15.	1	601-0181	TONE GENERATOR SOFTWARE	U5
16.	1	702-9213	PCB	
17.	1	810-0033	HOUSING, BASE	
18.	1	810-0035	RETAINER, MICROPHONE	
19.	1	815-9050	M5 FRONT PANEL SUB ASSEMBLY	

NOTES:

Notes are for production use only.

MODEL 5 CIRCUIT BOARD PARTS LIST 702-9213E.4

LEGEND:
/ = NOT INSTALLED
* = INSTALLED ON HIGHER ASSY
+ = OPTION (INSTALLED PER CUSTOMER ORDER)

Item	Quantity	Reference	Part	Description	Mfg.Part No.
1	8	R1,R2,R3,R4,R5,R6,R7,R8	101-0048	75 OHM 1/4W 5% CARBON FILM	
2	1	R20	101-0049	100 OHM 1/4W 5% CARBON FILM	
3	2	R9,R10	101-0057	220 OHM 1/4W 5% CARBON FILM	
4	2	R22,R26	101-0061	330 OHM 1/4W 5% CARBON FILM	
5	2	R11,R29	101-0073	1K 1/4W 5% CARBON FILM	
6	4	R13,R27,R30,R39	101-0081	2.2K 1/4W 5% CARBON FILM	
7	1	R15	101-0085	3.3K 1/4W 5% CARBON FILM	
8	1	R38	101-0089	4.7K 1/4W 5% CARBON FILM	
9	2	R12,R23	101-0092	6.2K 1/4W 5% CARBON FILM	
10	4	R19,R25,R28,R32	101-0097	10K 1/4W 5% CARBON FILM	
11	2	R16,R34	101-0106	24K 1/4W 5% CARBON FILM	
12	3	R18,R33,R36	101-0109	33K 1/4W 5% CARBON FILM	
13	1	R21	101-0119	82K 1/4W 5% CARBON FILM	
14	1	R17	101-0121	100K 1/4W 5% CARBON FILM	
15	1	R24	101-0123	120K 1/4W 5% CARBON FILM	
16	1	R37	101-0129	220K 1/4W 5% CARBON FILM	
17	2	R31,R35	101-0133	330K 1/4W 5% CARBON FILM	
18	1	R14	101-0145	1M 1/4W 5% CARBON FILM	
19	1	R40	107-0501	5K POT 1 TURN	3386P-1-502
20	1	RP1	119-0006	10K x 9 R-SIP	4610X-101-103
21	1	RP2	119-0021	R/2R 100K/200K 10 PIN	410L08104
22	2	C8,C9	150-0010	10 PF 1KV +-10% CERAMIC DISC	
23	1	C16	151-0010	100 PF 50V +-10% CERAMIC, TEMPERATURE STABLE	CM15C101K
24	10	C2,C4,C7,C10,C11,C13,C15, C18,C20,C25	152-0012	.1 UF 50V +-5% POLYESTER	ECQ-V1H104JZ
25	1	C6	152-0040	4.7 UF 50V NON-POLAR ELECTROLYTIC	EEH-4.7H50BA
26	2	C1,C12	152-0085	.01 UF 50V +- 5% POLYESTER	ECQ-V1H103JZ
27	1	C14	152-0088	.0047UF 50V +-5% POLYESTER	ECQ-B1H472JZ
28	3	C5,C17,C19	154-0025	1 UF 35V TANTALUM	ECS-F-35E1
29	1	C26	154-0100	10 UF 16V TANTALUM	ECS-FICE106K
30	4	C3,C22,C23,C24	155-0077	100UF 25V +-20% RADIAL ALUMINUM ELECTROLYTIC	ECEA1EU101
31	1	C21	155-0120	2200 UF 25V +-20% AXIAL ALUMINUM ELECTROLYTIC	ECE-B1EU222
32	3	DS5,DS6,DS7	311-3213	REC. RED LED	LTL 3213A
33	4	DS1,DS2,DS3,DS4	311-7303	LED 7-SEG .3	HDSP-7303
34	1	U9	316-0324	OP-AMP, QUAD	LM324
35	1	U8	316-0358	OP-AMP, DUAL	LM358N
36	1	VR1 *NOTE 2	316-7805	REGULATOR, +5V 1.5A	LM340T-5
37	2	U4,U5 *NOTE 4	321-0751	ASIC 001	
38	1	U6,U7/	322-9346	1024 BIT SERIAL EEPROM	93C46P
39	1	U1	323-4499	7-SEGMENT LED DISPLAY DECODER DRIVER W/SERIAL INTERFAC	MC14499P
40	1	U3	324-7414	HEX SCHMIDT	74HC14

