ZETRON

Model 15P Field Programmable Multi-Format Encoder Operating Manual

Part No. 025-9235E.1

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Repair work on this device must be done by Zetron, Inc. or a Zetron authorized repair station.

1. INTRODUCTION

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GENERAL DESCRIPTION

The Zetron Model 15P Field Programmable Multi-Format Encoder is a universal station encoder for the selective calling of radio pagers or mobiles. The keypad has 16 keys (labeled 0-9, *, #, A, B, C, and D) and three function keys (labeled CLEAR, ENTER, and PAGE). The display is a six-digit LED readout. Simple connection to a radio communications transmitter or base station via audio and keying relays provides an ideal small, desktop dispatching center. The Model 15P encoder can handle mixtures of different paging formats, including 2-Tone, 5/6-Tone, DTMF, 2805 Hz, Plectron, NEC Digital, POCSAG, Motorola GOLAY, and HSC. When equipped with its option serial communications port for message entry, the Model 15P also offers alphanumeric paging for those formats that support it.

All the features, parameters, and attributes of each optional format are user or field programmable from the keypad and are permanently saved in the unit's expanded nonvolatile memory. As paging requirements change, the Model 15P may be reprogrammed in the field without downtime. The addition of new formats is easily achieved in the field by the replacement of EPROM and EEPROM memories.

Through the use of advanced microprocessor circuitry together with a low total parts count, the Model 15P provides excellent long-term stability and reliability found only in other encoders costing several times as much. Microprocessor based circuitry combined with careful engineering provides compatibility with virtually all signaling formats used in the communications industry.

MODEL 15P FIELD PROGRAMMABLE VS. THE MODEL 15B

The Model 15P is an ideal encoder in most circumstances. The added flexibility of programmability provides a superior solution to growing or changing paging needs, without downtime. It can provide an advantage to dealers where an inventory of configurable or programmable paging encoders enables the quickest possible response to customer requests.

However, the Model 15P is not completely identical to the Model 15B encoder that preceded it. The following list is provided for those who have experience with the Model 15B in order to help them decide if the 15P can be used to replace the 15B in their application.

1. As required by a particular installation, Model 15Bs can be preconfigured to provide automatic Morse code station ID. With this feature, the radio site will send the Morse Code station identification signal at 15 or 30 minute intervals. The Model 15P can be programmed in the field to do a Morse Code Station ID, however, the time interval is fixed at 15 minutes only.

2. Plectron or custom calls are 2-tone pages that use nonstandard tones or reeds and sometimes nonstandard tone timings. Tone frequencies, timing, and individual capcodes for the Model 15B must be specified when ordering. These parameters may be changed only by factory reprogram, not by the user. The Model 15P supports this kind of paging with a format called CUSTOM TWO TONE, which can hold up to 111 custom pages. The capcode numbers assigned to these pages can be one to four digits long and are totally independent (i.e.: the programmer in the field is not locked into any predetermined numbering scheme set by Zetron).

3. Fixed-stack pages available on the Model 15B are a factory programmed group of capcodes that are sent out as a string of pages with the pressing of a single button. The Model 15P can also support fixed stack pages, however, there are some important differences between it and the 15B. The Model 15P supports fixed stack paging by having a paging format called Custom Stack. This format is assigned a leading digit in the same way other paging formats are. The individual stacks are assigned an identifying number when they are entered, and then the capcodes for that stack are entered. The stack numbers can be from one to four digits in length, so in order to send a fixed stack page in the Model 15P you enter a leading digit for the Custom Stack format plus the stack number.

   The Model 15P can also support calling a fixed stack page using a single key press. The Custom Stack format must be assigned to multiple leading digits, and one stack can be created under each of these leading digits that does not have a number assigned to it.

Each stack page in the Model 15P can hold approximately ten pager cap codes. If a larger number of pages is needed in a stack, the encoder will allow you to string stacks together by placing the number of another fixed stack in the last capcode position of the first stack. The number of entries that can be programmed for a stack depends upon the memory used by each entry, however, ten entries per stack is approximately correct.

4. The Model 15P has a new format, not found in the 15B, called Custom DTMF. This format supports DTMF code strings up to 10 digits in length. The pager capcodes and timing are independently assignable for each page.

USING THIS MANUAL

This manual is divided into seven sections, both to group similar topics together and to make it easy to find information quickly once you start using the encoder. The sections are:

1. Introduction	A brief description of the Model 15P and its capabilities.
2. Specifications	An organized listing of the capabilities and specifications of the encoder.
3. Operation	This section describes the use of the encoder once it has been installed and programmed. It covers how variations in programming can effect the operation of the unit.
4. Installation	This section covers the interfacing of the encoder to its radio equipment and how to make proper level adjustments to ensure optimum performance while paging.
5. Programming	This section provides in-depth explanations and examples of how to configure both the system and individual paging format parameters.
6. Repair	This section contains a list of the Error codes and their meaning. It also contains the parts list and schematics for the unit.
7. Quick Reference	This section contains specific background information on the various paging formats supported by the Model 15P. It includes tables of tone frequencies and timings for the analog formats, as well as capcode and message format information for the digital display formats. This section is to be used as resource when programming the unit.

2. SPECIFICATIONS

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SIGNALING FORMATS

Two-Tone

Standard Motorola and GE Tone Groups and Code Plan

Call Capacity:	100 call (first/second tones from one standard tone group each) 1000 call (one standard code plan)
Configurations:	User Programmable
Tone Groups (100-call):	Motorola 1,2,3,4,5,6,10,11,A,B,Z; GE A,B,C; or special
Code Plan (1000-call):	Motorola B,C,D,E,F,G,H,J,K,L,M,N,P,Q,R,S,T,U,V,W,Y,MT; General, Modified General, General Alternate; GE X,Y,Z; or special
Tone Timing:	Field Programmable 1st /Gap/ 2nd / Group Call 1.0 / 0 / 3.0 / 8.0 (GE std, Mot std Tone+Voice) 1.0 / 0 / 3.0 / 6.0 (NEC-B) 1.0 /0.3/ 3.0 / 6.0 (NEC-A) 1.0 / 0 / 1.0 / 4.0 (NEC-C) 0.5 / 0 / 0.5 / 3.0 (NEC-L) 0.4 / 0 / 0.8 / 8.0 (Motorola Tone Only) 0.4 / 0 / 0.8 / 4.0 (NEC-M) 0.4 / 0 / 0.4 / 3.0 (NEC-D)
Diagonal Tone:	None (group call) or standard tone group diagonals
Diagonal Tone Placement:	First Tone or Second Tone

Reach

Call Capacity:	100/1000 call and group call
Configurations:	Field Programmable
Tone Timing:	1st /Gap/ 2nd / Group Call 0.2 / 0 / 0.2 / 1.4 (Reach Fast) 2.0 / 0 / 0.7 / 4.5 (Reach Slow)
Group Call:	10 group calls or individual calls

Five/Six-Tone

Call Capacity:	Full format capacity of 100,000 calls
Configurations:	Field Programmable
Preamble:	Optional
Addressing:	Single, Dual (using even numbered pages for 1st address, odd for 2nd address), or selectable by function digit
Tones/Timing:	EIA, CCIR, ZVEI, or EEA

DTMF

Call Capacity:	1, 2, 3, 4, 5, 6, 7, or 8 digits
Configurations:	Field Programmable
Tones:	All 16 tone pairs available from keypad
Timing:	Programmable tone duration and gap duration

2805/1500 Hz

Call Capacity:	3, 4, 5, 6, 7, or 8 digits
Configurations:	Field Programmable
Tone Freq.:	1500 or 2805 Hz
Timing:	10 pps

HSC (Hexadecimal Sequential Code)

Call Capacity:	Full format capacity of 100,000 calls in 10 service blocks. Full group calling capacity.
Configurations:	Field Programmable
Functions:	9 pager control functions 10 message/data functions All call pager muting All call service range enable/disable All call battery saving, 0-60 second automatic repeat cycle
Messages:	Up to 23 numeric characters of formatted data with talk request

Custom Two-Tone

Call Capacity:	Up to 111 independently programmable capcodes, actual capacity depends on memory used by other custom formats.
Configurations:	Field programmable for each capcode
Tones:	Any tone between 250.0 Hz and 3500.0 Hz
Timing:	Programmable A and B tone duration and gap duration, range is from 0.000 to 9.999 seconds. Single tone pages made by setting the Gap and B tone to zero duration.
Capcodes:	Independently assignable, up to four digits in length.
Alert tones:	Any one of the four available Alert tones can be assigned to follow each capcode.

Custom DTMF

Call Capacity:	Up to 141 independently programmable capcodes, actual capacity depends on memory used by other custom formats.
Configurations:	Field programmable for each capcode
Capcode:	Independently assignable, up to four digits in length.
Page Length:	Up to 10 DTMF digits for each capcode.
Tones:	All 16 DTMF tone pairs available from keypad
Timing:	Programmable tone duration and gap duration

POCSAG (Digital Numeric Display Format)

Call Capacity:	Full format capacity of 2,097,152 calls
Configurations:	Field Programmable
Functions:	4 beep/tone alerts strappable
Messages:	Up to 20 numeric characters Up to 255 alphanumeric characters (when RS232 port option is used for message entry)
Data Rates:	512, 1200, and 2400 baud
Talk Enable:	0-60 seconds talk time

NEC (Digital Tone Only And Numeric Display Formats)

Call Capacity:	Full format capacity of 100,000 calls (Tone only) and 1,000,000 calls (Numeric display)
Configurations:	Field Programmable
Tone Only:	When using 5 digits of address
Display:	When using 6 digits of address. Messages of up to 20 numeric characters.

Motorola GOLAY (Digital Numeric Display Format)

Call Capacity:	Full format capacity of 1,000,000 calls with battery preamble digit
Configurations:	Field Programmable
Functions:	10 beep Alert/voice/data combinations
Messages:	Up to 12 numeric characters Up to 128 alphanumeric characters

Motorola METRO (Digital Tone-Only Format)

Call Capacity:	Full format capacity of 1,000,000 calls

Custom Stack (Fixed Stack Pages)

Call Capacity:	Up to 41 fixed stacks available, each with user assigned capcode. Each stack can hold approximately 10 pager capcodes, actual capacity depends on memory used by other custom formats. See “Custom Stacks (Fixed Stack Pages)” in Section 3.

Configurations:	Field Programmable
Stack Capcodes:	Independently assignable, up to four digits in length.
Pager Entry:	Pagers are added to the stack by entering their format leading digit, capcode, and any function codes that apply. Different paging formats can be mixed within a single stack.

NOTE:

"Single Key" fixed stack pages are not available in the Model 15P. All fixed stack pages will require at least a two-digit entry to initiate the page. Different paging formats can be “mixed” within a single stack.

SPECIAL FEATURES

Display:	Large 6-digit, 0.40-in. high, 7-segment readout Low RFI nonmultiplexed drive Smart alphanumeric operator messages
Page Indication:	" PAGE " message in display
Voice Prompt:	" tALH " message in display when Talk is active
Diagnostics:	Built-in self-test Special mode for setting transmitter deviation
Re-Page:	Unit holds prior pager number in display for paging again by simply pressing PAGE
Keypad Stack Entry:	Holds several calls in memory to be sent consecutively "StAC" message in display when each call is entered
Station Morse ID:	The encoder can be field programmed to send a Morse code ID string. The timer is fixed at 15minutes, and the speed is fixed at 22 WPM. The ID can be up to 10 characters in length.
Field Programmable:	All format selections and attribute settings are programmable from the keypad. Configuration is automatically saved in nonvolatile memory.

ELECTRICAL SPECIFICATIONS

Output Frequency Range:	250-3500 Hz, ±1.0 dB maximum
Frequency Accuracy:	1.0±%
Audio Output Drive:	Unipolar, single-ended (unbalanced), 600 ohms
Audio Output Amplitude:	Adjustable, +5 dBm to -20 dBm (0-4 V pk-pk, adjustable into 600 ohms)
Tone Distortion:	2% nominal from pure sine wave
Digital Output:	Bipolar -7 to +7 volts
Digital Mode:	Logic signal, polarity programmable (low = digital data, high = analog transmission)
Control Outputs:	2 sets of SPDT contacts, rated 1A at 26 VAC: one for Push-to-Talk (PTT) and one for switching audio output between internal tone and external voice microphone
Transmit Inhibit Input:	Senses TTL low or closure to ground. Requires that 2 seconds of free channel be sensed before paging.
Power Supply:	12 VAC rms or 12-14 VDC at 700 ma minimum
	Zetron Part No. 815-9033 Wall Transformer: 120 VAC, ±15%, 48-62 Hz input, 12 VAC at 1000 ma output
	Zetron Part No. 815-9028 Wall Transformer: 220 VAC, 50 Hz input, 12 VAC output

PHYSICAL

Operating Temp.:	0 to +65 degrees Celsius
Size:	2.7 in. high x 7.6 in. wide x 7.8 in. deep
Weight:	19 oz.
Case:	Desktop, high-impact plastic

3. OPERATION

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POWER-ON

Following installation by qualified radio service personnel, turn on power to the encoder. The first number shown in the display is the Zetron order number. The unit then displays its software version number. Finally, the display clears and ends up showing one or more hyphens which indicate successful power up completion and readiness for operation.

Any message such as “Err1” signifies an error condition (see “ Self-Test” in Section 6 for more information on error codes). Make a note of the error code, then the unit should be powered down and a call for repair made. A message of “SEtUP” indicates that no formats have been programmed (see “Overview” in Section 5 for more information), or that all the format programming has been deleted.

KEYPAD

A tactile, rugged 16-key conductive rubber keypad is built into the encoder. The keys are labeled 0-9, *, #, A, B, C, and D. Three extra keys are labeled CLEAR, PAGE, and ENTER. The 16 keys are used to key in the pager number. The PAGE key will send the paging information, the ENTER key will temporarily store a pager number in stack memory, and the CLEAR key will clear a partially entered number or message or stop a page in process and return the display to hyphens.

CONFIGURATION

All the specific characteristics of pager formats, such as two-tone code plans or tone groups, strapped digits and talk enable, as well as the general system behavior parameters, such as talk time, Autopage enabling and binary polarity selection, are programmable from the keypad.

Simple step-by-step menu prompts, yes/no questions, and requests for number values take you through the programming of the encoder.

This programming feature allows a technician, who is knowledgeable about the paging requirements, to make quick and easy changes whenever expansion or changing needs require different paging encoder operation.

However, since the programming of the encoder is not part of typical encoder operation, detailed information about programming can be found in Section 5.

FRONT PANEL DISPLAY

Table 3. ***OPERATION-1*** explains the meanings of the common display indications seen on the front panel of the encoder. In the table, “x” takes the place of any numeric digit.

Table 3. OPERATION-1 Common Display Prompts

Indication	Meaning
-	Ready to accept format leading digit from keypad. More than one hyphen indicates the unit has only one format programmed.
x-----	Ready to accept pager code number for format x from keypad. The number of dashes indicates how many capcode digits are expected.
_ _ _ _ _ _	Ready to accept a message from the keypad. This prompt follows the entry of a display pager capcode.
xxxxxx	Shows last six digits of the pager number or message. If a page has already been sent, pressing PAGE will repeat the page again (repage function) or prompt for a new message. When blinking, indicates invalid pager number not in configured code plan.
buSY	When flashing, indicates that channel is busy and call is being held until channel is free.
StAC	A pager number has just been accepted into the memory for a keypad stack. Another pager number may now be input. The new pager number may also be moved to the memory stack by pressing ENTER; pressing PAGE will send the pages starting with the most recent entry.
PAGE	Paging information being transmitted.
tALH	(talk) Voice interval is active; speak into desk microphone.
888888	Self-test is running. The self-test must be manually initiated by holding down the "B" key on power up.
Errx	Error number x detected. Refer to “Self-Test” in Section 6 for error code explanations.
crt on	Optional serial port is the active communication to the unit. Pressing any key on the keypad returns the unit to keypad control.

PLACING A PAGE

Format Selection

The encoder shows a single hyphen in the display to prompt for a format selection. One digit, 0-9 or A-D, may be entered to select the format of the following pager number. This leading digit is not a part of the pager capcode, nor will it be sent as any part of the page, but it is used to distinguish between formats in a multiple format encoder. If the encoder is programmed for only a single format configuration, then no format digit entry is required and the encoder displays a string of hyphens equal to the expected capcode entry length.

An incorrect format or pager code entry may be erased with the CLEAR key. If a digit is pressed for which there is no paging format assigned, the display will briefly blink to indicate an invalid entry, and then return to showing a single hyphen.

Pager Number

The display prompts for a pager capcode number by showing the leading digit (for a multiple format encoder) or a blank (for a single format encoder) at the left side of the display, followed by one or more hyphens. The number of hyphens indicate how many digits of a pager capcode number the unit is prepared to accept. One or two hyphens would prompt for a one or two digit pager number. Five hyphens signs would indicate that five or more digits might be accepted for a pager number. Whether the number of hyphens indicates the required number of digits, or just the maximum the encoder will accept, is determined by the paging format involved, however, once the encoder has received the maximum number of digits allowed by the selected format, it accepts no more.

As the digits are accepted from the keyboard they fill from the left to the right until the display is full. Additional entries continue to fill in on the right end while leading digits shift off the display to the left.

If a format uses extra “function code” digits to select special pager functions, these are generally entered as part of the pager capcode number.

An incorrect pager number can be erased with the CLEAR key. This causes the encoder to cancel the entire page and return to a format selection prompt.

Message

If a format and/or a selected function allow a message to be sent with the page, it may be entered when the message prompt, consisting of six underlines, appears in the display.

Different formats give different interpretations of the non-numeric keys A-D, *, and #. An overlay decal is provided to place adjacent to these keys for message formats. The information on the decal provides a key to the special characters that these keys will produce.

An incorrect message can be erased by pressing the CLEAR key and starting a new message. If no message has been entered, the CLEAR key cancels the page and returns the encoder to the format selection prompt.

Autopage

The Model 15P can be programmed by the installer to start the paging sequence either automatically after the last digit of the pager code has been entered (Autopage = ON), or only after the PAGE key has been pressed (Autopage = OFF). Autopage is activated after the encoder has received the maximum number of digits allowable for the chosen format. If the format allows variable length pager numbers or functions, a depression of the PAGE key may be necessary to start the paging sequence. Configuration is done by programming the APAG prompt in SYStEM programming; 0 = Autopage OFF and 1 = Autopage ON. See

"Programming System Parameters" in Section 5 for complete details. The encoder is shipped with the Autopage function off to allow the operator to review the pager number in the display before sending the page. If the chosen format allows a message to be sent, Autopage shows a message prompt. Once the message is entered, it is necessary to depress the PAGE key; Autopage will not activate during message entry. This allows the operator to verify correct entry.

Autoscroll

Once a pager number or message has been entered and Autopage activated or the PAGE key depressed, Autoscroll will redisplay the entry before starting the next sequence. Autoscroll shows the leading digits and the full pager capcode number with straps and function digits. It may be useful for verifying long pager numbers and messages, or to see the strapped digits which are not normally displayed. Autoscroll is programmed in the SYStEM programming by selecting SCrL; 0 = Autoscroll OFF, 1 = Autoscroll ON. See "Programming System Parameters" in Section 5 for complete details.

Because Autoscroll can be time consuming, it is not normally used. It should also be noted that code substitutions may be made to pager numbers and messages between the time they are entered and the time they are Autoscrolled.

Strapped Digits

Some formats require rather long pager numbers and their input can be tedious and repetitive. To alleviate this problem, many formats allow a portion of the pager capcode number to be programmed into the unit. This does limit the maximum call capacity of that format, but it also reduces the number of keystrokes necessary to enter a page.

When digit strapping is used, it is always the higher order digits which are strapped and they must be consecutive. For example, a Five-Tone pager number could not be strapped as 12x3x where x would be the pager number to input, but 123xx would be acceptable. Formats using service block or battery saving digits require these digits to be entered before the address digits. This feature allows these digits, which may be the same for an entire group of pagers, to be strapped.

During normal use the strapped digits are not seen and do not affect the display except to reduce the number of digits that must be entered. If the user wants to see the strapped digits before paging, the Autoscroll option may be used.