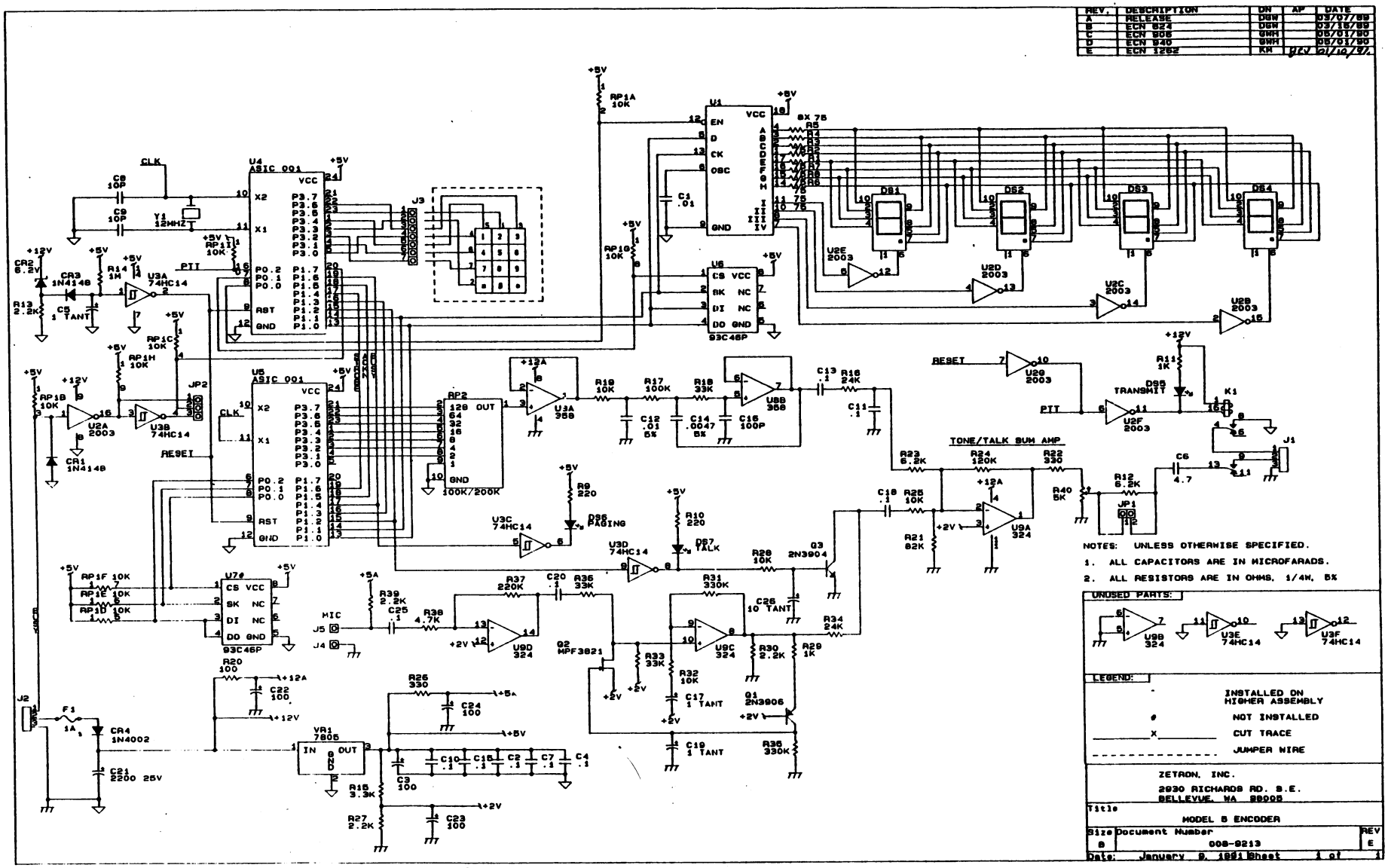
MODEL 5 CIRCUIT BOARD PARTS LIST 702-9213E.4 (cont'd)

Item	Quantity	Reference	Part	Description	Mfg.Part No.
41	1	U2	340-2003	RELAY DRIVER 50V/.5A	ULN2003
42	1	Q2	340-3821	JFET N-CHAN Vp=-2.5V	MPF3821
43	1	Q3	340-3904	NPN 40V/200MA	2N3904
44	1	Q1	340-3906	PNP 40V/200MA	2N3906
45	1	CR4	342-0001	SILICON 1A 100V .50 SP	1N4002
46	2	CR1,CR3	342-3009	SILICON .50 SP	1N4148
47	1	CR2	343-3030	1W 6.2V +-5% .50 SP	1N4735A
48	1	KEYPAD *NOTE 1	373-0004	KEYBOARD 12 KEY X-Y SLIM LINE	KUEALA945A
49	1	Y1	376-1200	12MHz HC-18 CASE	120
50	1	K1	380-0030	DPDT 12V COIL MINI	DS2E-M-DC12V
51	2	J1,J2	401-0132	3 POS 45D SCREW TERM	ZMA-03
52	1	JP1	403-0002	2 OF 401-0052	
53	1	JP2	403-0003	3 OF 401-0052	
54	1	J3 *NOTE 3	406-0007	7 OF 401-0108	
55	1	F1	416-0007	FUSE 1A SB MIN	
56	4	KEYPAD HARDWARE	210-0006	NUT 256	
57	4	KEYPAD HARDWARE	220-0012	256x1/2 PAN HEAD SLOTTED	
58	4	KEYPAD HARDWARE	234-0003	2-56 EXT LOCK WASHER	
59	1	XVR1	251-0103	SWAGE 440, 5/16	
60	4	KEYPAD HARDWARE	251-2500	SPACER 440, 1/4	
61	3	XDS5,XDS6,XDS7	251-9001	.120 LED COMP SPACER	
62	2	JP1,JP2 (POS B)	402-3040	MINI JUMPER	
63	2	XU6,XU8	407-0008	SKT, 8 PIN DIP	
64	2	XU3,XU9	407-0014	SKT, 14 PIN DIP	
65	1	XU2	407-0016	SKT, 16 PIN DIP	
66	1	XU1	407-0018	SKT, 18 PIN DIP	
67	2	XU4,XU5	407-0023	SKT, 24 PIN SKINNY DIP	
68	1	PCB	410-9213D	PCB	
69	2	XF1	416-0006	FUSE CLIP, MINIATURE	