Keypad Stack Entry

A limited number of pager capcode numbers may be entered into a temporary "stack" in the encoder memory and then all sent out consecutively in single transmission. This feature is referred to as a keypad stack. To put a pager number into the keypad stack, enter the format selection and pager number as usual, then depress the ENTER key instead of PAGE. The display briefly flashes the message "StAC" to indicate that the encoder has accepted the entry into its memory. Another format selection and pager number can then be entered. This next entry may be followed by another depression of the ENTER key, or by the PAGE key. As

long as pager number inputs are followed by an ENTER key they will be moved to memory until the memory is full. At that point, no further depressions of the ENTER key will be accepted. Press the PAGE key to send the calls consecutively in the opposite order of entry, i.e. last in, first out.

Keypad stacks are temporary in nature, and once the stack has been transmitted, the encoder clears the memory used, leaving only the last page made in the display. This means that, unlike a page to an individual pager, an entire keypad stack cannot be retransmitted simply by pressing the PAGE key (only the last pager capcode would be transmitted). To send the stack page again, the entire stack would need to be entered into memory again. Pressing the CLEAR key at any time in the keypad stack entry process causes all of the capcodes in the memory stack to be lost; therefore entry of these pager numbers should be done with care.

Digital and tone formats should not be intermixed in a keypad stack. Calls allowing a data message will not be accepted because the stack sequence would be stopped to receive a message from the operator. Calls requiring an additional pager muting transmission are not accepted because different formats may require different muting transmissions.

Custom Stacks (Fixed Stack Pages)

Some end-users may have a need to perform predefined stack pages with some regularity and will want to be able to do so in a hurry whenever the need arises. The keypad stack feature does not really serve the needs of these users because of the time required to enter more than a few pager capcodes. The Model 15P can also be programmed with fixed stack pages that are held in the encoder's non-volatile memory.

The Custom Stack feature is assigned to a leading digit just like one of the other paging formats. Each of the fixed stacks is assigned an identifying number (like a pager capcode) up to four digits long. In order to transmit one of the fixed stacks, the operator enters the leading digit for Custom Stack paging followed by the identifying number for the stack required, and then presses the PAGE key. The encoder displays each pager capcode in the stack as it is transmitted. The pages are sent in the same order they were entered into the database during programming (first-in/first-out). An Alert tone and/or Talk time to be used with the fixed stack is assigned when the stack is programmed. These replace any Alert tones or talk times assigned to individual pagers in the stack. The encoder takes care of these when all of the pages are finished.

Some users, out of concern for not only speed but also operator training, may require that fixed stacks can be sent with only a single key press. This can be accomplished by entering an asterisk (*) for the stack number when programming the stack. For each leading digit that the Custom Stack format is assigned to, the Model 15P will recognize one unnumbered stack. When the operator enters just the leading digit and presses the Page key, the encoder checks to see if there is an unnumbered stack and, if there is, sends it.

A fixed stack can be entered into a keypad stack along with other individual pager capcodes, however, only one fixed stack can be included, and the fixed stack pages will not be sent until

all of the individual pager codes have been transmitted, regardless of what position the fixed stack number had in the keypad stack.

The maximum number of pager capcodes that can be placed in a fixed stack is limited by the "stacks" memory available. As a general thumb rule, each stack can hold ten pages. The exact capacity of a fixed stack can be calculated using the worksheet found at the end of Section 7. The last pager capcode position can be used to call the stack number of another fixed stack (this is taken care of by the programmer when the fixed stacks are set up). Any number of fixed stacks can be strung together this way, up to the limits of the encoder's available database memory.

The rules governing the programming of fixed stacks are somewhat different than the ones for keypad stacks. These are covered in more detail in "Custom Stack-Page Format (Fixed Stack)" in Section 5.

Talk

Many formats allow a voice message to follow the paging transmission. The duration of this talk interval is set under programming and is the same for all formats. Several of the formats are programmed with the Talk time enabled or disabled when the format is set up; other formats enable or disable Talk time based on the function code number entered when the page is actually made.

If a Talk interval is activated, the transmitter is kept ON after the page is completed and the desk microphone activated. The display prompts the operator with the message "tALH". The voice message can be given during the Talk interval and then the transmitter is turned off. Longer voice messages can be sent in the normal manner by pressing the push-to-talk (PTT) on the desk microphone. Shorter voice messages can be terminated before the Talk time expires by pressing the CLEAR key. When Talk time is not used, the transmitter is turned off immediately after sending the paging information.

Some formats use an additional transmission to mute the pagers. If a Talk time is enabled for such a page, the desk microphone is turned off after the Talk interval and the additional transmission is sent to mute the pagers before turning off the transmitter. If a short voice message is terminated with the CLEAR key, the pagers will be left unmuted and an additional page may be necessary to mute them.

Paging Sequence

Once the pager number has been entered, the PAGE key may be pressed. If no message is expected, the encoder will immediately start the paging sequence. If a message format and/or function have been selected, the encoder responds to the PAGE key with a message prompt. After the message has been entered, another depression of the PAGE key starts the paging sequence. Once the paging sequence starts, the encoder:

1. Validates pager numbers and messages. This verifies that all entered digits are recognized by the format. An invalid pager number is shown by a blinking display. If a

pager number in a keypad stack is found to be invalid, the transmission halts and all remaining pager numbers are lost.

2. Checks for a channel busy input. If detected, the encoder blinks the display message “buSY” continuously at a rapid rate until an internal timer determines that the channel has been available for two seconds.

3. Closes the audio relay to disconnect the desk microphone and connect the encoder's tone output to the transmitter's audio input.

4. Turn on the transmitter by closing the push-to-talk (PTT) relay contacts.

5. Send the paging information to the transmitter and display “PAGE”.

6. If another page is waiting in the memory stack, the pager number of that call is displayed, validated, and Step 5 is then repeated.

7. If Talk is activated: Open the audio relay to connect the desk microphone to the transmitter and display “tALH”. The voice message may be spoken at this time.

8. If a pager muting transmission is required, close the audio relay to disconnect the desk microphone and display “PAGE”. The muting transmission is sent then.

9. Turn off the transmitter by opening the PTT relay.

10. Display the pager number again to allow for repaging of the pager number displayed by pressing the PAGE key.

Repage

Upon completion of a paging sequence, the encoder redisplays the last six digits of the pager number just sent. To send to that pager again (repage), just press the PAGE key. The encoder automatically goes through the entire paging cycle again. A message format does not repeat the old message. The encoder automatically prompts for a new message and wait for a PAGE key depression to start the paging sequence again. Only the pager number shown in the display is repaged. Once the display has been cleared, Repage no longer works.

Busy Channel

The transmit inhibit input senses a busy channel when the input is closed to ground or at a TTL low level. The transmitter will not be turned on until this input is open or at a TTL high level for two consecutive seconds.

Continuous Transmit Mode

The encoder can be configured to continuously transmit a single page with a one-second pause between transmissions by enabling the Continuous Transmit mode. Continuous Transmit mode is enabled/disabled under the SYStEM programming by setting “cont” variable to either 0 (= Continuous OFF) or 1 (= Continuous ON). The value of this particular

parameter is not saved in the Model 15P's nonvolatile memory and will revert to disabled should the power be disconnected. With Continuous Transmit enabled, a single pager number and message may be entered as usual, followed by PAGE. The encoder will transmit the page, pause one second, and then repeat this cycle until the CLEAR key is pressed. The Continuous Transmit mode is in effect only until the CLEAR key is pressed, i.e., it must be reset just before each continuous transmit page.

NOTE

The Continuous Transmit mode may not work with PG-50 format display pagers.

OPTIONAL SERIAL PORT

Power-Up Test

The Model 15P encoder has no dip switches in order to configure it. Instead, the encoder's configuration options are selected in Programming mode (see "Programming System Parameters" in Section 5). This means that nothing has to be set before applying power.

To test the CRT installation, connect the serial ports of the two units and then apply power first to the CRT and then to the encoder. When the encoder powers up, it prints the following message on the CRT screen:

```
Model 15P Field Programmable, Ver: 2.1
Copyright, 1984-1996, ZETRON INC.
```

If this message is not received, check to see that the serial cable is wired correctly (TX and RX may be reversed). If garbled characters are received, the CRT and encoder baud rates are different or the communication parameters (8 data bits, 1 stop bit and no parity) are not set correctly on the CRT. Check jumper JP-14 on the PCB for the baud rate setting. This jumper can be checked by turning the encoder upside-down and looking through the small, square hole midway up the left side. The default position is 9600 baud. It will be necessary to remove the bottom cover in order to set P-14 to the lowest baud rate settings.

Operation

When the power-up tests are complete, the following message is printed on the CRT screen:

```
Model 15P Field Programmable, Ver: 2.1
Copyright, 1984-1996, ZETRON INC.

KEYPAD ACTIVE: Any key activates CRT.

Enter capcode:
```

When the encoder is first powered up, it expects to receive commands from the keypad. All keys (0-9,A-D,*,#) typed at the encoder's keypad are displayed on the CRT. To begin input from the CRT, press any character on the CRT keyboard, the following message is displayed:

```
CRT ACTIVE...

Enter capcode:
```

The encoder displays “CRT ON” when it expects input from the CRT. Characters typed on the CRT are NOT displayed on the encoder's display.

Special Keys

Table 3. ***OPERATION-2*** shows which keys are used to accomplish equivalent functions on both the encoder's keypad and the CRT keyboard.

Table 3. OPERATION-2 Keypad vs. CRT Key Functions

KEYPAD	CRT	FUNCTION
ENTER	CTRL-K	The keypad ENTER key or CRT CTRL-K key is used to enter a page on the stack for later recall and paging. The keypad ENTER key is also used to accept entered programming data in the program mode.
CLEAR	CTRL-C	The keypad CLEAR key or CRT CTRL-C key is used to cancel a page or message entry or to abort a page in progress.
PAGE	ENTER	The keypad PAGE key or CRT ENTER (or RETURN) key is used to start a page. The keypad PAGE key is also used to accept entered programming data in the program mode.
	BACKSPACE	The CRT BACKSPACE key (not available on keypad) is used to erase the last character entered.

CRT Paging Examples

Table 3. ***OPERATION-3*** and Table 3. ***OPERATION-4*** are provided to demonstrate how pages are entered from the keyboard of a CRT or computer which is connected to a Model 15P. Table 3. ***OPERATION-3*** demonstrates a 5-tone page with talk time (assuming 5-tone is leading digit 0). Table 3. ***OPERATION-4*** shows how to enter a POCSAG page with an alphanumeric format message to be sent (assuming POCSAG is leading digit 1).

Table 3. OPERATION-3 Example of 5-tone Page from CRT

YOU TYPE	CRT PROMPT	EXPLANATION
	`Enter capcode:`	Ready for pager code
0654327	`Enter capcode: 0654327`	Mistake made entering capcode
BACKSPACE	`Enter capcode: 065432`	Prepare for correction
1	`Enter capcode: 0654321`	Enter new character
ENTER/RETURN	`Paging...`	Start page
	`Talk now:`	Talk time
	`Enter capcode:`	Ready for next page code
ENTER/RETURN	`Enter capcode: 0654321`	Remember last page
ENTER/RETURN	`Paging...`	Repage
CTRL-C	`Enter capcode:`	Page-in-progress aborted
0246801	`Enter capcode: 0246801`	New page code entered
CTRL-K	`Stacked page.`	Stacked page routine starts
	`Enter capcode:`	Prompts for next capcode in stack
0135791	`Enter capcode: 0135791`	Next page code entered
ENTER/RETURN	`Paging...`	Both pages sent
	`Talk now:`	Talk time
	`Enter capcode:`	Ready for next page code

Table 3. OPERATION-4 Example of POCSAG Alpha-message Page from CRT

YOU TYPE	CRT PROMPT	EXPLANATION
	`Enter capcode:`	Ready for pager code
0	`Enter capcode: 0`	Wrong leading digit
CTRL-C	`Enter capcode:`	Start over
11122334	`Enter capcode: 11122334`	POCSAG capcode
ENTER/RETURN	`Enter message:`	Ready for message
MSG 4 BILL	`Enter message: MSG 4 BILL`	Message
ENTER/RETURN	`Paging...`	Start page
	`Enter capcode:`	Ready for next page code
ENTER/RETURN	`Enter capcode: 11122334`	Remember last page
ENTER/RETURN	`Enter message:`	Get new message
MSG 2 JOHN	`Enter message: MSG 2 JOHN`	New message
ENTER/RETURN	`Paging...`	Start page
	`Enter capcode:`	Ready for next page code

4. INSTALLATION

4. INSTALLATION

INSTALLATION WARNING

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

OPENING THE EPNCODER

Place the unit face down on a table top and lift off the bottom cover. The component side of the circuit board will be exposed, including the transmitter interface connector and configuration jumpers. After configuration is complete install four 7/8-inch #4 self-tapping screws at the upper and lower edges of the case to retain the bottom cover.

WIRE ROUTING

Route all connecting wires through the hole in the rear of the bottom case and secure them with the tie-wrap restraint on the bottom case.

GROUNDING

It is recommended that shielded cabling be used on all audio connections between the encoder, microphone, 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, TB1 pin 5, to the system ground point.

POWER SUPPLY

If using the 12 VAC wall transformer supplied with the encoder or other 12 VAC source, connect the AC leads to pins 1 and 2 on the terminal strip TB1.

A +12 to +14 VDC power supply may also be used. If using a DC supply, connect the positive (+) lead to pin 1 of TB1 and the ground (-) to pin 5 of TB1.

AUDIO OUTPUT

The audio output from the encoder is obtained from TB1 pin 4. This pin is internally switched by the Model 15P's audio circuits between the tone generator output and the external microphone input. When idle and during Talk time TB1 pin 4 is normally connected to the microphone input.

DIGITAL OUTPUT

The digital paging formats require very accurate timing reproduction of the binary waveform edges. To guarantee such accuracy, the terminal must be located in close proximity to the digital transmitter; typically a distance of 50 feet or less. It is also recommended that coaxial cable with a DC resistance of less than 100 ohms be used to carry the digital output signal. For connections to remote transmitters, digital modems are required in order to preserve the high-bandwidth waveform edges. The pager manufacturer should be consulted for exact requirements, but in general, NEC requires 300 baud (or faster) modems, while POCSAG and Motorola GOLAY require 600, 1200, or 2400 baud.

MICROPHONE CONNECTION

The audio switching circuitry in the encoder is activated during paging transmission to mute the external microphone audio and supply the paging tone generator signal to the transmitter. This assumes that the microphone is connected to input TB1 pin 6. If the microphone needs to be “live” all of the time, then it will need to be connected in parallel with the encoder's audio output, TB1 pin 4.

If a low-level microphone (millivolt signal levels) is being used, then the tone output needs to be attenuated to produce levels comparable to the microphone level. To do this, remove (clip out) 620-ohm resistor R57 from the encoder circuit board.

PUSH-TO-TALK

Radio transmitter keying is performed with the normal “push-to-talk” (PTT) signal. The encoder uses a DPDT relay to provide its PTT output. On TB1, the PTT connections are found on pins 10 (N.O.), 11 (COM.), and 12 (N.C.). A second set of PTT connections are found on TB2; pins 20 (PTT COM.) and 21 (PTT SW.). Whether TB2 pins 20 & 21 constitute a normally open or normally closed pair of contacts is determined by the position of jumper JP2. The jumpers JP4 and JP5 can be installed to internally ground the PTT Commons, TB1 pin 11 and TB2 pin 20 respectively.

A very typical configuration would be that a contact closure to ground is used for the transmit PTT signal. Connect the encoder's normally open contact at TB1 pin 10 to the transmitter's PTT input, then install a jumper across JP4 of the encoder. Should an open connection be required for transmit PTT, connect the normally closed output at TB1 pin 12 to the transmitter's PTT input, and then either install JP4, or connect the PTT common output at TB1 pin 11 to the transmitter's other PTT connection. All of the relay contacts are provided so that other connection combinations may be made if needed.

When a desk microphone push-to-talk switch is used in conjunction with the encoder, it is normally connected in parallel with the encoder's PTT connections so either closure will key the radio.

DIGITAL MODE

The digital mode output at TB1 pin 8 is used to indicate when the encoder is supplying a analog paging signal at TB1 pin 4 as opposed to when it is supplying a digital waveform at TB1 pin 9. This information is used by digital capable paging transmitter to select the correct modulation input when transmitting a page. Digital mode is a binary TTL level signal, and its polarity can be inverted under system programming.

EXTENDING THE TALK TIME

Formats using a TALK-ENDER (PG-50) may require a longer talk time; TALK-ENDER is a short message sent at the end of the talk time over the radio channel to mute the pager's audio. The Model 15 uses its Channel Busy input to delay TALK-ENDER and extend the talk time.

Connect TB1 pin 7 (Channel Busy) to TB1 pin 10 (PTT) or to COR of the receiver on the channel. NOTE: The Channel Busy requires a logic low or closure to ground to operate properly. This enables the encoder to know when the channel is in use.

To allow a longer voice message than the programmed Talk time, the operator presses the PTT on the desk microphone while the TALK LED is on in the encoder display. This will extend the Talk time for as long as the microphone PTT is held; the TALK-ENDER and battery saver (PG-50) signals will not be sent until the microphone PTT is released. During the extended Talk time, the “buSY” prompt will be shown in the encoder display.

If battery saver (PG-50) is enabled, the page cannot be sent until the pager wakes up. The display will freeze until the pager wakes up, then the page will be sent.

ALPHA PAGING

For paging systems that use alphanumeric paging such as POCSAG, the encoder's optional serial port must be used to connect to the serial port of a CRT or computer. Please note that if a computer is used to enter alphanumeric messages through the encoder, some form of terminal emulation software must be used on the computer to allow the computer to communicate out through its serial port to the encoder. To simplify explanations from this point on, the CRT or computer used with the Model 15P will simply be referred generically to as the “terminal”.

The terminal's receive line is connected to the encoder's transmit line on TB2 pin 17. The terminal's transmit line is connected to the encoder's receive line at TB2 pin 15. The terminal's signal ground line is connected to TB2 pin 16 of the encoder. Select the desired baud rate of the encoder by moving the jumper at JP14 to the appropriate location 300 to 9600.

SERIAL CRT INTERFACE

The requirements for serial interface to the encoder are listed in Table 4. ***INSTALLATION-1***. Configure the terminal's serial communications parameters to match. Check jumper JP-14 on the PCB to find the baud rate.

Table 4. INSTALLATION-1. Serial Communications Parameters

Baud rate	300, 600, 1200, 2400, 4800 or 9600
Data bits	8
Stop bits	1
Parity bits	none
Handshake	none
Duplex	full

It may be necessary to install additional jumper wires across the terminal's serial port hardware hand-shaking pins (CTS/RTS, DTR/DSR) to enable communications. Consult the CRT or computer manuals to determine if the hardware hand-shaking requirements can be disabled internally.

INTERFACE CONNECTOR

Connections between the encoder and the radio equipment are made on the terminal strip TB1 inside the encoder. Connections on both terminal strips are described in Table 4. ***INSTALLATION-2*** or Table 4. INSTALLATION-3.

Table 4. INSTALLATION-2. Connector TB1 Pin-out

TB1-#	Signal	Function
1	AC/DC In	12 VAC wall transformer or +12 VDC
2	AC In	12 VAC wall transformer
3	Audio Out	(not used)
4	Switched Audio Out	Audio for paging
5	Ground	Common ground
6	Switched Mic Input	Microphone input for voice paging
7	Channel Busy	Inhibit page-out when channel is in-use. Usually connected to receiver's squelch signal.
8	Digital Mode	Digital/Audio output indicator
9	Digital Data	Data for digital paging
10	PTT Normally Open	PTT relay for transmitter control
11	PTT Common	PTT relay for transmitter control
12	PTT Normally Closed	PTT relay for transmitter control

Table 4. INSTALLATION-3. Connector TB2 Pin-out

TB2-#	Signal	Function
13	(not used)	
14	Ground	
15	RS-232 receive	Serial data from CRT
16	RS-232 ground	Serial ground
17	RS-232 transmit	Serial data to CRT
18	(not used)	
19	(not used)	
20	PTT common	PTT relay common
21	PTT N.O./N.C.	PTT selectable N.O. or N.C.
22	(not used)	
23	(not used)	
24	(not used)	

The drawing in Figure 4. ***INSTALLATION-1*** illustrates the interface connector.