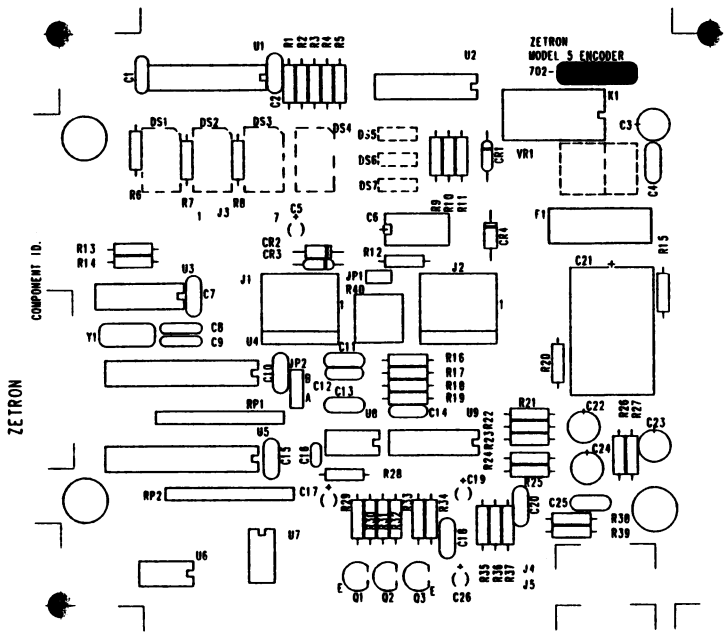
NOTES:

Notes are for production use only.

SCHEMATIC DIAGRAM 008-9213E



SILKSCREEN 702-9213E.1



6. QUICK REFERENCE AND CONFIGURATION LOG

6. QUICK REFERENCE AND CONFIGURATION LOG

ENCODER FORMAT CROSS-REFERENCE

Encoder Mfr.	Encoder Model #	Call Capacity	Format Encoding	Zetron Equivalent
GE	101X1B	16	GE A	100-Call Groups A'+A'
GE	101Y1B	16	GE B	100-Call Groups B'+B'
GE	101Z1B	16	GE C	100-Call Groups C'+C'
GE	101X2B	64	GE A,B	1000-Call Plan GE X
GE	101Y2B	64	GE B,C	1000-Call Plan GE Y
GE	101Z2B	64	GE A,C	1000-Call Plan GE Z
GE	101X3B	100	GE A	100-Call Groups A'+A'
GE	101Y3B	100	GE A	100-Call Groups B'+B'
GE	101Z3B	100	GE A	100-Call Groups C'+C'
GE	101X4B	400	GE A,B	1000-Call Plan GE X
GE	101Y4B	400	GE B,C	1000-Call Plan GE Y
GE	101Z4B	400	GE A,C	1000-Call Plan GE Z
GE	101X5B	900	GE A,B,C	1000-Call Plan GE X
Motorola	N1016	2	Mod. General	100-Call One Group of 1-5,7-9*
Motorola	N1017	6	Mod. General	100-Call One Group of 1-5,7-9*
Motorola	N1018	12	Mod. General	100-Call One Group of 1-5,7-9*
Motorola	N1019	20	Mod. General	100-Call One Group of 1-5,7-9*
Motorola	L08,L09	870	Std. Motorola	1000-Call One Plan of Motorola
Motorola	Moden-900	870	Std. Motorola	1000-Call One Plan of Motorola

* Subaudible tone groups Mot 7-9,17-19 not supported on Model 5.