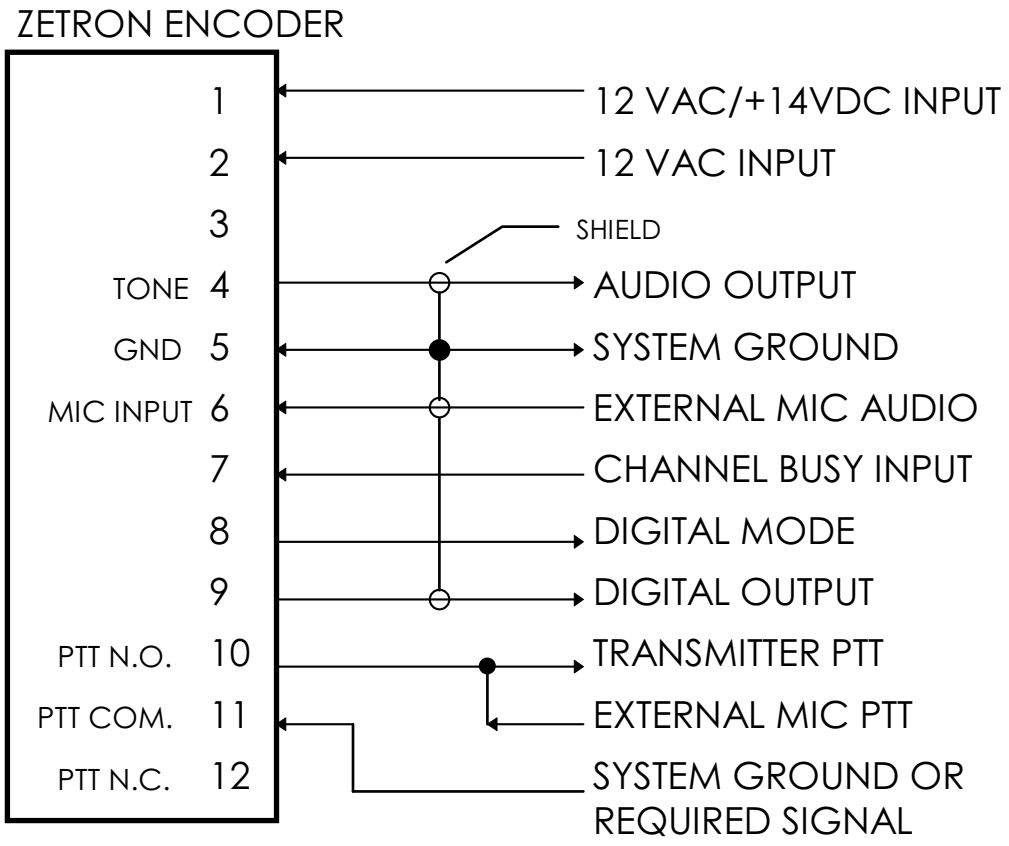


Figure 4. INSTALLATION-1. Typical Interface Connections

Jumpers

The jumpers listed in Table 4. ***INSTALLATION-4*** are used to configure the Model 15P hardware for the system it is installed in. More detailed explanations and instructions for jumper placement are contained in the installation instructions.

Table 4. INSTALLATION-4. Model 15P Jumpers

JP#	Name	Function
1	Channel Busy Input	Select input from receiver (position B or out), or pulled high (position A).
2	PTT-2 operation	Select PTT-2 N.C. (position B) or N.O. (position A).
3	Aux aud rly select	Select auxiliary relay audio (position A and C).
4	PTT-common ground-1	Ground PTT common (IN)
5	PTT-common ground-2	Ground PTT common (IN)
6	Aux-common ground	Ground Auxiliary-relay common (IN)
10	Paging mic/line in	B = mic input (de-emph) A = line input (flat)
13	Aux relay control	Separate (position A), follow PTT (position B)
14	Baud select	One of 300, 600, 1200, 2400, 4800 or 9600.
17	Chnl busy polarity	Normal (position A), Inverted (position B)

ADJUSTMENTS

Two adjustments are necessary to complete the installation of the encoder; setting the tone and digital output levels. Both adjustments are made with the bottom cover off.

Audio Test Mode

Depress the A + CLEAR keys while at the normal idle prompt (-) to activate the tone output test. The encoder will display the prompt “Audio” while in this test mode. The encoder will close the tone relay and generate a sequence of three test tones at 2000 Hz, 1000 Hz, and 500 Hz (±0.1 Hz) at TB1 pins 3 and 4. Each tone lasts for 1.5 seconds and then automatically switches to the next tone. The encoder continues to generate these tones until the test is terminated by pressing the CLEAR key again.

The output levels of all microprocessor generated tone frequencies will be referenced to these test tones. This test is also useful for checking that the de-emphasis jumper (JP10) is in the correct position to ensure a reasonably flat modulation level across all of the audible paging frequencies.

Adjust tone level potentiometer R26 to obtain a standard FM peak channel deviation of between 3kHz and 5kHz, as observed on a deviation meter or oscilloscope.

Binary Test Mode

The Binary test mode is similar to the Audio test, however, it is used for setting deviation for signals from the digital modulation output. While at the normal idle prompt, press the B + CLEAR keys to activate the digital circuitry tests. After pressing the two keys the prompt "binArY" is displayed. The encoder will accept the keys shown in Table 4. ***INSTALLATION-1*** for selecting test functions. The keys can be pressed in any order and repeated as many times as needed. Press the CLEAR key to exit this test and return to the normal operating mode.

Table 4. INSTALLATION-1. Binary Test Functions

Key	Prompt	Function
0	LOU.	Logic "0" output
1	HIGH	Logic '1' output
2	200	200 baud continuous preamble (alternate 0/1)
3	300	300 baud preamble
5	512	512 baud preamble
6	600	600 baud preamble
7	1200	1200 baud preamble
8	2400	2400 baud preamble

DTMF Output Test

While the DTMF tone pairs are generated by a different source than the rest of the analog paging signals, they come out through the same final audio stages as the other analog signals and their level is adjusted using the same control, R26. If the Audio test has been done correctly, it is very likely that you will never need to test the DTMF tone pairs independently. However, if you do need to fine tune the DTMF performance, this test makes that possible.

The DTMF test mode is entered by first removing power from the encoder, and then holding down the ENTER key while re-applying power. When you hear the DTMF tone, release the ENTER key. The key pad is now live. As you press the keys, the encoder will display the digit and send out the DTMF tone pair. All sixteen pairs are supported.

Press the CLEAR key to exit this test and return to the normal operating mode.

EXCEPTIONS

Zetron engineers are available for consultation on exceptional installation connections not described above.

CABLE OPTIONS

Drawings for any option interface cables that were ordered with the encoder are included with your order.

5. PROGRAMMING

5. PROGRAMMING

OVERVIEW

All of the parameters of the various encoder formats are set from the keypad by the dealer or a technician during installation. These parameters may be changed at any time by re-entering the programming mode and modifying the values or selections. All programmable values are saved in nonvolatile memory when leaving programming mode.

During power-up, the Zetron order number is momentarily displayed, followed by the installed software's version number. When the encoder is first powered up for the first time or is powered up without configurations or formats programmed, the LED display shows the prompt “SEtUP”.

LED Display	Explanation
12345	ZETRON Order Number displayed
X-X	Software version number displayed
SEtUP	Message indicating no configuration(s)

If an optional CRT is connected to the encoder, when the encoder is first powered up or is powered up without configurations or formats programmed, the CRT shows “Invalid Configuration” after the power-on messages, as shown below.

```
Model 15P Field Programmable, Ver: 2.1
Copyright, 1984-1996, ZETRON INC.

KEYPAD ACTIVE: Any key activates CRT.
Invalid Configuration
```

At this time, the encoder will only respond to the C-CLEAR keystroke combination from the terminal keyboard.

NOTE

A “SEtUP” or “Invalid Configuration” message always indicates an unprogrammed encoder. Any other error numbers indicate a malfunction has been detected during power up. Should this ever occur, contact Zetron for assistance.

Programming mode is entered by pressing and holding the C key on the encoder's keypad while pressing and releasing the CLEAR key (making sure the C key is still depressed when CLEAR is released). Programming may only be accomplished via the encoder’s keypad and not from an optional CRT terminal. When the program mode is entered, the message “ConFiG” is briefly displayed, announcing that the system is entering the programming mode. Following that, “diGt=0” is displayed and the encoder waits for user input.

When programming mode is first entered or anytime “diGt=0” is displayed, the user/programmer has three options:

1. *Program Paging Formats* - Enter the leading digit (any key from 0 to 9, or A to D) that is to be used for the paging format being configured. In the case of a single format encoder, any key may be used as a leading digit to program the specifics of the single paging format used.

2. *Program System Parameters* - Press the PAGE key. The display will then show SYStEM. Pressing the ENTER key enables the programming of the general system parameters. Pressing PAGE again would return the display to “diGt=0”.

3. *Exit Programming Mode* - Press the CLEAR key to exit the programming mode.

During programming, if an equal sign is displayed, the system is expecting a numeric input. Numeric values entered are always range checked so only valid entries are accepted. The numeric entries are usually only one or two digits. The displayed value can be changed by entering a new value from the keypad. The display changes automatically to show the new value as it is entered. Once satisfied with the newly displayed value, or if the original value is acceptable as is, the ENTER key is pressed to accept the value and advance to the next parameter.

When the displayed prompt is not followed by an equal sign, the choices for the parameter being selected may be scrolled through by depressing the PAGE key (for example, when selecting a paging format). When satisfied with the displayed choice, pressing of the ENTER key accepts the choice and advances to the next prompt. In all cases, once a selection has been made, or a displayed condition is to be accepted, the ENTER key must be pressed accept the present display and advance to the next parameter.

When the all the parameters for a given selection have been made, the Model 15P briefly displays the prompt “ .... ” (four dots), indicating that all the parameters for that mode have been programmed. The display then returns to the “diGt=0” prompt and awaits further selections.

To exit the programming mode, first be sure the “diGt=0” prompt is in the display. It may be necessary to press ENTER several times to finish the parameters of your current selection reach the display prompt required. Press the CLEAR key on the encoder. The prompt “SAVE Y” is displayed. Pressing the CLEAR key again toggles the “Y” to “n”. When the prompt shows the desired answer to the question about saving the current set of parameters, press the ENTER key to exit the program mode. If the encoder was set to save the current programming, the prompt “SAVinG” is displayed while the encoder writes this data into its nonvolatile memory. This operation will take a moment. The encoder will then return to the operating mode prompt. If a CRT option has been installed, it may now be used if desired.

PROGRAMMING SYSTEM PARAMETERS

A description of the prompts encountered when programming system parameters is presented in Table 5-1 for easy reference. The mix of upper and lower case characters in the prompts simulate what is actually viewed on the LED display. To the right of the prompt is a description of what the prompt is asking for and what responses are valid. The prompts are presented in the order in which they are encountered while programming the encoder. Should an improper or out of range value be entered while programming the encoder, the encoder will not proceed to the next prompt after pressing the ENTER key. Instead it will redisplay the same prompt and await an allowable value. Out of range entries to prompts for single digit entries will not be displayed.

Table 5-1 System Programming Parameters

Prompt	Explanation
SYStEM	Pressing ENTER at this prompt starts the programming of system parameters.
tLH= 0	Talk Time - Should Talk be enabled in a paging format, this parameter sets the Talk-time period. The range is between 00 and 60 in seconds. Keypad entries are shifted from right to left in the display. If an error is made during entry, continue to press keys until the correct two digits are displayed. The two digits showing when ENTER is pressed are the accepted value.
binP=0	Binary Polarity - This parameter selects whether a Logic “0” will appear as a High or Low level on the Digital output. An acceptable value is 0 or 1.
diGP=0	Digital Mode Polarity - A “0” indicates that TB1 pin 8 will be low for digital mode output, and a “1” indicates a high output for a digital page.
APAG=0	Autopage - A “1” enables the Autopage feature, sending the page automatically following entry of the final digit of a page number. Keypad stack may not be used when Autopage is enabled. A “0” indicates the feature is disabled.
SCrL=0	Autoscroll - “0” = disabled, “1” = enabled The display scrolls through the entire capcode (including the leading digit) to before sending out a page.
cont=0	Continuous-test Mode - “0” = disabled, “1” = enabled The encoder continuously repeats the last page entered at one second intervals (until the CLEAR key is pressed). NOTE: This parameter is not saved in nonvolatile memory and will revert to disabled if the power is cycled.
Sid= 0	Station ID - This parameter enables or disables the Morse code Station ID feature.

System Programming Example

The Table 5. ***PROGRAMMING-2*** is an example of the sequence of prompts and keystrokes for programming system parameters.

Table 5. PROGRAMMING-2 System Programming Example

Prompt	Keystroke	Explanation
SEtUP	C and CLEAR together	Displaying the SEtUP prompt indicates that no formats have been programmed. Hold the C and CLEAR keys down together.
ConFiG	Release keys	Displaying ConFiG confirms entering the program mode.
diGt=0	PAGE	Pressing the PAGE key will toggle between the leading digit prompt and the system prompt.
SYStEM	ENTER	Pressing the ENTER key will select the system function programming mode.
tLH=0	10, ENTER	Talk time in seconds. If voice-capable pagers are used, this will set the amount of time allowed for voice messages after the page. Pressing ENTER will accept the value displayed and proceed to the next prompt.
binP=0	ENTER	Binary polarity. Pressing ENTER will accept the value displayed and proceed to the next prompt. Unless you know you need to invert this parameter, leave it at default.
diGP=0	ENTER	Digital Mode polarity. Pressing ENTER will accept the value displayed and proceed to the next prompt. Unless you know you need to invert this parameter, leave it at default.
APAG=0	ENTER	Autopage. Pressing ENTER will accept the value displayed and proceed to the next prompt. Unless you know you need to invert this parameter, leave it at default.
SCrL=0	ENTER	Autoscroll. Pressing ENTER will accept the value displayed and proceed to the next prompt. Unless you know you need to invert this parameter, leave it at default.
cont=0	ENTER	Continuous-test mode. Pressing ENTER will accept the value displayed and proceed to the next prompt. Testing is the only time you would change this.
Sid= 0	0 or 1, ENTER	Enables/Disables use of Station Morse Code ID. 0 = Disabled, 1 = Enabled. If enabled, it will be followed by an opportunity to enter the ID characters.
....		Momentary display indicates all parameters are programmed.
diGt=0	CLEAR	Pressing the CLEAR key exits the program mode. Pressing PAGE displays the SYStEM prompt again. Entering a digit 0 - D selects a leading digit for paging format programming.
SAVE Y	Pressing CLEAR will toggle Yes/No	If you press the CLEAR key at the diGt=0 prompt, this prompt asks if the unit should save the programmed values from this session into non-volatile memory. Press ENTER to save data and exit the program mode.

Station ID Characters

The Model 15P is capable of transmitting the station call sign in Morse code at 22 Words Per Minute. The encoder will do this approximately every 15 minutes during normal, regular usage. The modifier "approximately" is used because the encoder does not key up to make the ID just because the ID timer has run out. The encoder checks the ID timer every time it is told to make a page, and if the timer has expired, the encoder transmits the station ID before transmitting the page. This means that the real period between ID transmissions will be affected to some extent by the amount of paging being done. The interval timer and the code transmission speed are fixed at 15 minutes and 22 WPM.

The Model 15P will accept call signs up to ten characters in length. The call sign can use all 26 letters of the alphabet and the digits "0" to "9". Because all of the programming of the Model 15P must be entered from the rather limited keypad, it is necessary to use two-digit combinations to represent all of the characters in the ID call sign. These two-digit combinations are shown in Table 5. ***PROGRAMMING-3***, and are based on the typical number-letter assignments used on telephone keypads.

The first digit of each pair indicates the position that the letter has on its key, and the second digit is the number of the key on which that letter is found. For example, the letter "N" is the second letter on key six, so its two-digit code is "26". All numeric characters are entered simply by adding a leading zero to them, i.e. the number eight would be entered "08". There are two letters that do not appear normally on telephone keypads; the letters Q and Z. These were assigned the combinations 11 and 21, respectively.

Table 5. PROGRAMMING-3 Station ID Cross-Reference

Digits	#	Code	Digits	Letter	Code	Digits	Letter	Code
00	0	– – – – –	12	A	• –	26	N	– •
01	1	• – – – –	22	B	– • • •	36	O	– – –
02	2	• • – – –	32	C	– • – •	17	P	• – – •
03	3	• • • – –	13	D	– • •	11	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	– • – –
			16	M	– –	21	Z	– – • •

Example

To set the call sign to “WNCR414”, first enter into system programming on the 15P and work your way down to the station ID prompt. Enable the Station ID by entering a one and pressing ENTER. The display will either go blank at this point, if there is no prior ID string in memory, or it will display the last six characters of the last ID string anyone has programmed into the Model 15P. To enter a new ID, you simply start keying in the two-digit combinations for each character. As the second digit of each pair is entered, the encoder will display the proper letter or number for that entry. The characters will start on the right end of the display and move to the left as more entries are made. This will continue until you finish entering the call sign or all ten character positions are filled. Press ENTER to accept the call sign entered. The following example shows the series of two-digit numbers that would be entered for a typical seven-digit call sign.

ID Characters	W N C R 4 1 4	
Keypad Entry	19 26 32 27 04 01 04	+ ENTER

The Model 15P does not erase the existing ID string just because you disable the Station ID feature, and when you re-enable the Station ID, the last call sign entered will still be there. However, as soon as you enter a single new character into the ID slot, the encoder overwrites the old string with the new one. To accept the old ID without any changes, you simply press the ENTER key and return to the “diGt=0” prompt.

PROGRAMMING PAGING FORMATS

The following paragraphs describe the prompts encountered when programming paging formats.

When the display reads “diGt=0”, selecting a digit between 0 and D will select the leading digit under which a paging format may be programmed. When only a single format is to be programmed in the encoder, a leading digit still needs to be selected for programming to proceed. The leading digit does not, however, need to be pressed when entering a page in an encoder that has only a single format programmed.

After a leading digit is selected, press ENTER, If the leading digit selected has been programmed with a paging format before, then that format name is displayed. If the “dELEtE” prompt is displayed, this indicates that the leading digit current does not have any format assigned to it. If you want to accept the format displayed, press ENTER. If you want to select another format, press the PAGE key as necessary to cycle through the available formats, and then press ENTER when the desired format name is shown. This erases the existing format data and starts the programming process for the selected format. If you wish to erase the existing format and leave the leading digit blank, press PAGE until the “dELEtE” prompt is displayed and then press ENTER. The encoder will erase that block in the database and return to the “diGt=0” prompt.

The tables presented list the prompts encountered when programming the paging formats. The indented prompts pertain to values that are related to the major category. The mix of upper and lower case characters in the prompts simulate what is actually viewed on the LED display. To the right of the prompt is a description of what the prompt is asking for and what responses are valid.

Should an improper or out of range value be entered while programming the encoder, the program will not proceed to the next prompt after pressing the ENTER key. Instead it will redisplay the same prompt and await an allowable value. Out of range entries to single digit requests will not be displayed.

About the Custom Calls Formats

The Custom Two-Tone, Custom DTMF, and Custom Stacks formats are all based upon the Custom Calls database. At the time a leading digit is assigned to one of the Custom Calls formats a Custom Calls database is opened for that format. Records are then added to the database where each record represents the capcode and data associated with a single page. The number of capcodes that may be assigned to a format is limited only by available memory and records may be added to the database until memory is exhausted. As the record lengths will vary between the three Custom Calls formats, the maximum number of database entries per format will also vary. To help determine the required amount of memory to support your Custom Calls programming, use the worksheet at the end of Section 7.

Two-Tone

For 100 and 1000 call 2-tone encoding, select the format prompt "2 tonE", then press ENTER. Table 5. ***PROGRAMMING-4*** shows and explains the prompts associated with this format.

Table 5. PROGRAMMING-4 Two-Tone Format Prompts

Major Prompt	Conditional Prompt	Explanation
tALH=0		0 = Talk disable; 1 = enable. Talk time value set in System programming.
COdE=0		0 = tone groups will be used for 100 call units; 1 = code plans will be used for 1000 call units.
	GP1= 1	When COdE = 0, this prompt requests the first tone group for a 100 call paging system. For group numbers, see Section 7, "Motorola and GE Tone Group Frequencies".
	GP2= 1	When COdE = 0, this prompt requests the second tone group for a 100 call paging system.
	PLN= 0	When COdE = 1, this prompt requesting the Zetron code plan number (0 - 24) for 1000 call paging systems. For code plan numbers, see Section 7, "Motorola and GE Code Plans".
1St= 0		Timing for first tone. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid. For timing information, see Section 7, "Two-Tone Timing".
GAP= 0		Timing of the gap between the first and second tones. The number entered will be the number of 100ms intervals (gap time X 100ms). A value from 00 to 99 is valid.
2nd= 0		Timing of the second tone. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid.
diAG= 0		Diagonal tone enable/disable. 1 = enabled, 0 = disabled.
	dur= 0	If the diagonal tone is disabled, this prompt sets the group tone duration. The time is set in 100ms increments, the range is from 00 - 99.
	742	This is the default diagonal tone frequency, and shows up when diagonal tone is enabled. This may be set from 299 to 3001 Hz. For diagonal tone information, see Section 7, Table 7-1 or 7-2.
	A b=	This prompt selects placement of the diagonal tone. "0" selects the A (or first) tone for diagonal tone substitution. "1" selects the B (or second) tone for diagonal tone substitution.

Programming Example

Table 5. ***PROGRAMMING-5*** is an example of the sequence of prompts and keystrokes for programming the 2-tone paging format under leading digit "0". The encoder will set up to use the 1000 call Motorola code plan "P" and the standard Tone & Voice timing. The Talk time will be used.

Table 5. PROGRAMMING-5 Programming a Leading Digit for 2-Tone

Prompt	Keystroke	Explanation
SEtUP	C and CLEAR	The display indicates that no formats have been programmed. Hold the C and CLEAR keys down together to enter the programming mode.
ConFiG	Release keys	Display indicates the encoder is entering the program mode.
diGt=0	0 , ENTER	Selects the leading digit “0” for paging format programming. Pressing ENTER will accept the value displayed and proceed to the next prompt.
dELEtE	PAGE	dELEtE is the default message displayed if no format resides in the leading digit selected. Pressing the PAGE key repeatedly will scroll through all the installed paging formats available.
2 tonE	ENTER	Pressing the ENTER key will accept the format displayed and proceed to the next prompt. For this example, 2 tonE is displayed when the ENTER key is pressed.
tALH=0	1 , ENTER	1 = Voice Message Used. Pressing ENTER will accept the value displayed and proceed to the next prompt.
COdE=0	1 , ENTER	1 = use 1000 code plans, see Section 7 for 2-tone code plan information. Pressing ENTER will accept the value displayed and proceed to the next prompt.
PLN=0	12 , ENTER	Selects the 1000 call code plan Motorola “P”. This uses the Motorola tone groups 2, 3, 4, and 6.
1St=0	10 , ENTER	Sets the first tone's timing to 1 second (10 x 100-millisecond intervals). Pressing ENTER will accept the value displayed and proceed to the next prompt.
GAP=0	0 , ENTER	Sets the Gap timing between tones to zero. Pressing ENTER will accept the value displayed and proceed to the next prompt.
2nd=0	30 , ENTER	Sets the second tone's timing to 3 seconds (30 x 100-millisecond intervals). Pressing ENTER will accept the value displayed and proceed to the next prompt.
diAG=0	0 , ENTER	Disables the use of Diagonal Tone. In any 100 call block of this code plan that uses the same tone group for both tones, group call paging will be supported. Pressing ENTER will accept the value displayed and proceed to the next prompt.
dur= 0	80, ENTER	Sets the diagonal tone duration to 8.0 seconds.
....		Momentary display indicating all parameters are programmed.
diGt=0	CLEAR	After programming the format is completed, the display returns to the prompt for a leading digit. Other keys can be used for additional programming at this point. Pressing the CLEAR key exits the programming mode.
SAVinG		The display indicates the encoder is saving the programming values in non-volatile memory.
---		The display indicates the encoder is ready for capcode entry. The number of dashes will depend on the programming and type(s) for mats used.

Five-Tone

For 5/6-tone format programming (full 100,000 call capacity) select the paging format prompt “5 tonE”, then press ENTER. Table 5. ***PROGRAMMING-6*** shows and explains the prompts for this format.

Table 5. PROGRAMMING-6 Five-Tone Format Prompts

Major Prompt	Conditional Prompt	Explanation
tALH=		0 = Talk time disable; 1 = Talk time enable. Talk time value set in System programming.
PrE =		0 = Disable preamble, 1= Enables the sending of a preamble digit to the pager prior to the address digits.
StrP =		Number of strapped digits. If Preamble is enabled, up to four digits may be strapped. If Preamble is disabled, a maximum of three digits may be strapped.
	StP(n)=	If the number of strapped digits is > 0, this prompt requests the digit desired for the strapped number position shown. “StP1=“ would be the preamble digit, if enabled, and is always the first digit sent. “StP2=“ is the next digit, so forth.
rEPt =		Number of times to repeat page. Range is 0 to 9.
tYPE =		Tones/Timing type. 0 = EIA, 1 = CCIR, 2 = ZVEI, 3 = EEA.
Addr =		Address mode. 0 = single, 1 = dual, 2 = extra digit.

DTMF Format

For DTMF encoding, select the paging format prompt "dtn.F", and then press ENTER. Table 5. ***PROGRAMMING-7*** shows and explains the prompts for this format. The maximum length for DTMF paging is eight digits.

Table 5. PROGRAMMING-7 DTMF Format Prompts

Major Prompt	Conditional Prompt	Explanation
tALH =		0 = Talk disable; 1 = enable.
dur =		Tone duration (timing). A two digit entry specifying the number of 10ms units of time for each tone. (tone time X 10ms)
GAP =		The gap timing (time between tones). (Gap time X 10ms)
dGtS =		Number of DTMF digits. A valid entry is from 1 to 8 digits may be sent per page.
StrP =		Number of digits strapped within the encoder. A valid response is from 0 to 7 digits, however, the encoder will not accept a value greater than "dGtS" - 1 for this entry.
	StP(n)=	If the number of strapped digits programmed is > 0, this prompt requests the digit desired for the strap number. "StP1=" is always the first digit sent, "StP2=" is the next and so on.

HSC Format

For Hexadecimal Sequential Code (HSC) for PG-50 pagers, select the paging format prompt "HSC" and then press ENTER. Table 5. ***PROGRAMMING-8*** shows and explains the prompts for this format.

Table 5. PROGRAMMING-8 HSC Format Prompts

Major Prompt	Conditional Prompt	Explanation
StrP =		Number of digits strapped within the Model 15. A valid response is from 0 to a maximum of 4 digits.
	StP(n)=	If the number of strapped digits programmed is > 0, this prompt requests the digit desired for the strap number. StP1= would be the service block and is always the first digit sent, StP2= is the first pager address digit and would be the next digit sent, and so on.
rEPt =		Number of times to repeat page. From 0 to 9 repeat pages may be selected.
tYPE =		Tones/Timing type. 0 = EIA, 1 = CCIR, 2 = ZVEI, 3 = EEA.
SuPS =		Supersave feature enabled, yes or no. 0 = no, 1 = yes.
	bAt =	00-60. Time interval in seconds to issue Supersave command.

NOTE

Upon completion of programming, Supersave always defaults to off. Supersave may be toggled on and off as desired, by typing the leading HSC digit, the character "B" and PAGE from the keypad. The LED display will momentarily flash the state of Supersave.

Reach Format

For Reach paging format, select the paging format prompt "rEACH", and press ENTER. Table 5. ***PROGRAMMING-9*** shows and explains the prompts for this format.

Reach is essentially a specialized form of two-tone paging. For the purposes of fitting it into the Model 15P, Zetron has taken 50 tones from the original group of 60 Reach tones and organized them into five tone groups. These five tone groups are then used to make up a 1000-call code plan. Reach paging in the Model 15P is done by specifying a particular 100-call block within the Zetron/Reach code plan, and then two more digits for a specific capcode within that block. See Tables 7-10 through 7-13 in Section 7 for more information on Reach tones and timings.

Table 5. PROGRAMMING-9 Reach Format Prompts

Major Prompt	Conditional Prompt	Explanation
tALH =		0 = Talk disable; 1 = enable.
StrP =		A digit may be strapped within the encoder to fix the 100-call block from which the page comes. A valid response is 0 or 1. If StrP = 0, then the operator must enter the block number with every page made.
	StP1=	If StrP = 1, then this prompt requests the digit for the 100-call block to use from the Reach code plan. The number may be between 0 and 9.
1St =		Timing for first tone. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid.
GAP =		Timing of the gap between the first and second tones. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid.
2nd =		Timing of the second tone. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid.
dur =		Timing of the group tone duration. The number entered will be the number of 100ms intervals (tone time X 100ms). A value from 00 to 99 is valid.

2805 Format

For 2805/1500-Hz pulse paging format, select the paging format prompt “2805”, and then press ENTER. Table 5. ***PROGRAMMING-10*** shows and explains the prompts for this format.

Table 5. PROGRAMMING-10 2805 Format Prompts

Major Prompt	Conditional Prompt	Explanation
tALH =		Enables talk time during the page, the amount of Talk time has been set in "SYStEM" programming. 0 = Talk disable; 1 = enable.
1500 =		Selects tone used for pulse generation. 0 = use 2805 Hz tone, and 1 = use 1500 Hz tone
dGtS =		Select the number of digits to be sent per page. A value between 1 and 8 is acceptable.
StrP =		The number of strapped digits for this format. An entry of 0 to 7 is valid, however, the encoder will not accept a value greater than “dGtS - 1".
	StP(n)=	If the number of strapped digits programmed is > 0, this prompt requests the digit desired for the strap position indicated. So that StP1= is always the first digit sent, StP2= is the next and so on.

Alert Tones

For Alert tone encoding, select the format prompt ALErt, and press ENTER. Table 5-11 shows and explains the prompts for this format.

The Model 15P can transmit the audible Alert tones by themselves, just as though they were paging tones. This format allows the Alert tones to be assigned a leading digit. The Alert tone desired can be selected manually each time this feature is used, or a single Alert tone can be strapped to the leading digit. This allows the Alert to be sent with a single key press.

Table 5-11 Alert Tones Menu Prompts

Major Prompt	Conditional Prompt	Explanation
tALH =		Selects whether or not a talk time follows the transmission of the Alert tone. 0 = Talk disable; 1 = enable.
StrP =		Strapped digit enable. A “1” allows an alert tone to be strapped in the encoder, and a “0” means the alert will be selected from the entered code.
	tonE =	If StrP = 1, the programmer will be prompted for the tone type. 1 = HiLo Tone, 2 = Five beeps, 3 = Slow Siren, 4 = Fast Siren.

Custom Two-Tone Format

To program this format, select the "c2tonE" prompt from the format selection menu. Table 5-12 explains the various prompts that are used by this format, and Table 5-13 shows the keys that are used for editing.

Table 5-12 Custom Two-Tone Format Prompts

Prompt	Explanation
C	This is the capcode prompt. This is the number that is entered during the paging cycle to send a Two-Tone page. Valid characters are the digits 0 through 9. One to four digits in any combination is allowed and each combination is unique (ex: 0001 vs. 01 vs. 1). To exit from programming this format, press the CLEAR key while at this prompt.
A 0.0	The "A" tone frequency (the first tone sent). The valid range is 250.0Hz to 3500.0 Hz.
d 0.000	The "A" tone duration. The valid range is 0.000 to 9.999 seconds.
G 0.000	The gap time duration between tones "A" and "B". The valid range is between 0.000 and 9.999 seconds.
b 0.0	The "B" tone frequency (the second tone sent). The valid range is 250.0 to 3500.0 Hz.
d 0.000	The "B" tone duration. The valid range is 0.000 to 9.999 seconds. This duration can be left at zero if you are constructing a single-tone page.
Alrt 0	The Alert Tone. This prompt sets which Alert Tone, if any, follows the page. The valid settings are: 0 = No alert sent, 1 = Hi/Lo warble, 2 = five rapid beeps, 3 = slow siren, 4 = fast siren
tALH 0	Talk enable/disable. This is a yes/no field that selects whether or not a talk time follows the page and Alert tone. The valid settings are: 0 = No, 1 = Yes

Table 5-13 Editing Keys for the Custom Two-Tone Format

Key Used	Function
C	Clear the display
A	Review previous capcode
B	Review next capcode.
D	Delete a capcode.
CLEAR	- Stop editing and return to capcode entry. - Stop capcode entry and exit the format.
ENTER	To enter displayed data as input.

Brief Summary

The Custom Two-Tone format allows you to program the frequencies, their timings and gap duration on a capcode by capcode basis. All programming can be done from your bench without the need for a PC or assistance from Zetron. Here is a list of the Custom Two-Tone capabilities:

- Each Custom Two Tone capcode may be from 1 to 4 digits long.
- Tone A and Tone B are programmable for each capcode.
- Tone A duration and Tone B duration are programmable for each capcode.
- The gap duration is programmable for each capcode.
- Talk may be enabled or disabled for each capcode.
- Any of 4 Alert tones may be selected for each capcode, or Alert may be disabled.
- Up to 111 Custom Two Tone capcodes can be stored.

Programming Example

This example assumes no prior knowledge of the Model 15P. You will be taken from power up to programming. At the end of this exercise you will have programmed and edited two Custom Two-Tone capcodes and their data. The encoder will be programmed for the following pages:

Capcode	A Freq	A Dur	Gap	B Freq	B Dur	Alert	Talk
901	1000.0	1.000	0.000	1750.0	3.000	4	1
902	2000.0	1.000	0.000	1500.0	3.000	0	0

Before beginning this exercise insure that a 12VAC wall transformer is properly connected to pins 1 and 2 of TB1. See “ELECTRICAL SPECIFICATIONS” in Section 2 for the proper wall transformer. Table 5-14 shows the steps required to program in the first page.

Once you have programmed one capcode and its data and are ready to program the next, the steps in Table 5. PROGRAMMING-15 demonstrate how the encoder utilizes the data from the previous capcode as default data for the next capcode. Anticipating the next entry should speed the programming process for large Custom Two-Tone data bases. Note, to avoid redundancy, some of the steps performed in Table 5-14 will be skipped in Table 5. PROGRAMMING-15.

After you have programmed two distinct capcodes and are ready to program another, the steps shown in Table 5. ***PROGRAMMING-16*** demonstrate how to edit an existing capcode. You will change the Tone B frequency in capcode 901 from 1500.0 Hz to 1750.0 Hz.

Table 5-14 First Custom Two-Tone Page

Display	Keystrokes	Explanation
#####		Plug in the wall transformer. Display shows Z-number & version number during power up.
2.1		Version 2.1
SEtUP		SEtUP means no formats programmed yet.
ConFIG	C+CLEAR keys together	Display momentarily shows ConFiG to indicate that it is entering programming mode.
diGt =0	0 to D , ENTER	Select the leading digit. This digit identifies the format that you are programming.
dELEtE	PAGE, PAGE, ...	PAGE key steps through the format selection menu . Press PAGE key until c2tonE appears in the display.
c2tonE	ENTER	Select the Custom Two-Tone format.
C	901	Type in 901 for the capcode.
C 901	ENTER	Press ENTER to input the capcode.
A 0.0	10000	Type in 1000.0 Hz for the Tone A frequency. It is not necessary to input the decimal point.
A1000.0	ENTER	Press ENTER to input the Tone A frequency.
d 0.000	1000	Type in 1.000 seconds for the Tone A duration.
d 1.000	ENTER	Press ENTER to input the Tone A duration.
G 0.000	ENTER	Press ENTER to input 0.000 seconds for gap duration.
b 0.0	15000	Type in 1500.0 Hz for the Tone B frequency. It is not necessary to input the decimal point.
b1500.0	ENTER	Press ENTER to input the Tone B frequency.
d 0.000	3000	Type in 3.000 seconds for the Tone B duration. It is not necessary to input the decimal point.
d 3.000	ENTER	Press ENTER to input the Tone B duration
ALrt 0	4	Type in 4 for a “fast siren” Alert function.
ALrt 4	ENTER	Press ENTER to input the Alert function number.
tALH 0	1	Type in 1 to enable talk for this capcode.
tALH 1	ENTER	Press ENTER to input the talk enable/disable selection.
C		Ready to program the next capcode and data.

Table 5. PROGRAMMING-15 Second Custom Two-Tone Page

Display	Keystrokes	Explanation
C 902	902, ENTER	Type in 902 for the next capcode and press ENTER.
A1000.0	2000.0	1000.0Hz appears in the display as the default Tone A frequency. Type in 2000.0 Hz to replace it.
A2000.0	ENTER	Press ENTER to input the Tone A frequency.
d 1.000	ENTER	1.000s appears in the display as the default Tone A duration. Press ENTER to accept this default value.
G 0.000	ENTER	0.000s appears in the display as the default gap duration. Press ENTER to accept this default value
b1500.0	ENTER	1500.0Hz appears in the display as the default Tone B frequency. Press ENTER to accept this default value.
d 3.000	ENTER	3.000s appears in the display as the default Tone B duration. Press ENTER to accept this default value.
ALrt 4	0, ENTER	4 appears in the display as the default Alert function. Type 0 and press ENTER to replace it.
tALH 1	0, ENTER	1 appears in the display as the default talk setting. Type 0 and press ENTER to replace it.
C		Ready to program the next capcode and data.

Table 5. PROGRAMMING-16 Editing a Custom Two-Tone Page

Display	Keystrokes	Explanation
C	A	Press A (Above) to cycle backwards through the data base. B (Below) will cycle the opposite direction.
C 902	A	Press A until capcode 901 appears in the window.
C 901	ENTER, ENTER, ENTER, ENTER	Press ENTER four times. The Tone B frequency will appears in the display.
b1500.0	17500	Type in 1750.0 for the new tone B frequency.
b1750.0	ENTER	Press ENTER to input the new Tone B frequency.
d 3.000	ENTER, ENTER, ENTER	Press ENTER three more times to return to the capcode prompt.
C		Ready to program the next capcode and data.

Finally, the steps in Table 5-17 show how to save the two capcodes that were created in this example to the nonvolatile memory.

Table 5-17 Saving the Custom Two-Tone Programming

Display	Keystrokes	Explanation
C	CLEAR	Press the CLEAR key to exit the Custom Two-Tone format.
diGt =0	CLEAR	Press the CLEAR key again to exit programming mode.
SAVE y	CLEAR	You are given the option to save or not.
SAVE n	CLEAR	Notice that pressing any key other than ENTER will toggle between SAVE y and SAVE n.
SAVE y	ENTER	Pressing ENTER with SAVE y in the display will save any changes that were made during programming to nonvolatile memory.
SAVinG		The display will flash SAVinG for a few seconds then display the page mode prompt.
-		Ready to page.

POCSAG Format

For POCSAG tone-only and alpha/numeric pagers, select the POCSAG format prompt, and press ENTER. Table 5-18 shows and explains all of the prompts for this format.

Table 5-18 POCSAG Format Prompts

Major Prompt	Conditional Prompt	Explanation
StrP =		Number of capcode digits strapped within the encoder. A valid response is from 0 to a maximum of 5 digits.
	StP(n)=	If StrP > 0, this prompt requests the digit desired for the strap position shown. StP1= is always the first digit sent, StP2= is the next and so on.
Fnct =		A prompt asking whether or not to strap the function code. 0 = disabled, 1 = enabled
	diGt =	If Fnct = 1, this prompts for the function code to strap. This number may have a value from 1 to 4.
tALH =		0 = Talk disable; 1 = enable Talk time.
bAUd =		Entering a "0" will select 512 baud operation, entering a "1" will select 1200 baud operation and a "2" will select 2400 baud operation.
ALFA =		A 0 (default) or a 1 needs to be entered to disable / enable alphanumeric messages. Up to 255 alpha characters may be sent if enabled or a maximum of 20 numbers may be sent in numeric only operation.
d4 =		A 1 = NEC type D4 pager operation, 0 = NEC D4 disabled. This option is only available if alphanumeric messaging is enabled.