Two-Tone, 100-Call Tone Group Chart

Zetron Group No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Manufacturer Tone Group	Mot 1	Mot 2	Mot 3	Mot 4	Mot 5	Mot 6	Mot A	Mot B	Mot Z	GE A'	GE B'	GE C'	Mot 10	Mot 11
Tone Number 0	330.5	569.1	1092.4	321.7	553.9	1122.5	358.9	371.5	346.7	682.5	652.5	667.5	1472.9	1930.2
1	349.0	600.9	288.5	339.6	584.8	1153.4	398.1	412.1	384.6	592.5	607.5	712.5	1513.5	1989.0
2	368.5	634.5	296.5	358.6	617.4	1185.2	441.6	457.1	426.6	757.5	787.5	772.5	1555.2	2043.8
3	389.0	669.9	304.7	378.6	651.9	1217.8	489.8	507.0	473.2	802.5	832.5	817.5	1598.0	2094.5
4	410.8	707.3	313.0	399.8	688.3	1251.4	543.3	562.3	524.8	847.5	877.5	862.5	1642.0	2155.6
5	433.7	746.8	953.7	422.1	726.8	1285.8	602.6	623.7	582.1	892.5	922.5	907.5	1687.2	2212.2
6	457.9	788.5	979.9	445.7	767.4	1321.2	668.3	691.8	645.7	937.5	967.5	952.5	1733.7	2271.7
7	483.5	832.5	1006.9	470.5	810.2	1357.6	741.3	767.4	716.1	547.5	517.5	532.5	1781.5	2334.6
8	510.5	879.0	1034.7	496.8	855.5	1395.0	822.2	851.1	794.3	727.5	562.5	577.5	1830.5	2401.0
9	539.0	928.1	1063.2	524.6	903.2	1433.4	912.0	944.1	881.0	637.5	697.5	622.5	1881.0	2468.2
Diagonal	569.1	979.9	569.1	569.1	979.9	979.9	979.9	979.9	979.9	742.5	742.5	742.5	none	none

Two-Tone, 1000-Call Codeplan Chart

Zetron Codeplan No.	0	1	2	3	4	5	6	7	8	9	10	11	12
Manufacturer Codeplan	Mot B Groups	Mot C Groups	Mot D Groups	Mot E Groups	Mot F Groups	Mot G Groups	Mot H Groups	Mot J Groups	Mot K Groups	Mot L Groups	Mot M Groups	Mot N Groups	Mot P Groups
Pager Capcode 0xx	2+4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4+2	4+2	4+2
1xx	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	2+3	2+3	2+3
2xx	2+2	2+2	2+2	2+2	1+3	1+3	1+3	1+4	1+4	1+5	2+2	2+2	2+2
3xx	3+3	1+2	1+2	1+2	3+3	3+3	3+3	4+1	4+1	5+1	3+3	3+3	3+3
4xx	1+2	4+4	1+5	2+1	4+4	3+1	3+1	4+4	4+4	1+6	4+4	3+2	3+2
5xx	1+3	1+4	5+5	1+6	3+1	5+5	1+6	5+5	1+6	5+5	3+2	5+5	2+6
6xx	2+1	2+1	2+1	6+6	1+4	1+5	6+6	1+5	6+6	6+6	2+4	2+5	6+6
7xx	3+1	4+1	5+1	6+1	4+1	5+1	6+1	4+5	6+1	6+1	4+2	5+2	6+2
8xx	2+3	2+4	2+5	2+6	3+4	3+5	3+6	5+4	4+6	5+6	3+4	3+5	3+6
9xx	3+2	4+2	5+2	6+2	4+3	5+3	6+3	5+1	6+4	6+5	4+3	5+3	6+3
Groups	1,2,3,4	1,2,4	1,2,5	1,2,6	1,3,4	1,3,5	1,3,6	1,4,5	1,4,6	1,5,6	2,3,4	2,3,4,5	2,3,4,6