NEC Format

For NEC D2 (five-digit capcode) tone only and D3 (six-digit capcode) tone and numeric display pagers, select the NEC format prompt and press ENTER. Table 5-19 shows and explains all of the prompts for this format.

Table 5-19 NEC Format Prompts

Major Prompt	Conditional Prompt	Explanation
StrP =		Number of capcode digits strapped in the Model 15P. A valid response is from 0 to 4 digits. *Please note:* if **four** digits are strapped, the encoder will be limited to 6-digit tone/numeric display operation only.
	StP(n)=	If StrP > 0, then this prompt requests the digit desired for the strap position shown. StP1= is always the first digit sent, StP2= is the next and so on.

GOLAY (GSC) Format

For Motorola GOLAY encoding (sometimes called GSC for Golay Sequential Code), select the GSC format prompt and press ENTER. Table 5-20 shows and explains all of the prompts for this format.

Table 5-20 GOLAY Format Prompts

Major Prompt	Conditional Prompt	Explanation
StrP =		Number of capcode digits strapped in the Model 15B. A valid response is from 0 to 4 digits.
	StP(n)=	If StrP > 0, then this prompt requests the digit desired for the strap position shown. StP1= is always the first digit sent, StP2= is the next and so on.
ALFA =		Enable/disable alphanumeric characters. 0 = only allow numeric display messages of up to 24 characters, and 1 = enables a maximum of 128 alphanumeric characters and voice capability.

Metro-PageBoy Format

For the Motorola GOLAY encoding used for the Metro PageBoy, select the MEtro format prompt and press ENTER. Table 5-21 shows and explains all of the prompts for this format.

Table 5-21 Metro-PageBoy Format Prompts

Major Prompt	Conditional Prompt	Explanation
StrP =		Number of capcode digits strapped the Model 15P. A valid response is from 0 to 4 digits.
	StP(n)=	If StrP > 0, then this prompt requests the digit desired for the strap position shown. StP1= is always the first digit sent, StP2= is the next and so on.

Custom DTMF Format

To program this format, select the "Cdtn.F" prompt from the format selection menu. Table 5-22 explains the various prompts that are used by this format and Table 5-23 shows the keys that are used for editing.

Table 5-22 Custom DTMF Format Prompts

Prompt	Explanation
C	The capcode prompt. This is the number that is entered during the paging cycle to send a DTMF page. Valid digits are 0 to 9. One to four digits in any combination is allowed and each combination is unique (ex: 0001 vs. 01 vs. 1). To exit from programming this format, press the CLEAR key while at this prompt.
dtn.F	DTMF prompt. This is the DTMF string that will be assigned to the capcode. Valid entries for this field are the digits 0 to 9, the letters A,B,C,D and the characters * and #. The string can be up to ten digits in length.
on	On duration prompt. Sets the "on" duration of each DTMF digit. Valid entries are from 10 ms to 990 ms in 1 millisecond increments.
OFF	Off duration prompt. Sets the "off" time between each DTMF digit. Valid entries are from 0 ms to 990ms in 1 millisecond increments.

Table 5-23 Editing Keys for the Custom DTMF Format

Key used	Function
C	Clear the display
A	Review previous capcode
B	Review next capcode.
D	Delete a capcode.
CLEAR	- Stop editing and return to capcode entry. - Stop capcode entry and exit the format.
ENTER	To enter displayed data as input.

Brief Summary

The Custom DTMF format allows you to send from 1 to 10 digits with a single capcode. All programming can be done from your bench without the need for a PC or assistance from Zetron. Here is a list of the Custom DTMF capabilities:

- Each Custom DTMF capcode may be from 1 to 4 digits long.
- From 1 to 10 DTMF digits can be sent per page.
- Up to 141 capcodes for Custom DTMF10 digit can be programmed (subject to memory limitations, see the Custom Calls Memory Requirement Worksheet in Section 7).
- DTMF "On time" is programmable from 10ms to 990ms in 1ms increments.
- DTMF "Off time" is programmable from 0ms to 990ms in 1ms increments.

Programming Example

This example assumes no prior knowledge of the Model 15P. You will be taken from power up to programming. At the end of this exercise you will have programmed and edited two Custom DTMF capcodes and their data. The encoder will be programmed with the following:

Capcode	DTMF	ON	OFF
1	893 # # # # DD3	20	20
2	893 # # # # DD4	20	20

Before beginning this exercise insure that a 12VAC wall transformer is properly connected to pins 1 and 2 of TB1. See "ELECTRICAL SPECIFICATIONS" in Section 2 for the proper wall transformer. Table 5-24 shows the required steps for programming the first page.

Table 5-24 Custom DTMF Example Page #1

Display	Keystrokes	Explanation
#####		Plug in the wall transformer. Display shows Z-number & version number during power up.
2.1		Version 2.1
SEtUP		SEtUP means no formats programmed yet. You will see a single dash if a format has been programmed.
ConFIG	C+CLEAR keys together	Display momentarily shows ConFiG to indicate that it is entering programming mode.
diGt= 0	0 to D , ENTER	Select the leading digit. This digit identifies the format you are programming. (Note: select an unused digit yet).
dELEtE	PAGE, PAGE, ...	PAGE key steps through the format selection menu . Press PAGE key until Cdtn.F appears in the display.
Cdtn.f	ENTER	Select the Custom DTMF format.
C	1	Type in 1 for the capcode.
C 1	ENTER	Press ENTER to input the capcode.
dtn.f	893####DD3	Type in 893####DD3 for the DTMF string.
###dd3	ENTER	Press ENTER to input the DTMF string. (The "903" has scrolled of the left end of the display.)
On 40	20	Type in 20 ms for the DTMF tone on duration.
On 20	ENTER	Press ENTER to input the on duration.
Off 40	20	Type in 20 ms for the DTMF tone off duration.
Off 20	ENTER	Press ENTER to input the off duration.
C		Ready for next capcode.

You have now programmed one capcode and its data and are ready to program the next. The steps shown in Table 5-25 demonstrate how the encoder utilizes the data from the previous capcode as default data for the next capcode. Anticipating the next entry should speed the programming process for large Custom DTMF data bases. Note, to avoid redundancy, some of the steps performed above will be skipped in this next exercise.

Table 5-25 Custom DTMF Example Page #2

Display	Keystrokes	Explanation
C 2	2, ENTER	Type in 2 for the next capcode and press ENTER.
dtn.f	893####DD*, ENTER	Type in 893####DD* for the DTMF string and press ENTER.
On 20	ENTER	Notice that the value 20 has been carried over from the last capcode and used as the default. Press ENTER to use it.
Off 20	ENTER	Notice that the value 20 has been carried over from the last capcode for this entry also. Press ENTER to use it.
C		Ready for next capcode.

You have now programmed two distinct capcodes and are ready to program another. The steps shown in Table 5-26 demonstrate how to edit an existing capcode. You will change the DTMF data under capcode “2” from 893####DD* to 893####DD4.

Table 5-26 Editing a Custom DTMF Page

Display	Keystrokes	Explanation
C	A	Press A (Above) to cycle backwards through the data base. B (Below) will cycle the opposite direction.
C 2	A	Press A until DTMF capcode “1” appears in the window.
C 1	ENTER	Press ENTER to view the existing data for this DTMF page..
###dd3	893####DD4	Type in the digits: 893####DD4. This will replace the existing data.
###dd4	ENTER	Press ENTER to input the new DTMF digits. (The “893” has scrolled off the left end of the display.)
On 20	ENTER	Press ENTER to keep the existing “on time” setting.
Off 20	ENTER	Press ENTER to keep the existing “off time” setting
C		Ready to program the next capcode.

Table 5. ***PROGRAMMING-27*** shows how to save the two capcodes that were created in this example to nonvolatile memory.

Table 5. PROGRAMMING-27 Saving Custom DTMF Programming

Display	Keystrokes	Explanation
C	CLEAR	Press the CLEAR key to exit the Custom DTMF format
diGt =0	CLEAR	Press the CLEAR key again to exit programming mode.
SAVE y	CLEAR	You are given the option to save or not.
SAVE n	CLEAR	Notice that pressing any key other than ENTER will toggle between SAVE y and SAVE n.
SAVE y	ENTER	Pressing ENTER with SAVE y in the display will save any changes that were made during programming to nonvolatile memory.
SAVinG		The display will flash SAVinG for a few seconds then display the page mode prompt.
-		Ready to page.

Custom Stack-Page Format (Fixed Stack)

To program this format, select the StACH prompt from the format selection menu.Table 5-28 explains the various prompts that are used by this format, and Table 5-29 shows the keys that are used for editing.

Table 5-28 Custom Stacks Format Prompts

Prompt	Explanation
St	*The stack number prompt.* This is the number that is entered during the paging cycle to send a stack of pages. Valid characters are the digits 0 through 9. One to four digits in any combination is allowed and each combination is unique (ex: 0001 vs. 01 vs. 1). Press the "*" key at this prompt to program an unnumbered stack. To exit from programming the Custom Stacks format, press the CLEAR key while at this prompt.
ALrt	*Alert tone prompt.* This prompts for which, if any, of the Alert tones is to follow the last page in the stack. A "0" means no Alert, and "1" through "4" selects one of the tones from Table 5-11.
tALH	*Talk time prompt.* This prompts for whether or not there is to be a talk time granted once the Alert tone is done. A "0" means no talk time, and a "1" means the encoder will use whatever time period was programmed for Talk under System parameters.
CAP	*Pager capcode and message prompt.* This prompts for the pager capcodes and messages that are to be entered into the stack as data. You key in the leading digit and capcode of the pager just as you would for a real page, then press the ENTER key. To follow a display page with a message just type in the message at the next CAP prompt and press enter. POCSAG requires a message, so if you wish to skip the message, a zero length ("NULL") message must be entered. To do this, press the PAGE key at the cap prompt, and then ENTER. Alpha-numeric messages are not supported within Custom Stacks. This format does not validate capcodes during entry, you must do that.

Table 5-29 Editing Keys for the Custom Stacks Format

Keys used	Function
C	Clear the display (not used while stacking capcodes)
A	Review previous stack (not used while stacking capcodes)
B	Review next stack. (not used while stacking capcodes)
D	Delete a stack. (not used while stacking capcodes)
CLEAR	- Stop editing and return to stack number entry. - Stop stack number entry and exit the format.
ENTER	To input data as displayed.
PAGE	To enter a zero length message after a POCSAG capcode.

The Custom Stack format gives you the ability to send several pages from one capcode. The number of pages per stack is determined by the number of capcodes and messages that may be in the stack, which is limited the block of memory reserved for each stack. There is a worksheet at the end of Section 7 that can be used to determine whether or not all the pages/messages you wish to send can be fit into a single stack. Stacks may be linked if additional capacity is needed for a single transmission. Formats may be mixed within a stack and display formats may be sent with or without messages.

- Each Custom Stack capcode may be from 1 to 4 digits long, and one unnumbered stack can be programmed for each leading digit assigned this format.
- Formats may be freely mixed within a stack and numerical messages may be stored in a stack for display paging formats.
- Up to 41 Custom Stacks can be entered. Available memory sets the real limit on the number of stacks. Use the worksheet in Section 7.
- Each stack can have one of the four Alert tones assigned to follow the stack page, as well as Talk time. These may both be disabled.

The process of programming a fixed stack starts at the “St” prompt. The number entered at this prompt identifies the fixed stack in the same way a cap code identifies an individual page. (To program an unnumbered stack, for single key stack paging, press the “*” key instead of entering a number.) Next, the encoder will prompt for which Alert tone to use and whether or not a Talk time will be provided at the end. The prompt “CAP” indicates that the encoder is ready for the first pager capcode. Enter the leading digit for the format required followed by the individual capcode, then press ENTER. To fill out the rest of the stack after entering the first capcode, you continue entering leading digits and capcodes, pressing ENTER after each one. You can string stacks together by placing the leading digit and stack number of the next stack to be sent in the last capcode position of the stack you are programming. Pressing the CLEAR key at any time during this process will cancel all programming done up to this point and return the encoder to the “St” prompt.

To terminate the programming of a stack while there are still capcode positions left open, press the ENTER key at the “CAP” prompt without entering a capcode first. The encoder will return to the “St” prompt.

Programming Example

This example assumes no prior knowledge of the Model 15P. You will be taken from power up to programming. At the end of this exercise you will have programmed and edited a Custom stack. The encoder will be programmed with the following:

Stack Number	ALErt	tALH	CAP	CAP	CAP	CAP	CAP
903	4	1	801	802	123	256	708

Before beginning this exercise insure that a 12VAC wall transformer is properly connected to pins 1 and 2 of TB1. See “ELECTRICAL SPECIFICATIONS” in Section 2 for the proper wall transformer.

Table 5. ***PROGRAMMING-30*** shows the steps required to program a stack containing the five pages and to set the Alert Tone and Talk time as shown. The Alert and Talk time used by any given stack is independent of the ones assigned to any individual pagers contained within that stack.

Table 5. PROGRAMMING-30 Example Programming for Custom Stack

Display	Keystrokes	Explanation
#####		Apply power. Display shows Z-number during power up.
2.1		Software Version 2.1
SEtUP		SEtUP means no formats programmed yet. You will see a single dash if a format has been programmed.
ConFIG	C+CLEAR keys together	Display momentarily shows ConFiG to indicate that it is entering programming mode.
diGt =0	A, ENTER	Select the leading digit to identify the format that you are programming. (We will use “A” in this example.)
dELEtE	PAGE, PAGE, ...	PAGE key steps through the format selection menu . Press PAGE key until StACH appears in the display.
StACH	ENTER	Select the Custom Stack format.
St	903	Type in 903 for the stack number.
St 903	ENTER	Press ENTER to input the stack number
ALrt 0	4	Type in 4 for a “fast siren” Alert function.
ALrt 4	ENTER	Press ENTER to input the Alert function.
tALH. .0	1	Type in 1 to open an audio channel after the stack pages have finished.
tALH 1	ENTER	Press ENTER to input the talk setting.
CAP	801	Type in “801” as the first capcode.
801	ENTER	Press ENTER to input the capcode.
CAP	800	Type in “802” as the second capcode. (Yes “800” is a mistake, but we will fix it in the next example.)
800	ENTER	Press ENTER to input the capcode.
CAP	123	Type in “123” as the third capcode.
123	ENTER	Press ENTER to input the capcode.
CAP	256	Type in “256” as the fourth capcode.
256	ENTER	Press ENTER to input the capcode.
CAP	ENTER	Press ENTER without entering any data to end the stack.
St		Ready to build next stack.

You have now programmed a stack and are ready to program another. The steps shown in Table 5. ***PROGRAMMING-31*** demonstrate how to edit an existing stack. For this example, you will change the capcode 800 (entered in error) to 802 and add one more capcode (708) to the stack that was created previously. Finally, you will save the stack that was created in this example to nonvolatile memory.

Table 5. PROGRAMMING-31 Editing a Custom Stack Page

Display	Keystrokes	Explanation
St	A	Press A (Above) to cycle backwards through the data base. B (Below) will cycle the opposite direction.
St 903	ENTER	When stack number 903 appears in the display then press ENTER to edit the stack.
Alrt 4	ENTER	Press ENTER to keep the previous Alert function..
TALH 1	ENTER	Press enter to keep the previous “talk” setting.
801	ENTER	Press ENTER to skip to the next capcode.
800	802	Type in 802 to correct the second capcode.
123	ENTER	Press ENTER to skip to the next capcode.
256	ENTER	Press ENTER to skip to the next capcode
CAP	708	Type in 708. This will add the capcode 708 to the stack.
708	ENTER	Press ENTER to input the new capcode.
CAP	ENTER	Press ENTER without any data to exit capcode entry mode.
St	CLEAR	Ready to create another stack. Press the CLEAR key to exit the Custom Stack format.
diGt =0	CLEAR	Press the CLEAR key again to exit programming mode.
SAVE y	CLEAR	You are given the option to save or not. Notice that pressing any key other than ENTER will toggle between “SAVE y” and “SAVE n”.
SAVE y	ENTER	Pressing ENTER with SAVE y in the display will save any changes that were made during programming to nonvolatile memory.
SAVinG		The display will flash SAVinG for a few seconds then display the page mode prompt.
-		Ready to page.

The example shown in Table 5. ***PROGRAMMING-32*** demonstrates how to stack capcodes and messages for display type pagers which require messages. In this example you will create a custom stack containing one POCSAG page with a numeric message and one POCSAG page without a message. The encoder will be programmed with the following:

Stack Number	ALErt	tALH	CAP	CAP (message)	CAP	CAP (message)
100	4	1	61234562	(null)	61234563	8206363

Table 5. PROGRAMMING-32 Inserting Messages in a Stack for POCSAG

Display	Keystrokes	Explanation
St	100	Type in 100 for the stack number.
St 100	ENTER	Press ENTER to input the stack number.
Alrt 0	4	Type in 4 to give a “fast siren” Alert.
Alrt 4	ENTER	Press ENTER to input the Alert value.
TALH 0	1	Type in 1 to enable talk for the stack.
TALH 1	ENTER	Press ENTER to input the talk value.
CAP	61234562	Type in the first capcode.
61234562	ENTER	Press ENTER to input the capcode.
CAP	PAGE	Press the PAGE key to enter a zero length (null) message.
CAP	61234563	Type in 61234563 as the second capcode.
61234563	ENTER	Press ENTER to input the capcode.
CAP	8206363	Type in 8206363 as the message to be sent for the last capcode entered.
8206363	ENTER	Press ENTER to input the message.
CAP		Press ENTER without any data to exit capcode entry mode.
St		Ready to program another stack.

The POCSAG entries shown here are eight digits long (format leading digit + seven capcode digits) because they do not have any of the capcode digits strapped. They do, however, have their function code strapped or that would have had to entered here long with each capcode. The more digits you strap in a given paging format, the fewer digits will need to be entered to place a page from that format into a stack. This directly affects how many pages can be placed into a single stack. See the Custom Stack Memory Requirement worksheet at the end of Section 7.

Important Things to Remember When Programming Stacks

When the capcodes are entered into stack memory, they are stored as long strings of digits, with a terminating character between each group of digits. The encoder does not do any checking at this time to see if each of these entries is a valid capcode. That is, it does not check to see if each “leading digit + capcode + function code (if required)” combination would have produced a valid page if entered manually at the normal page prompt.

When a fixed stack page is executed, the encoder starts at the beginning of the string and reads the characters as though they were being entered from the keypad. If the format programmed for a particular leading digit requires more digits than you supplied when you programmed that position in the stack, then the Model 15P will "borrow" the necessary digits from the next capcode in the stack. This will result in several possible failure modes for this stack page:

- The page that was short a digit or two will still go out, however, it will not call the decoder you intended it for because the final digits came from the next capcode position. At a minimum this page in the stack is wasted.

- The encoder moves on to the stack position that follows the "short" capcode. If the "new" leading digit (the next digit after the ones that were borrowed) does not point to a programmed format, then the encoder treats it as a bad entry and moves on to the next digit and tries it as a leading digit, and so on. That means that this page in the stack is lost as well.

- If the "new" leading digit does point to a programmed format, then the encoder will look for enough digits to make a page. This page will also be a waste, since it isn't for any of the pagers you intended. Worse yet, if it requires more digits than remain in this capcode position, it too will borrow from the next position, passing the failure on down the stack.

Just how much damage a bad capcode entry can do to a stack page is determined in part by where it occurs in the stack. If it occurs in the last position, the single page is lost. If it occurs a few pages from the end, then you can lose everything from there to the end. If it occurs early in the stack, it can possibly sabotage the entire stack.

It should be obvious at this point that there are some precautions you should take whenever you are going to be programming fixed stack pages under the Custom Stacks format. In order of importance they are:

1. DO ALL OF THE PROGRAMMING TO SET UP THE INDIVIDUAL PAGING FORMATS FIRST.
   This is necessary to define exactly what the valid capcode entry is for each of the pagers or decoders being used. If possible, try each of the pages manually and record the leading digit + capcode string necessary to set off each unit.

2. STRAP CAPCODE DIGITS AND FUNCTION CODES.
   Whenever possible in the programming of individual formats, strap as many of the capcode digits as the format will allow. This includes function codes as well. (If an operator would have to key in the function code when making a manual page, then the programmer must do so when entering the same capcode into a stack.) This provides two benefits. It makes manual entry of individual pagers easier by reducing the number the operator must key in. It also increases the number of pagers that can be programmed into a single stack by reducing the digits added to the fixed stack string.

3. ALWAYS SUPPLY A MESSAGE (OR TURN THEM OFF).
   If the stack you are programming includes capcodes for one of the display paging

formats, then you must always provide it with an appropriate message in the next capcode position, or make sure that the appropriate function code is supplied (or strapped) to turn off messaging. The POCSAG format requires a message, so if you aren't going to send one, a "null" message must be supplied. This is done by pressing the Page key at the next capcode position (see Table 5. ***PROGRAMMING-32***).

4. ALWAYS TEST STACK PAGES BEFORE YOU NEED THEM.
   The one and only foolproof way to confirm that you have gotten it all in correctly is to save the programming, exit the program mode, and try out the stack page. The Model 15P will display the pages as they are made, which should allow you to check whether or not the stack is going out as you intended. Even if you are not in a position to actually transmit the stack and set off the pagers, you should at least run this test into a dummy load to confirm that the capcodes and messages all appear and get processed as you entered them.

6. REPAIR

6. REPAIR

IN CASE OF DIFFICULTY

In case of installation or programming difficulty, first check the programming. Some problems occur due to improper setup or programming. Additionally, it is a good idea to again go through the installation and adjustment procedures. If the unit continues to fail, call the Zetron Model 15P Applications Department at (425) 820-6363. In case of malfunctions that are not programming or installation related, contact the Zetron Model 15P Service Department at the same number.

When calling Zetron for help, please have the serial number of the unit and/or the Zetron order number (the order number is momentarily displayed when powered up). If an error message is displayed by the unit following power up, please record this number as well.

If the call is made from the installation site by the installer or technician, the problem can usually be solved over the phone.

The parts list and schematic for the encoder are included in this section to aid in the installation or repair of the unit.

SELF-TEST

The built-in self-test, which is automatically run when the encoder is powered up, checks the display by lighting all display segments and tests internal digital circuitry.

If an error occurs, then the test is halted and an error code is displayed in the front-panel window.

Error Code Displayed	Probable Failure Cause
Err1	U15
Err2	U14, U15, U18, U25, U26
Err3	U14, U15, U19, U25, U26
Err4	U15, U21
Err5	U15, U18
Err6	EEPROM error
Err8	Data programmed in one of the Custom databases (Custom Two-Tone, Custom DTMF, Custom Stacks) is corrupt.
Err99	Call for technical assistance.
SEtUP	Unit has no formats programmed. See Section 5.

OUTPUT TESTS

Three output tests are provided to allow setting of the tone output levels. Cycle the unit's power to exit the output tests.

Audio Test Mode

Depress the A + CLEAR keys while at the normal idle prompt (-) to activate the tone output test. The encoder will display the prompt “Audio” while in this test mode. The encoder will close the tone relay and generate a sequence of three test tones at 2000 Hz, 1000 Hz, and 500 Hz (±0.1 Hz) at TB1 pins 3 and 4. Each tone lasts for 1.5 seconds and then automatically switches to the next tone. The encoder continues to generate these tones until the test is terminated by pressing the CLEAR key again.

The output levels of all microprocessor generated tone frequencies will be referenced to these test tones. This test is also useful for checking that the de-emphasis jumper (JP10) is in the correct position to ensure a reasonably flat modulation level across all of the audible paging frequencies.

Binary Test Mode

The Binary test mode is similar to the Audio test, however, it is used for setting deviation for signals from the digital modulation output. While at the normal idle prompt, press the B + CLEAR keys to activate the digital circuitry tests. After pressing the two keys the prompt “binArY” is displayed. The encoder will accept the keys shown in Table 6. ***REPAIR-1*** for selecting test functions. The keys can be pressed in any order and repeated as many times as needed. Press the CLEAR key to exit this test and return to the normal operating mode.

Table 6. REPAIR-1. Binary Test Functions

Key	Prompt	Function
0	LOU.	Logic “0” output
1	HIGH	Logic '1' output
2	200	200 baud continuous preamble (alternate 0/1)
3	300	300 baud preamble
5	512	512 baud preamble
6	600	600 baud preamble
7	1200	1200 baud preamble
8	2400	2400 baud preamble

DTMF Output Test

While the DTMF tone pairs are generated by a different source than the rest of the analog paging signals, they come out through the same final audio stages as the other analog signals and their level is adjusted using the same control, R26. If the Audio test has been done correctly, it is very likely that you will never need to test the DTMF tone pairs independently. However, if you do need to fine tune the DTMF performance, this test makes that possible.

The DTMF test mode is entered by first removing power from the encoder, and then holding down the ENTER key while re-applying power. When you hear the DTMF tone, release the ENTER key. The key pad is now live. As you press the keys, the encoder will display the digit and send out the DTMF tone pair. All sixteen pairs are supported.

Press the CLEAR key to exit this test and return to the normal operating mode.

FAULT IDENTIFICATION

Listed below are some possible problems and their causes to assist in troubleshooting faults:

PROBLEM	POSSIBLE CAUSE(S)
No display on power up	F1, Power supply, wiring of the power supply.
Error message "Errx"	Refer to Self-Test subsection above.
Only some pagers work	Check the actual capcode or reed frequencies of the pagers that do not work. Most problems are due to incorrect capcode entry.
Talk time doesn't work	The talk parameter has to be enabled within the format programming for each leading digit that is to use voice. The talk time has to also be set to more than 0 seconds in system programming.
Can't exit program mode	The CLEAR key will only exit program mode when it is allowable to do so. This is to avoid conflicts or incomplete programming. Press the ENTER key repeatedly until the display reads "diGt=0", then press the CLEAR key.

MODEL 15P TOP LEVEL PARTS LIST

(Reference: 901-9313J)

ITEM	QTY	PART NUMBER/REV.	DESCRIPTION	REFERENCE
1.	4	220-0108	SCREW #440 ¼"	PCB
2.	4	220-0109	SCREW #440 ¾"	BOTTOM COVER
3.	4	220-0110	440x3/16 NYLON SCREW	KEYPAD
4.	1	322-7256	32Kx8 CMOS EPROM	U18 (702-9855)
5.	1	322-0103	16K EEPROM	U22 (702-9855)
6.	1	373-0116	16 KEYPAD	
7.	8	401-0108	STAKE .6"	KEYPAD
8.	1	415-9094	DECAL SN/PN/FCC	SERIAL NUMBER TAG
9.	1	415-9255-1	FRONT PANEL	
10.	1	415-9280	LENS	FRONT PANEL
11.	1	415-9644	DISPLAY BACKING	
12.	1	601-0434	SOFTWARE	U18
13.	1	702-9855	M15P ENCODER BOARD	
14.	1	810-0012	DSS COVER	
15.	1	815-9034	ENCLOSURE BOTTOM COVER	

MODEL 15P MULTI-FORMAT ENCODER (702-9855B)

Parts List

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF		MFR. PART #
1.	1	101-0033	22 OHM	R79		
2.	4	101-0049	100 OHM	R37 45 46 77		
3.	1	101-0065	470 OHM	R21		
4.	1	101-0068	620 OHM	R57		
5.	9	101-0073	1K	R6 7 22 24 35 44 55 59 63		
6.	1	101-0074	1.2K	R29	**NOTE 2**	
7.	2	101-0081	2.2K	R30 31		
8.	2	101-0085	3.3K	R75 76		
9.	1	101-0092	6.2K	R58		
10.	2	101-0094	7.5K	R36 38		
11.	16	101-0097	10K	R1 2 4 5 39-43 50 66-70 80		
12.	1	101-0103	18K	R25		
13.	1	101-0105	22K	R51		
14.	2	101-0113	47K	R61 62		
15.	1	101-0117	68K	R27		
16.	5	101-0121	100K	R47-49 52 53		
17.	3	101-0145	1M	R64 65 71		
18.	1	107-0501	5K POT 1 TURN	R23		
19.	2	107-0502	50K POT 1 TURN	R26 34		
20.	2	150-0024	24 PF 1KV DISC	C30 31		
21.	2	150-0033	33 PF 1KV DISC	C24 25		
22.	1	151-0199	.47UF 50V TS	C18		
23.	13	152-0012	.1 UF 50V POLY	C3 4 14 23 28 32 34 36 38 45-47 48		
24.	3	152-0040	4.7 UF 50V NON-POLAR	C16 17	**XR29 - NOTE 2**	
25.	1	152-0085	.01 UF 50V POLY	C26		
26.	2	152-0089	.001 UF 50V POLY	C21 33		
27.	3	152-0250	.047 UF 50V POLY	C19 22 29		
28.	2	154-0025	1 UF 35V TANT	C15 27		
29.	6	155-0050	10 UF 25V ALUM AX	C13 39 41-44		
30.	1	155-0078	100 UF 6.3V ALUM	C1		
31.	1	155-0140	3300 UF 25V ALUM AX	C35		
32.	1	210-0001	440 KEPT NUT PLATED	XVR1		
33.	1	220-0102	440x3/8 PH SCREW	XVR1		
34.	3	311-0030	DUAL LED 7-SEG AMBER	DS1-3	**NOTE 4**	
35.	2	311-3213	REC. RED LED	DS4 5	**NOTE 4**	
36.	1	316-0004	TONE FILTER	U17		MF4CN-50
37.	1	316-0353	OP-AMP, DUAL BIFFET	U9		LF353
38.	1	316-3403	QUAD OP-AMP	U10		MC3403P
39.	1	316-7660	VOLTAGE CONVERTER	U27		ICL7660CPA
40.	1	316-7805	REGULATOR +5V 1.5A	VR1	**NOTE 1**	LM340T-5
41.	1	316-7808	REGULATOR +8V	VR2		LM78L08CZ
42.	1	317-5406	DUAL RS-232 DRIVER	U23		MC145406D
43.	1	321-2090	DTMF XCVR	U20		75T2090IP
44.	1	321-6264	8Kx8 RAM	U19	**NOTE 3**	HY6264ALP-10

MODEL 15P MULTI-FORMAT ENCODER (702-9855B)

Parts List (Continued)

ITEM	QTY	ZETRON P/N	DESCRIPTION	COMPONENT REF	MFR. PART #
45.	1	321-6522	VIA/TIMER	U21	R6522
46.	1	321-6803	MICROPROCESSOR	U15	6803P
47.	6	323-4015	DUAL 4-BIT SHIFT REG.	U3-8	MC14015B
48.	1	323-4053	3PDT SWITCH	U12	MC144053
49.	1	323-4066	QUAD ANALOG SWITCH	U11	MC14066B
50.	1	324-4060	14 BIT COUNTER	U13	74HC4060
51.	1	324-4139	DUAL 2-4 LN DECODER	U24	74HC139
52.	1	324-7400	QUAD NAND	U26	MC74HC00
53.	1	324-7414	HEX SCHMIDT	U25	74HC14
54.	1	325-4373	OCTAL LATCH	U14	74HCT373
55.	1	340-2003	RELAY DRIVER 50V/.5A	U16	ULN2003
56.	1	340-0014	NPN DARLINGTON	Q2	MPSA14
57.	3	340-3904	NPN 40V/200MA	Q1 3 4	2N3904
58.	4	342-0001	SILICON 1A/100V	CR6-9	1N4002
59.	5	342-3009	SILICON	CR3 4 10-12	1N4148
60.	1	343-3030	1W 6.2V +-5%	CR5	1N4735A
61.	1	343-3102	1W 10V	CR1	1N4740A
62.	3	371-0002	SINGLE KEY	SW1-3 **NOTE 4**	
63.	1	376-0004	4.000 MHZ HC18	Y1	
64.	1	376-0245	2.4576 MHZ HC33/HC18	Y3	
65.	1	376-0358	3.58 MHZ HC 18 CASE	Y2	
66.	2	380-0030	DPDT 12V COIL MINI	K1 2	
67.	1	381-0010	HEATSINK	XVR1 **NOTE 1**	
68.	1	401-0009	12 POS THRU PCB	J1	
69.	24	401-0052	STAKE PINS	XJP1 15 10 17 (3 EA) XJP14 (12 EA)	
70.	2	401-0112	12-POS 45DG SCR TERM	TB1 2	
71.	5	402-3040	MINI JUMPER	JP1 10 17 POS A JP15 POS B JP14 POS 9600	
72.	4	407-0008	SKT, 08 PIN DIP	XU9 17 22 27	
73.	4	407-0014	SKT, 14 PIN DIP	XU10 11 25 26	
74.	11	407-0016	SKT, 16 PIN DIP	XU3-8 12 13 16 23 24	
75.	1	407-0020	SKT, 20 PIN DIP	XU14	
76.	1	407-0022	SKT, 22 PIN DIP	XU20	
77.	2	407-0028	SKT, 28 PIN DIP	XU18 19	
78.	2	407-0040	SKT, 40 PIN DIP	XU15 21	
79.	7	408-0001	WIRE JUMPER	JP11 13 POS A JP8 16 18 POS B JP3 POS A & C	
80.	1	410-9125A	PCB, BARE		
81.	1	416-1202	FUSE, AGC 2A	F1	
82.	2	416-3040	FUSE CLIP	XF1	
83.	.75	525-0500	1/2" SHRINK TUBING	XR29 **NOTE 2**	
84.	A/R	561-0001	THERMAL COMPOUND	XVR1 **NOTE 1**	

NOTES: Notes are for production use only.

REV	DESCRIPTION	DRN	APD	DATE
A	RELEASE	GWH	[illegible]	[illegible]
B	ECN 9294	KM	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 1/4W, 5%.
2. ALL CAPACITORS ARE IN MICROFARADS.
3. ALL CAPACITORS ARE DISC.
4. LAST REF. DES. USED: C48, CR12, DS5, F1, J1, JP19, K2, Q4, RBD, SW3, T1, TB2, TP2, U27, VR2, Y3.
5. REF DES. NOT USED: R76

LEGEND
- ▲ POSITIVE OR NEGATIVE VOLTAGE
- ANALOG GND
- ▽ DIGITAL GND
- ▽ POWER SUPPLY GND
- CHASSIS GND
- ▷ CONNECTION ON SAME SHEET
- ▷ CONNECTION ON DIFFERENT SHEET
- ✳ NOT INSTALLED

SPARE GATES

ZETRON

SCALE N/A	APPROVED BY	DRAWN BY HUGHES
DATE 09-25-96		SHT 1 OF 2
TITLE: MISP MULTI-FORMAT ENCODER		
DRAWING NO: 008-9855		REV B

REV	DESCRIPTION	DRN	APD	DATE
	SEE SHEET 1 OF 2			

NOT INSTALLED

NOT INSTALLED

ZETRON

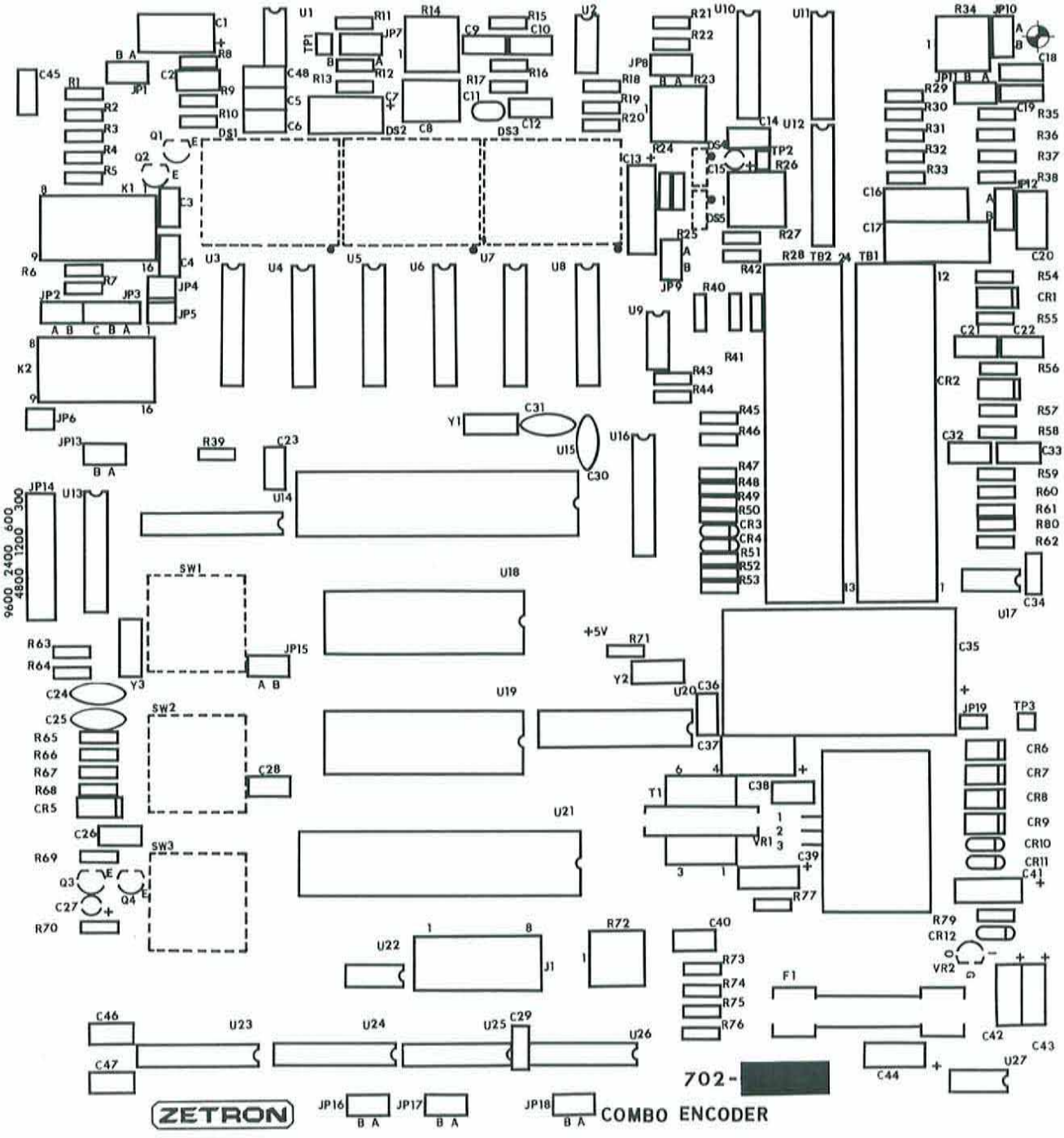
DRAWN: HUGHES
SHT 2 OF 2

TITLE: M1SP MULTI-FORMAT ENCODER

DRAWING NO. 008-9855 REV B

MODEL 15B/P (702-9855B)

Silkscreen



MODEL 15P SERIAL PORT PARTS LIST

(Reference: 950-9373A)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1	1	317-5406	DUAL RS-232 DRIVER	U23
2	1	709-7038	M23 PRT/TERM.CABLE	