Zetron Codeplan No.	13	14	15	16	17	18	19	20	21	22	23	24
Manufacturer Codeplan	Mot Q Groups	Mot R Groups	Mot S Groups	Mot T Groups	Mot U Groups	Mot V Groups	Mot W Groups	Mot Y Groups	Mot MT Groups	GE X Groups	GE Y Groups	GE Z* Groups
Pager Capcode 0xx	4+2	4+2	4+2	4+2	4+2	4+2	4+2	N/A	4+2	A'+A'	B'+B'	A'+A'
1xx	2+4	2+4	2+5	3+4	3+4	3+5	4+6	A+A	1+1	B'+A'	C'+B'	C'+A'
2xx	2+2	2+2	2+2	4+3	4+3	5+3	6+4	B+B	2+2	B'+B'	C'+C'	C'+C'
3xx	4+2	4+2	5+2	3+3	3+3	3+3	5+6	Z+Z	1+2	A'+B'	B'+C'	A'+C'
4xx	4+4	4+4	2+6	4+4	4+4	3+6	4+4	A+B	4+4	C'+C'	N/A	N/A
5xx	5+5	2+6	5+5	5+5	3+6	5+5	5+5	A+Z	5+5	C'+A'	N/A	N/A
6xx	2+5	6+6	6+6	3+5	6+6	6+6	6+6	B+A	2+1	C'+B'	N/A	N/A
7xx	4+5	6+2	6+2	4+5	6+3	6+3	4+5	Z+A	4+5	A'+C'	N/A	N/A
8xx	5+4	4+6	5+6	5+4	4+6	5+6	5+4	B+Z	5+4	B'+C'	N/A	N/A
9xx	5+2	6+4	6+5	5+3	6+4	6+5	6+5	Z+B	2+4	N/A	N/A	N/A
Groups	2,4,5	2,4,6	2,4,5,6	2,3,4,5	2,3,4,6	4,5,6	2,4,5,6	A,B,Z	1,2,4,5	A',B',C'	B',C'	A',C'

* G.E. 100-call plan Z is tone groups C'+C'; use 100-Call programming. For capcodes ending in double-digits using tone group twice (for example: 122 in code plan C), use diagonal as one of the tones.

TWO-TONE TIMING CHART

Timing	1st	Gap	2nd	Group Call	Type
0	1.0	0	3.0	8.0	GE std, Mot std Tone+Voice
1	0.4	0	0.8	8.0	Motorola Tone Only
2	1.0	0	3.0	6.0	NEC-B
3	1.0	.25	3.0	6.0	NEC-A
4	1.0	0	1.0	4.0	NEC-C
5	0.4	0	0.8	4.0	NEC-M
6	0.5	0	0.5	3.0	NEC-L
7	0.4	0	0.4	3.0	NEC-D

FIVE-TONE GROUPS/TIMING CHART

Zetron Group number Tone series		0 EIA	1 CCIR	2 ZVEI
Tone number	0	600	1981	2400
	1	741	1124	1060
	2	882	1197	1160
Tone	3	1023	1275	1270
Frequency	4	1164	1358	1400
in	5	1305	1446	1530
Hz.	6	1446	1540	1670
	7	1587	1640	1830
	8	1728	1747	2000
	9	1869	1860	2200
2nd ADDR "X" tone		2010	2247	2796
REPEAT "R" tone		459	2110	2600
TIMING Preamble		690	690	690
IN Gap		65	65	65
msec Tone		33	100	70
X Tone		65	100	70

PROGRAMMING QUICK REFERENCE

80 System programming items that alter total operation

01. n	Single/mixed format	0=Single format 1=Mixed format (leading digit 0-9)
02. n	Autopage	0=Off 1=On
03.nn	Keyup delay	0-20, x 0.1 seconds (12=1.2 sec)
04.nn	Talktime duration	0-59 seconds
05. n	Talk audio source	0=Use built-in mic 1=Use external desk mic

0 Set function of single format encoder, or leading digit 0
1 Set function of leading digit 1, for multi-format operation
2 Set function of leading digit 2, for multi-format operation
3 Set function of leading digit 3, for multi-format operation
4 Set function of leading digit 4, for multi-format operation
5 Set function of leading digit 5, for multi-format operation
6 Set function of leading digit 6, for multi-format operation
7 Set function of leading digit 7, for multi-format operation
8 Set function of leading digit 8, for multi-format operation
9 Set function of leading digit 9, for multi-format operation

Each leading digit:

10. n	Format select;	0=Disable, 1=2tone 100, 2=2tone 1000, 3=5tone, 4=alert tone
11. n	Talk enable	0=Off, 1=on
12. n	Alert tone	0=none, 1=five beep, 2=warble

Two-tone tone groups (item 10=1)