MODEL 15P SPARE PARTS LIST

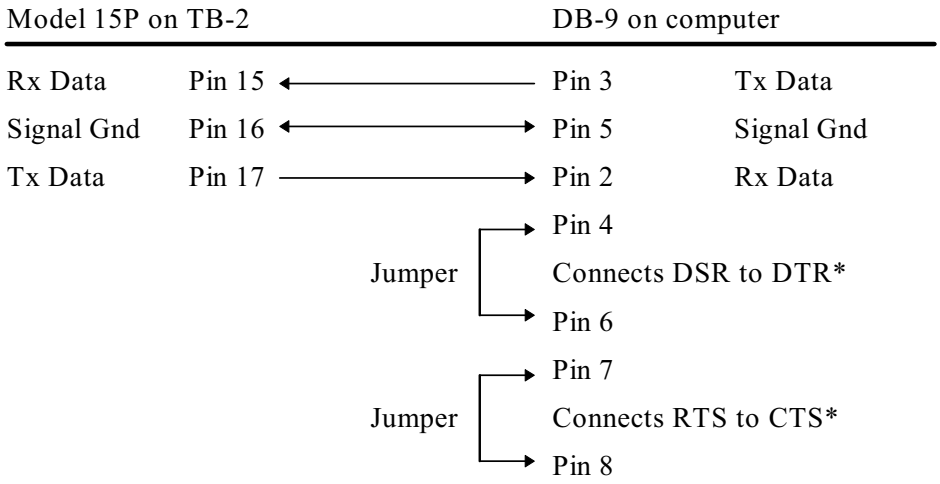
(Reference: 951-9061B)

ITEM	QTY	ZETRON P/N	DESCRIPTION	REFERENCE
1.	1	107-0502	50K POT 1 TURN	R26,R34
2.	1	155-0050	10uF 25V ALUM AX	C39,41-44
3.	1	155-0078	100uF 6.3V ALUM	C1
4.	1	155-0140	3300uF 25V ALUM AX	C35
5.	1	311-0030	DUAL LED 7-SEG AMBER	DS1-4
6.	1	311-3213	REC. RED LED	DS4,5
7.	1	316-0004	TONE FILTER	U17
8.	1	316-0353	OP-AMP, DUAL BIFET	U9
9.	1	316-3403	QUAD OP-AMP	U10
10.	1	316-7805	REGULATOR +5 1.5A	VR1
11.	1	316-7808	REGULATOR +8	VR2
12.	1	321-6264	8Kx8 RAM	U19
13.	1	321-6522	VIA/TIMER	U21
14.	1	321-6803	MICROPROCESSOR	U15
15.	1	323-4015	DUAL 4-BIT SHIFT REG.	U3-8
16.	1	323-4053	3PDT SWITCH	U12
17.	1	323-4066	QUAD ANALOG SWITCH	U11
18.	1	324-4060	14 BIT COUNTER	U13
19.	1	324-4139	DUAL 2-4 DECODER	U24
20.	1	324-7400	QUAD NAND	U26
21.	1	324-7414	HEX SCHMIDT	U25
22.	1	325-4373	OCTAL LATCH	U14
23.	1	340-2003	RELAY DRIVER 50V/.5A	U16
24.	1	340-0014	NPN DARLINGTON	Q2
25.	1	340-3904	NPN 40V/200MA	Q1,3,4
26.	2	342-0001	SILICON 1A/100V	CR6-9
27.	2	342-3009	SILICON	CR3,4,10-12
28.	1	343-3030	1W 6.2V +-5%	CR5
29.	1	343-3102	1W 10V	CR1
30.	1	371-0002	SINGLE KEY	SW1-3
31.	1	376-0004	4.000mHz HC18	Y1
32.	1	376-0245	2.4576mHz HC33/18	Y3
33.	1	380-0030	DPDT 12V COIL MINI	K1,2
34.	1	402-3040	MINI JUMPER	JP1,10,14,17
35.	1	416-1202	FUSE, AGC 2A	F1

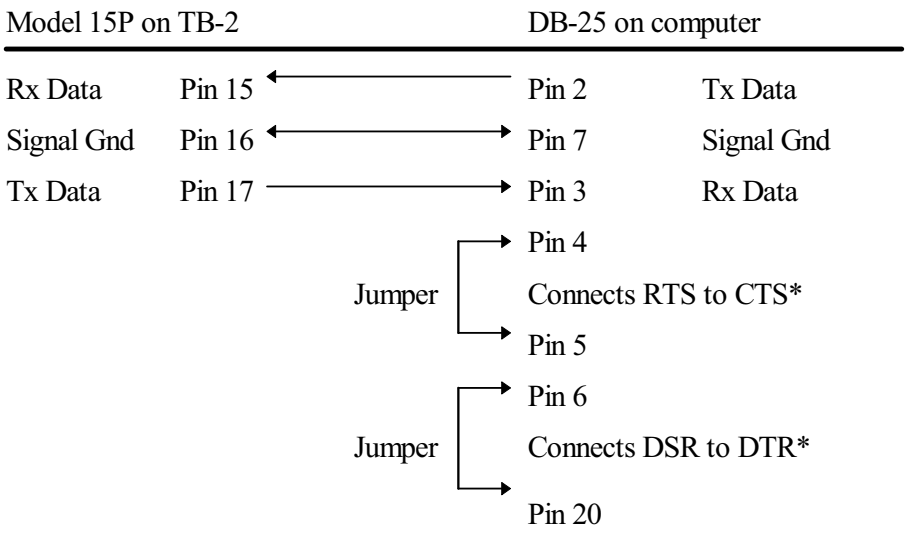
MODEL 15P SERIAL PORT CONNECTIONS

There are two typical configurations for the Model 15P connection to a computer serial port.

1. Using a DB-9 connector:



2. Using a DB-25 connector:



* The DSR/DTR and RTS/CTS jumpers are not strictly necessary, but they provide an easy way to get the computer or terminal to work if it provides no easy way to turn off hardware handshaking.

When interfacing the Model 15P to a CRT terminal instead of a PC, the connector is typically a male 25-pin D-connector instead of a female connector. This information is correct for most computers. Consult your computer manual for more details on its serial port.

7. QUICK REFERENCE

7. QUICK REFERENCE

UNDERSTANDING THE TWO-TONE CODING SYSTEM

This is a brief guide to the two-tone coding system. It defines the terminology, such as “tone group” and “code plan”, and tells how to use the coding charts to determine the tone frequencies of a certain two-tone pager.

The Reeds

The first step in understanding the two-tone coding system is understanding the distinguishing characteristics of a two-tone sequential pager. Two-tone pagers contain two reeds or active filters tuned to specific frequencies. These reeds can be referred to as the A reed and the B reed. They set off the pager's alerting mechanism (e.g. bell or vibrator) or open the receiver for a voice transmission when they detect tone A followed by tone B over the radio channel.

Tone Groups

To coordinate paging equipment, standardized sets of frequencies and timings for the A and B tones have been developed by pager manufacturers such as Motorola and GE. Two-tone sequential pagers use the 140 tones that fall between 288.5 Hz and 2468.2 Hz. For organizational purposes, these 140 tones have been divided into the 14 tone groups. Eight standard timings have also been established. These tone groups and timings are shown in Table 7-1or Table 7-2.

Motorola and GE Tone Group Frequencies

Table 7-1 Zetron Tone Groups 1 to 7

Zetron Group No. / Mfr. Tone Groups		1 Mot 1	2 Mot 2	3 Mot 3	4 Mot 4	5 Mot 5	6 Mot 6	7 Mot A
T	0	330.5	569.1	1092.4	321.7	553.9	1122.5	358.9
O	1	349.0	600.9	288.5	339.6	584.8	1153.4	398.1
N	2	368.5	634.5	296.5	358.6	617.4	1185.2	441.6
E	3	389.0	669.9	304.7	378.6	651.9	1217.8	489.8
	4	410.8	707.3	313.0	399.8	688.3	1251.4	543.3
N	5	433.7	746.8	953.7	422.1	726.8	1285.8	602.6
U	6	457.9	788.5	979.9	445.7	767.4	1321.2	668.3
M	7	483.5	832.5	1006.9	470.5	810.2	1357.6	741.3
B	8	510.5	879.0	1034.7	496.8	855.5	1395.0	822.2
E	9	539.0	928.1	1063.2	524.6	903.2	1433.4	912.0
R								
Diagonal		569.1	979.9	569.1	569.1	979.9	979.9	979.9

Table 7-2 Zetron Tone Groups 8 to 14

Zetron Group No. / Mfr. Tone Groups		8 Mot B	9 Mot Z	10 GE A'	11 GE B'	12 GE C'	13 Mot 10	14 Mot 11
T	0	371.5	346.7	682.5	652.5	667.5	1472.9	1930.2
O	1	412.1	384.6	592.5	607.5	712.5	1513.5	1989.0
N	2	457.1	426.6	757.5	787.5	772.5	1555.2	2043.8
E	3	507.0	473.2	802.5	832.5	817.5	1598.0	2094.5
	4	562.3	524.8	847.5	877.5	862.5	1642.0	2155.6
N	5	623.7	582.1	892.5	922.5	907.5	1687.2	2212.2
U	6	691.8	645.7	937.5	967.5	952.5	1733.7	2271.7
M	7	767.4	716.1	547.5	517.5	532.5	1781.5	2334.6
B	8	851.1	794.3	727.5	562.5	577.5	1830.5	2401.0
E	9	944.1	881.0	637.5	697.5	622.5	1881.0	2468.2
R								
Diagonal		979.9	979.9	742.5	742.5	742.5	none	none

Two-Tone Timing

The standard two-tone timings are listed in Table 7-3.

Table 7-3 Standard Two-Tone Timings

1st	Gap	2nd	Group Call	Type
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	0.3	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

Code Plans

Each pager contains two reeds, and because 140 frequencies are available for each reed, there are about 19,600 possible reed combinations. To bring order to the reed coding process, the possible combinations are organized into groups of 1000 pager codes known as “code plans” (see Table 7-4 through Table 7-6). About 25 conventional code plans have been created from the different combinations of the 140 tones. There is a Mot B code plan, a Mot C code plan, and so on.

Each code plan in Table 7-4 through Table 7-6 is broken down into 10 blocks of 100 pager codes. The blocks are numbered 0 through 9. As you look at a certain 100-block within a certain code plan in the table, you'll see that it's referred to with a pair of numbers, such as 1+2 or 5+3. This pair of numbers signifies all pagers whose A reed is from the first digit's tone group and whose B reed is from the second digit's tone group. For instance, 5+3 refers to all pagers with an A reed from tone group 5 and a B reed from tone group 3.

A block can be referred to according to its position on the chart. The fourth block in Code Plan B (1+2), labeled 4xx in Table 7-4, can be called the 400-block of Code Plan B. The seventh block in D (5+1) can be called the 700-block of Code Plan D, and so on.

Pager Capcode

Each two-tone pager is given a four-character code or address that tells which two tones activate it. Examples of pager addresses are B123, F561, and T625. From this address, the frequencies of the two tones can be determined.

The first two characters of an address specify the 100-block to which the address belongs. If a pager address begins with B5, for instance, it belongs to the 500-block of Code Plan B. When this block is looked up on the charts, a designation of 1+3 is found; thus, the B5 pager has a first tone that comes from tone group 1, and a second tone that comes from tone group 3. The last two digits of a pager address simply point to specific A and B tones within the two tone groups.

Example

As an example, consider pager address B542. Looking up B5 in code plans Table 7-4 through Table 7-6 gives us 1+3, which means the tones for A and B are taken from tone groups 1 and 3 respectively. The 4 in B542 means the A tone is the fourth tone in tone group 1, which, from, Table 7-1 is 410.8 Hz. The 2 means the B tone is the second tone in tone group 3, or 296.5 Hz.

Summary

The letter of an address selects a code plan. The first number selects a code plan. The first number selects a 100-block, which is all the possible combinations of two tone groups. The last two digits locate a combination within the 100-block.

Motorola and GE Code Plans

Table 7-4 Numbers Assigned to Motorola Code Plans "B" to "K"

Zetron Codeplan Mfr Codeplan Pager Capcodes	0 Mot B	1 Mot C	2 Mot D	3 Mot E	4 Mot F	5 Mot G	6 Mot H	7 Mot J	8 Mot K
0xx	2+4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1xx	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1
2xx	2+2	2+2	2+2	2+2	1+3	1+3	1+3	1+4	1+4
3xx	3+3	1+2	1+2	1+2	3+3	3+3	3+3	4+1	4+1
4xx	1+2	4+4	1+5	2+1	4+4	3+1	3+1	4+4	4+4
5xx	1+3	1+4	5+5	1+6	3+1	5+5	1+6	5+5	1+6
6xx	2+1	2+1	2+1	6+6	1+4	1+5	6+6	1+5	6+6
7xx	3+1	4+1	5+1	6+1	4+1	5+1	6+1	4+5	6+1
8xx	2+3	2+4	2+5	2+6	3+4	3+5	3+6	5+4	4+6
9xx	3+2	4+2	5+2	6+2	4+3	5+3	6+3	5+1	6+4
Groups Used	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

Table 7-5 Zetron Numbers Assigned to Motorola Code Plans "L" to "U"

Zetron Codeplan Mfr Codeplan Pager Capcodes	9 Mot L	10 Mot M	11 Mot N	12 Mot P	13 Mot Q	14 Mot R	15 Mot S	16 Mot T	17 Mot U
0xx	N/A	4+2	4+2	4+2	4+2	4+2	4+2	4+2	4+2
1xx	1+1	2+3	2+3	2+3	2+4	2+4	2+5	3+4	3+4
2xx	1+5	2+2	2+2	2+2	2+2	2+2	2+2	4+3	4+3
3xx	5+1	3+3	3+3	3+3	4+2	4+2	5+2	3+3	3+3
4xx	1+6	4+4	3+2	3+2	4+4	4+4	2+6	4+4	4+4
5xx	5+5	3+2	5+5	2+6	5+5	2+6	5+5	5+5	3+6
6xx	6+6	2+4	2+5	6+6	2+5	6+6	6+6	3+5	6+6
7xx	6+1	4+2	5+2	6+2	4+5	6+2	6+2	4+5	6+3
8xx	5+6	3+4	3+5	3+6	5+4	4+6	5+6	5+4	4+6
9xx	6+5	4+3	5+3	6+3	5+2	6+4	6+5	5+3	6+4
Groups Used	1,5,6	2,3,4	2,3,4,5	2,3,4,6	2,4,5	2,4,6	2,4,5,6	2,3,4,5	2,3,4,6

Table 7-6 Zetron Numbers Assigned to Remaining Motorola and GE Code Plans

Zetron Codeplan Mfr Codeplan Pager Capcodes	18 Mot V	19 Mot W	20 Mot Y	21 Mot MT	22 GE X	23 GE Y	24 GE Z*
0xx	4+2	4+2	N/A	4+2	A'+A'	B'+B"	A'+A"
1xx	3+5	4+6	A+A	1+1	B'+A"	C'+B"	C'+A"
2xx	5+3	6+4	B+B	2+2	B'+B"	C'+C"	C'+C"
3xx	3+3	5+6	Z+Z	1+2	A'+B"	B'+C"	A'+C"
4xx	3+6	4+4	A+B	4+4	C'+C"	N/A	N/A
5xx	5+5	5+5	A+Z	5+5	C'+A"	N/A	N/A
6xx	6+6	6+6	B+A	2+1	C'+B"	N/A	N/A
7xx	6+3	4+5	Z+A	4+5	A'+C"	N/A	N/A
8xx	5+6	5+4	B+Z	5+4	B'+C"	N/A	N/A
9xx	6+5	6+5	Z+B	2+4	N/A	N/A	N/A
Groups Used	4,5,6	2,4,5,6	A,B,Z	1,2,4,5	A',B',C"	B',C"	A',C"

5/6-TONE FREQUENCIES AND TIMINGS

Table 7-7 Five-Tone Groups and Timings

Tone Number	EIA	CCIR	ZVEI	EEA
0	600	1981	2400	1981
1	741	1124	1060	1124
2	882	1197	1160	1197
3	1023	1275	1270	1275
4	1164	1358	1400	1358
5	1305	1446	1530	1446
6	1446	1540	1670	1540
7	1587	1640	1830	1640
8	1728	1747	2000	1747
9	1869	1860	2200	1860
2nd Address X	2010	2247	2796	1055
Repeat R	459	2110	2600	2110
Timing				
Preamble	690	690	690	690
Gap	65	65	65	100
Tone	33	100	70	40
X Tone	65	100	70	40

Note: All tone frequencies are in hertz and all tone timings are in milliseconds.

5/6-Tone Format

CAPCODE ENTRY:

Five Tone	xxxxx e	(one or more x may be strapped)
Six Tone	p xxxxx e	(p and one or more x may be strapped)

p = preamble digit 0-9
* = preamble tone omitted

xxxxx = address, digits 0-9

e = extra address digit 1 or 2 (if used)

Three addressing modes are available for the Model 15 5/6 Tone formats. Single addressing always instructs pagers to give a 1st address beep alert. Dual addressing sends single address tones for even numbered pager entries and sends the extra dual address tone for odd numbered pager entries. The actual address sent is always even, however. With this option all of the user's pagers are required to be even numbered, reducing the call capacity by half. Extra digits addressing requires an extra function digit to be entered after the pager number, 1=first address, 2=second address. This scheme requires an extra keystroke but allows all 100,000 addresses to be sent.

DTMF TONE PAIR FREQUENCIES

This diagram shows the tones actually generated by the Model 15P for DTMF signaling. Keys are from the 16 button keypad, all frequencies are in Hertz.

	Column 1	**Column 2**	**Column 3**	**Column 4**
Row 1	**--1--** 701.3 1215.9	**--2--** 701.3 1331.7	**--3--** 701.3 1471.9	**--A--** 701.3 1645.0
Row 2	**--4--** 771.4 1215.9	**--5--** 771.4 1331.7	**--6--** 771.4 1471.9	**--B--** 771.4 1645.0
Row 3	**--7--** 857.2 1215.9	**--8--** 857.2 1331.7	**--9--** 857.2 1471.9	**--C--** 857.2 1645.0
Row 4	**--*--** 935.1 1215.9	**--0--** 935.1 1331.7	**--#--** 935.1 1471.9	**--D--** 935.1 1645.0

Precise tone frequencies are shown below. Tones shown above are actual tones generated by the encoder. A +/-1.5% error is allowed as per industry standard, and DTMF tones generated by the encoder fall well within this range.

	1209	**1336**	**1477**	**1633**
697	1	2	3	A
770	4	5	6	B
852	7	8	9	C
941	*	0	#	D

HSC TONE FREQUENCIES AND TIMINGS

Table 7. QUICK REFERENCE-8 HSC Tones and Timings

HSC	EIA (USA)	CCIR	ZVEI	EEA
0	600	1981	2400	1981
1	741	1124	1060	1124
2	882	1197	1160	1197
3	1023	1275	1270	1275
4	1164	1358	1400	1358
5	1305	1446	1530	1446
6	1446	1540	1670	1540
7	1587	1640	1830	1640
8	1728	1747	2000	1747
9	1869	1860	2200	1860
A	2151	2400	2800	1055
B	2435	930	810	930
C	2010	2247	970	2247
D	2295	991	886	991
E	459	2110	2600	2110
F	none	none	none	none
Timing				
Gap	64	290	140	100
Tone	33	100	70	40

Note: All tone frequencies are in hertz and all tone timings are in milliseconds.

HSC Format

HSC (hexadecimal sequential code) pagers are capable of many functions, all of which are implemented in the Model 15. When sending a page, the function is specified by one or two function digits that are entered after the capcode. HSC pagers use a unique battery saving method, in which the encoder issues tone sequences to command the pager to power down its RF circuitry or "go to sleep" for a specified period of time, typically 10-30 seconds. The encoder keeps track of when it has last sent the "go to sleep" command and waits until the pager "wakes up" before sending the page. If no pages are being sent, the encoder will methodically key the transmitter and issues the "go to sleep" command as soon as the pager "wakes up". This periodic keying of the transmitter and sending tones will continue as long as the encoder is idle. See "HSC Format" in Section 5 for how to disable battery saver, which will leave the pagers powered on continually. Both unsquelching and resetting the audio muting of the HSC pager are controlled by tone sequences from the encoder. For any function/message that requests Talk, the interval will be given following transmission of the HSC address and message tones. Speak when "tALH" is displayed. A pager Mute will automatically follow the Talk interval; "PAGE" will again be displayed.

If any message function is repaged, a new message must be entered before paging. The old message is lost.

No HSC pager numbers may be entered into the memory stack.

The address and service block are printed on the HSC pager in the following order: xxxxx-s-b, where xxxxx is the address, and s is the service block, as described below. b is the beep duration, which is not entered into the encoder.

For multiple format or test-bench encoders, the appropriate leading digit must be entered first to select HSC format. Then enter the service block address, function digit(s), PAGE, message, #, PAGE.

CAPCODE ENTRY: s xxxxx ff (s and one or more x may be strapped)

s = service block (0-9)

xxxxx = pager address. Specify individual pagers with digits 0-9, "A" in any address position is a "don't care" or All call address.

ff = function, one or two digits

MESSAGE ENTRY: d1 # d2 # d3 # A (d2 and d3 as needed)

d1 = data field 1 (Telephone Number or Code)

d2 = data field 2 (Source, Extension, or Data)

d3 = data field 3 (Source or Data)

= field separator; must follow each data field used.

A = Talk request (optional; enter after last "#" to request talk)

MESSAGE CHARACTERS:

Model 15 Key	Received Character in Pager
0-9	0-9
A	none; used to request Talk following a message
B	none; Model 15 will not accept key
C	none; Model 15 will not accept key
D	none; Model 15 will not accept key
#	none; used to separate message fields
*	- (hyphen)

EXAMPLES:

In each of the examples shown, the HSC leading digit is 8, the pager address is 12345, and the service block is 9.

Message Type	Pager Entry Sequence
Voice Message Call Alert	8 9 12345 3 PAGE
Data “123456”	8 9 12345 7 PAGE 123456#PAGE
Phone # “206-644-1300”, Extension “0000”, Source “99”	8 9 12345 08 PAGE 206*644*1300 # 0000 # 99 # PAGE
Phone # “206-644-1300”, voice message also	8 9 12345 00 PAGE 206*644*1300 # A PAGE
Tone Only Call Alert	8 9 12345 2 PAGE
Disable/Enable Battery Saver	8 B PAGE

HSC FUNCTIONS:

NON-DATA

Function	Pager Response
0	Mute Audio and Reset Auxiliary 1 & 2
1	Mute Audio
2	Tone-only Call Alert
3	Voice Message Call Alert, Unmute Audio.
4	Set Aux. 1
5	Set Aux. 2
6	Set Aux. 1 & 2
8	Reset Aux. 1
9	Reset Aux. 2

Usually, the only non-data functions that are useful with HSC pagers are 1, 2 and 3.

DATA
In Table 7-9, in the function code column, the letter "p" will stand for priority, where: 0 = none and 1 = priority page. The column headers tell which pager display symbol is used with which message. The individual cells show the number of characters available in a message field and the field number (d1, d2, etc.).

Table 7-9 HSC Message Fields

pf	Large Telephone (for phone #)	C (for code)	S (for source)	Small Telephone (for extension)	D (for data)
p0	12(d1)				
p1		12(d1)			
p2		12(d1)	7(d2)		
p3		12(d1)			7(d2)
p4	12(d1)		7(d2)		
p5	12(d1)				7(d2)
p6	12(d1)			4(d2)	
p7	12(d1)			4(d2)	7(d3)
p8	12(d1)		7(d3)	4(d2)	

No priority, data only (no message formatting by pager)

7 12 characters # PAGE

IMMEDIATE ZETRON FUNCTIONS
No address or message required. Press the leading digit, if required, then the key for the selected function. All Immediate Functions use an All Call address of HSC code "A"s except where digits are strapped or a service block must be specified.

Function	Pager Response
0-9	All Pagers in service block f mute audio speakers
C	Service Range Enable all pagers (all service blocks)
D	Service Range Disable all pagers (all service blocks)
B	Enables or Disables automatic Battery Saving. If previously Enabled, the display will blink "oFF" and the function will be disabled. If previously Disabled, the display will blink "on" and the function will be enabled. When enabled the Battery Saver transmission is periodically sent when the previous sleep time has expired, there is no transmit inhibit, no other page is currently taking place, and a capcode entry is not taking place. However, if the capcode entry takes longer than 13 seconds between key hits, the Battery Saver will interrupt and display "SAvE" while transmitting. The display will be CLEARED.

Field Programming the Maxon HSC-5000 Pager with the Model 15P

1. Start with the Pager ON/OFF Model Selector Switch in the OFF position.

2. Move the Switch to the high position AND during the period when all the segments of the display are visible, press the R/R (Read/Reset) Button twice. This will display the pager's current address in the form RRR-CCCCC-SB where RRR is the Roam Mode Capcode, CCCCC is the Capcode, S is the service block, and B is the beep time. If the current address does not appear in the display and instead seven dashes are displayed, go back and repeat steps 1 and 2.

3. Press and hold the R/R (Read/Reset) Button for 10 to 12 seconds until the pager beeps. The pager is now in the "Learn Mode".

4. Using the Zetron Model 15P, connected to the Maxon HSC-6000 pager via an RF link or direct audio input, enter the current capcode of the pager using the keypad, ignoring the RCC Capcode and beep time. For example: if the current capcode is 000-00121-03, key the leading digit required, and then SCCCCC (S = Service Block, CCCCC = Capcode), then the function digits 00 and then the PAGE key. The Model 15 will respond with four underline characters. At this time enter the new capcode followed by the service block and a beep time of 3 or less. Enter #, then PAGE and PAGE will appear in the encoder display while the information is transmitted to the pager.

For example: Enter 12345 03 # PAGE, and the Model 15 transmits the properly formatted message to the HSC-6000 pager that will make the new capcode 000-12345-03. Verify this new capcode by repeating steps 1 and 2.

REVIEW: Enter 0 0 00121 00 PAGE 12345 0 3 # PAGE and the old capcode of 000-00121-03 is replaced with the new capcode 000-12345-03 if the pager is in the learn mode when this transmission occurs.

REACH ENCODING PLAN

The standard Reach tone frequencies are listed in Table 7-10.

Table 7-10 Standard Reach Tone Frequencies

Tone Number	Freq.	Tone Number	Freq.	Tone Number	Freq.	Tone Number	Freq.
0	3960.0	15	2354.0	30	1400.0	45	832.0
1	3824.0	16	2274.0	31	1352.0	46	804.0
2	3694.0	17	2196.0	32	1306.0	47	776.0
3	3568.0	18	2121.0	33	1261.0	48	750.0
4	3446.0	19	2049.0	34	1219.0	49	725.0
5	3329.0	20	1980.0	35	1177.0	50	700.0
6	3215.0	21	1912.0	36	1137.0	51	676.0
7	3106.0	22	1847.0	37	1098.0	52	653.0
8	3000.0	23	1784.0	38	1061.0	53	631.0
9	2898.0	24	1723.0	39	1025.0	54	609.0
10	2799.0	25	1664.0	40	990.0	55	588.0
11	2704.0	26	1608.0	41	956.0	56	568.0
12	2612.0	27	1553.0	42	923.0	57	549.0
13	2523.0	28	1500.0	43	892.0	58	530.0
14	2437.0	29	1449.0	44	862.0	59	512.0
						60	495.0

Zetron Tone Groups for REACH Encoding

Zetron's Reach tone-group assignment is shown in Table 7-11.

Table 7-11 Zetron's Reach Tone-Group Assignment

Tone Number	Z1	Z2	Z3	Z4	Z5
0	1980.0	1177.0	1400.0	832.0	588.0
1	2704.0	1608.0	1912.0	1137.0	804.0
2	2612.0	1553.0	1847.0	1098.0	776.0
3	2523.0	1500.0	1784.0	1061.0	750.0
4	2437.0	1449.0	1723.0	1025.0	725.0
5	2354.0	1400.0	1664.0	990.0	700.0
6	2274.0	1352.0	1608.0	956.0	676.0
7	2196.0	1306.0	1553.0	923.0	653.0
8	2121.0	1261.0	1500.0	892.0	631.0
9	2049.0	1219.0	1449.0	862.0	609.0

REACH Code Plan

Zetron's Reach code plans are listed in Table 7-12.

Table 7-12 Zetron's Reach Code Plans

Pager Capcode	Indiv. Call Tone Groups
0xx	Z5+Z3
1xx	Z1+Z2
2xx	Z2+Z1
3xx	Z3+Z4
4xx	Z4+Z3
5xx	Z1+Z4
6xx	Z4+Z1
7xx	Z1+Z5
8xx	Z5+Z1
9xx	Z3+Z5

NOTE

For REACH group call, 0xx group is not present. Instead, ten group calls are accessible using pager numbers 000,011,022, ... 099, that generate the ten group call tones from tone group Z1. The group calls activate 1st tone Z1 pagers (cap codes 1xx, 5xx, and 7xx). Reach 2000 Series codes are available by request.

REACH Tone Timing

The Reach tone timings are listed in Table 7-13.

Table 7-13 Reach Tone Timings

Reach	1st	Gap	2nd	Group Call
Fast	0.2	0	0.2	1.4
Slow	2.0	0	0.7	4.5

POCSAG DIGITAL FORMAT

If any message function is repaged, a new message must be entered before paging. The old message is lost. *No POCSAG pager numbers may be entered into the memory stack.*

DATA RATE: 512, 1200, or 2400 Baud

CAPCODE ENTRY: xxxxxxx f (one or more x may be strapped)

xxxxxxx = address, digits 0-9, range 0000000-2097151

f = beep alert function 1-4

MESSAGE ENTRY: Free form, up to 20 digits from keypad, with RS-232 option free form, up to 255 alphanumeric characters

MESSAGE CHARACTERS:

Model 15 Key	Received Character in Pager
0-9	0-9
A	[left bracket
B	] right bracket
C	U
D	activates alphanumeric test message
#	space
*	- (hyphen)

ALPHANUMERIC TEST ENTRY: example " xxxxxxx f PAGE D t PAGE "

t = alphanumeric test message 1 or 2

Test Message #1 = "ABCDEFGHJKLMNPQRSTUVWXYZ" (24 characters, control character <EOT> terminates the message)

Test Message #2 = "0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTU VWXYZ[ ] _" (48 characters, ASCII $30 to $5F, control character <EOT> terminates the message)

TEST MODES ENTRY: example 2018536 t PAGE

t = test mode number 1, 2, 3, or 4
Test #1 transmits Test Message #1 for NEC type D4 pagers
Test #2 transmits Test Message #2 for NEC type D4 pagers
Test #3 enables pager battery saving (sends message 40) for NEC-type D4 pagers
Test #4 disables pager battery saving (sends message 41) for NEC-type D4 pagers

NEC DIGITAL FORMAT (D2/D3)

If any message function is Re-paged, a new message must be entered before paging. The old message is lost. *No NEC pager numbers may be entered into the memory stack.*

CAPCODE ENTRY:

(NEC D2)	Tone Only Page	xxxxx	(1 to 3 x may be strapped)
(NEC D3)	Data Page	xxxxxx	(1 to 4 x may be strapped)

xxxxx = address, digits 0-9, range 00000-65535
xxxxxx = address, digits 0-9

Group 1	xx0000-xx2499
Group 2	xx2500-xx4999
Group 3	xx5000-xx7499
Group 4	xx7500-xx9999

MESSAGE ENTRY: free form, up to 20 characters

MESSAGE CHARACTERS:

Model 15 Key	Received Character in Pager
0-9	0-9
A	a
B	b
C	C
D	d
#	space
*	- (hyphen)

TEST MODES ENTRY: t PAGE

t = test mode number 1 or 2
Test #1 Transmits test sequence #1 for NEC type D3 pagers
Test #2 Transmits test sequence #2 for NEC type D3 pagers and repeats after 1 second

MOTOROLA GOLAY DIGITAL FORMAT

For any function that requests Talk, the interval will be given following transmission of the GSC address and message data. Speak when "tALK" is displayed. A pager Mute will automatically follow the Talk interval; "PAGE" will again be displayed. If any message function is Re-Paged, a new message must be entered before paging. The old message is lost. *No GOLAY GSC pager numbers may be entered into the memory stack.*

CAPCODE ENTRY: example xxxxxx f (one or more x may be strapped)

xxxxxx = address, digits 0-9

f = pager function
= 1 to 4 Voice page
= 5 to 8 Data page
= 9 and 0 Tone only page

MESSAGE ENTRY: free form, up to 12 numeric characters

MESSAGE CHARACTERS:

Model 15 Key	Received Character in Pager
0-9	0-9
A	# (3 horizontal bars)
B	E
C	U
D	activates alphanumeric test message (see following list)
#	space
*	- (hyphen)

ALPHANUMERIC TEST ENTRY: example xxxxxx f PAGE D t PAGE

t = alphanumeric test message 1 or 2

Test message 1 = “ABCDEFGHJKLMNPQRSTUVWXYZ” (24 characters)

Test message 2 = “0123456789:;<=>?*ABCDEFGHIJKLMNOPQRSTU VWXYZ[/]$%” (48 characters)

MOTOROLA METRO DIGITAL FORMAT

No METRO pager numbers may be entered into the memory stack.

CAPCODE ENTRY: example xxxxxx (one or more x may be strapped)

xxxxxx = address, digits 0 to 9

PROGRAMMING FUNCTIONS LOG

Use this Programming Functions Log to record the settings programmed into your encoder. This log will be a handy reference should changes be required. Copy these pages as necessary to record all leading digits programmed. *Please Note:* Throughout the following lists, 0 = No or Off, 1 = Yes or On

SYStEM System wide parameters.

Prompt and Default	Programmed Value	Description
tLH= 0		Talk time (seconds)
binP=0		Logic “0 “ sent as 0/1
diGP=0		Digital mode select polarity
APAG=0		Autopaging On/Off
SCrL=0		Autoscroll On/Off
cont=0		Continuous transmit On/Off
Sld=0		Station ID On/Off
Id		(ID string, 10 characters max)

2 tonE ___ = Leading digit for 100/1000 call Two-Tone

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
COdE =			Use 1000 call Code Plan? Yes/No
	GP1=		100 call group 1 select
	GP2=		100 call group 2 select
	PLN=		Select 1000 call code plan
1St =			First Tone timing #/100ms
GAP =			Gap timing #/100ms
2nd =			Second Tone timing #/100ms
diAG =			Diagonal tone Yes/No
	dur =		Group Tone duration #/100ms
	742 =		Diagonal tone freq. (Hz), default = 742
	A b =		Diagonal tone placement A/B tones

5 tonE ___ = Leading digit for 5/6 Tone format

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
PrE =			Send preamble digit Yes/No
StrP =			# of strapped digits including PrE
	StP(n)=		Strapped digit value #_____
rEPt =			# of times to repeat page
tYPE =			0=EIA,1=CCIR,2=ZVEI,3=EEA Tone type
Addr =			Address mode, Single, Dual, Extra

dtn.F ___ = Leading digit for DTMF Tone format

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
dur =			Tone duration #/10ms
GAP =			Gap timing #/10ms
dGtS =			# of digits 1 to 8
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____

HSC ___ = Leading digit for Hexadecimal Sequential Code format

Main Prompt	Dependent Prompt	Programmed Value	Description
StrP =			# of strapped digits
	StP(n) =		Strapped digits #_____
rEPt =			# of times to repeat page
tYPE =			Tone type 0=EIA,1=CCIR,2=ZVEI,3=EEA
SuPS =			Supersaver enabled Yes/No
	bAt =		Time (seconds) between Supersave commands

rEACH ___ = Leading digit for Reach format

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
StrP =			# of strapped digits
	StP1 =		Strapped digits #_____
1St =			First tone timing #/100ms
GAP =			Gap timing #/100ms
2nd =			Second tone timing #/100ms
dur =			group tone duration #/100ms

2805 ___ = 2805/1500 Pulse Paging format

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
1500 =			Use 1500Hz tone Yes/No
dGtS =			# of digits 3 to 8
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____

ALErt ___ = Leading digit for Alert tone encoding

Main Prompt	Dependent Prompt	Programmed Value	Description
tALH =			Talk enable Yes/No
StrP =			Strap digit Yes/No
tonE =			Alert tone type 1 to 4

POCSAG ___ Leading digit for POCSAG format

Main Prompt	Dependent Prompt	Programmed Value	Description
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____
Fnct =			Strapped Function code Yes/No
	diGt =		Function digit 1 to 8
tALH =			Talk enable Yes/No
Baud =			0=512 1=1200 2=2400
ALFA =			Alphanumeric Yes/No
	d4 =		NEC D4 format Yes/No

NEC ___ Leading digit for NEC D2/D3 format

Main Prompt	Dependent Prompt	Programmed Value	Description
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____

GSC ___ Motorola GOLAY format

Main Prompt	Dependent Prompt	Programmed Value	Description
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____
ALFA =			Alphanumeric Yes/No

Metro ___ Leading digit for Metro PageBoy format

Main Prompt	Dependent Prompt	Programmed Value	Description
StrP =			# of strapped digits
	StP(n)=		Strapped digits #_____

CUSTOM CALLS MEMORY REQUIREMENT WORKSHEET

The real capacity of the Model 15P for the Custom paging formats is determined by how much of its non-volatile memory has been used. This in turn is determined by which formats where used and how many pager capcodes were programmed under each format. This work sheet will allow the installer to determine whether the Model 15P can support the number of Custom calls that a particular end user requires, or if the remaining memory can accommodate adding additional pages to the unit's programming.

The example shown is for a customer that requires an encoder capable of 20 Custom Two-Tone pages, 10 Custom DTMF pages, and 5 Custom Stacks.

EXAMPLE	Number of Capcodes		Memory Used
Custom Two-Tone ⇒	20	X 14 =	280
Custom DTMF ⇒	10	X 12 =	120
Custom Stacks ⇒	5	X 38 =	190
		Total memory used =	590

Memory is adequate if the answer is less than 1558.

Use the blank provided to calculate your needs.

	Number of Capcodes		Memory Used
Custom Two-Tone ⇒		X 14 =	
Custom DTMF ⇒		X 12 =	
Custom Stacks ⇒		X 38 =	
		Total memory used =	

Memory is adequate if the answer is less than1558.

CUSTOM STACK MEMORY REQUIREMENT WORKSHEET

As a general approximation the Custom Stack feature has a capacity of ten pager capcodes per stack. If your application requires more than ten pages in a single series, then you can put the capcode of another fixed stack in the last position and the next stack will follow the first without interruption. However, because the actual capacity of the stack is controlled by memory usage, there can be instances where the capacity of a fixed stack is more (or less!) than ten capcodes, based on the size and number of capcodes actually entered. This worksheet will help the installer determine whether or not all the pages desired can fit into a single stack.

The worksheet requires that you enter the number of digits required to enter each pager's capcode. This includes the leading digit that selects the format block. In the example shown, the stack consists of five Two-Tone pages from a leading digit set up for a 1000-call code plan (thus requiring three digit capcodes) and five DTMF pages from a leading digit set up for five digit capcodes.

Pager Position	Pager Capcode
1	4 + 1 = 5
2	4 + 1 = 5
3	4 + 1 = 5
4	4 + 1 = 5
5	4 + 1 = 5
6	6 + 1 = 7
7	6 + 1 = 7
8	6 + 1 = 7
9	6 + 1 = 7
10	6 + 1 = 7
Total	60

Pager Position	Pager Capcode
1	+ 1 =
2	+ 1 =
3	+ 1 =
4	+ 1 =
5	+ 1 =
6	+ 1 =
7	+ 1 =
8	+ 1 =
9	+ 1 =
10	+ 1 =
Total	

The maximum total allowed for a single fixed stack is 67. As the example on the left shows, there is actually room in the stack memory for one more pager of either format.

Please remember that when you enter a POCSAG pager capcode into the stack, you must follow it with a message entry in the next capcode slot, and that this also consumes stack memory resources. The position with a "NULL" message in it would be valued as "1 + 1".

MODEL 15P CONFIGURATION SHEET

Serial number: _____

Zetron order number: _____

Model number: 901-9313 Rev _____

Software revision: 601-0434 Rev._____

Date: _____

Installed options: ☐ Analog option

- Two Tone
- Five Tone
- DTMF
- HSC
- Reach
- 2805
- Alert tones
- Custom Stacks

☐ Custom calls option

- Custom Two Tone
- Custom DTMF
- Custom Stacks

☐ Digital option

- POCSAG
- NEC D2/D3
- Golay
- Metro PageBoy
- Custom Stacks

☐ RS-232 option