20.nn	First tone group	1-14, from two-tone tone group chart
21.nn	Second tone group	1-14, from two-tone tone group chart
22. n	Tone timing	0-7, from two-tone timing chart
23. n	Group call	0=group call, 1=diagonal on A, 2=diagonal on B

Two-tone codeplans (item 10=2)

20.nn	Codeplan	0-24, from two-tone codeplan chart
21. n	Tone timing	0-7, from two-tone timing chart
22. n	Group call	0=group call, 1=diagonal on A, 2=diagonal on B

Five-tone (item 10=3)

50. n	Tone series/timing	0=EIA, 1=CCIR, 2=ZVEI
51. n	Call size	0=P-123xx, 1=P-12xxx, 2=P-1xxxx, 3=P-xxxxx, 4=x-xxxxx
52. n	Preamble strap	0-9, 10=no preamble
53. n	First digit strap	0-9 (1-n2345)
54. n	Second digit strap	0-9 (1-1n345)
55. n	Third digit strap	0-9 (1-12n45)
56. n	Dual address	0=no dual address, 1=odd capcodes, 2=extra digit (1=1st 2=2nd)
57. n	Number of repeats	0-3

90 Setup test tone, 288 Hz (displays [A.1.1. .])
91 Setup test tone, 1007 Hz (displays [A.7.7. .])
92 Setup test tone, 2468 Hz (displays [A.9.9. .])
93 Setup test sequence; 288, 1007, 2468 Hz + PTT cycle

MODEL 5 CONFIGURATION LOG

SYSTEM SETTINGS: (default settings are ***bold type***)

Format	[ ] Mixed	[✓] ***Single*** (use leading digit 0)
Autopage	[ ] On	[✓] ***Off***
Keyup delay	1.0 seconds (0.0-2.0, ***default=1.0***)	
Talktime duration	0 seconds (0-59, ***default=5 sec***)	
Talk audio source	[ ] ***Internal***	[✓] External desk mic

FORMAT SETTINGS: (5T=Five-tone, 2T=Two-tone)

Leading digit	5T Capcode/Dual addr 2T Groups/Codeplan	5T Series/Repeats 2T Timing/Grp call	Alert tone	Talk time
Default	~~1000 call~~ Codeplan B 100 Call Not Ix1	1/0/3 ~~8~~ sec groupcall	~~Warble tone~~ No alert	~~Yes~~ No
0	01 330.5/349.0	Sirens	[]N []5 []W	[]Y []N
1	02 330.5/368.5	Squad/Fire	[]N []5 []W	[]Y []N
2			[]N []5 []W	[]Y []N
3			[]N []5 []W	[]Y []N
4			[]N []5 []W	[]Y []N
5			[]N []5 []W	[]Y []N
6			[]N []5 []W	[]Y []N
7			[]N []5 []W	[]Y []N
8			[]N []5 []W	[]Y []N
9			[]N []5 []W	[]Y []N

Questions regarding programming or installation? Call Zetron (206) 820-6363.

PRODUCT MANUAL CUSTOMER FEEDBACK FORM

Please provide us with suggestions on how we can improve this manual. Your opinions are important to us.

Product:_____ Manual No.: #025-_____ Date:_____

RATING OF MANUAL	Excellent	Good	Average	Below Avg.	Poor
Understandability	1	2	3	4	5
Technical Completeness	1	2	3	4	5
Explanation of Operation	1	2	3	4	5
Installation Instructions	1	2	3	4	5
Programming Instructions	1	2	3	4	5
Schematics/Diagrams	1	2	3	4	5
Overall Ease of Use	1	2	3	4	5
As a Quick-Reference Tool	1	2	3	4	5

Suggestions (use second sheet if necessary):_____

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Specific Edits/Changes (include page no.):_____

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Thank you for your help.

CHANGE INFORMATION

At Zetron, we continually strive to improve our products by updating hardware components and software as soon as they are developed and tested.

Due to printing and shipping requirements, this manual may include information about the latest changes on the following pages.