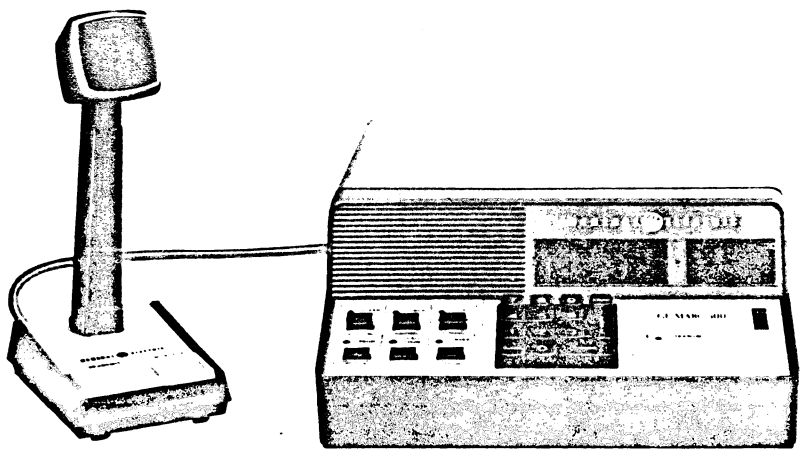
MOBILE RADIO

LBI30883

(DF9052)

PROGRAMMERS MANUAL FOR YOUR

GE-MARC 500 PROGRAMMABLE PAGING TERMINAL



GENERAL ELECTRIC

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GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
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DESCRIPTION

The GE-MARC 500 Paging Terminal provides facilities for alerting personal portable receivers to a page originated locally via the terminal keyboard or remotely by telephone. Also inherent in the terminal is the capability for mobile dispatching from the console. Provisions have been made to accommodate up to two optional telephone trunk inputs, required when paging by telephone. The terminal has a capacity of 250 or (optionally) 500 subscriber numbers.

Two-tone, two-tone-plus-voice interval, or six-tone signaling formats are available for paging. Priority status may be assigned to any address without regard to the tone signaling format used.

Pagers may be called individually or by group call. The terminal will alert all personal receivers assigned to the group by entering the assigned group call number. The terminal supports GE Type 99 and GE Universal group calls and is also compatible with the Motorola group call format.

Message accounting (optional) may also be provided for each subscriber number assigned. A tally of each subscriber's calls (999 maximum) processed by the terminal may be tabulated. Subscriber call counters are reset via the keyboard.

Terminal identification data, i.e., Morse Code, may be transmitted automatically after pages, at timed intervals, or not at all as programmed from the keyboard. Nine programmable options to transmit identification data are defined in the Configuration Table.

The GE-MARC 500 Terminal will accommodate up to two telephone trunk interfaces for paging in addition to the console. Standard trunk interface types that may be used are DID (Selector Level/Dial Pulse Trunk), End-to-End (DTMF), DCW or DCK. It can accommodate dial-pulse digits and DTMF on the same input in the DCK configuration if the terminal is so equipped.

Custom trunk installations may be accommodated; however, these would be special applications and may require special instructions.

PAGE QUEUES

Four page queues are provided for inbound pages; tone only - priority, tone only - non priority, tone-plus-voice - non priority, and tone-plus-voice - priority. The tone only priority queue has a capacity of 12 pages; the tone only non priority queue has a capacity of 24 pages. The number of tone only non-priority pages held in queue is displayed. The tone-plus-voice queues (with or without priority) each have a capacity of two pages. The page queues are prioritized and transmitted in the following order:

(1) Tone-plus-voice, priority

(2) Tone only, priority

(3) Tone-plus-voice, non-priority

(4) Tone only, non priority

CONSOLE DISPLAY

An eight-digit display separated into fields of 3, 1, and 4 digits (address, type and data) respectively is employed on the console front panel to indicate the status of the terminal or of the programming being performed by the operator. The display fields are identified in Figure 1.

In the paging mode the first three didigits identify the subscriber number being transmitted, the center digit displays a "P" if a priority page is held in queue, and the last two digits indicate the number of pages held in the tone-only, non-priority queue.

When entering pages from the console the subscriber number is displayed as entered in the address field - queueing information is blanked. If the subscriber number entered is a tone only page the terminal will return to the idle mode immediately after the "PAGE" key is pressed. If the subscriber number entered is a tone-plus-voice page, the subscriber number will remain displayed for the duration of the page (or until CLEAR is entered) after which reorder busy is signalled and the terminal will return to the idle mode.

During console initiated pages various prompts are displayed (Figure 2) indicating the operating status of the terminal. When the pages have been transmitted the display will return to its normal operating mode. When operating in the radio dispatch mode, the address field is used for prompts. In the programming modes the first three digits again indicate the subscriber number or parameter being operated on. The remaining digits contain the data related to the subscriber number or parameter.

Two types of error displays may be observed on the console display panel; the equipment error display and the keystroke error display. The equipment "Error" display occurs when a malfunction is detected by the terminal error detection circuitry and appears in the type and data fields. All critical system parameters are monitored.

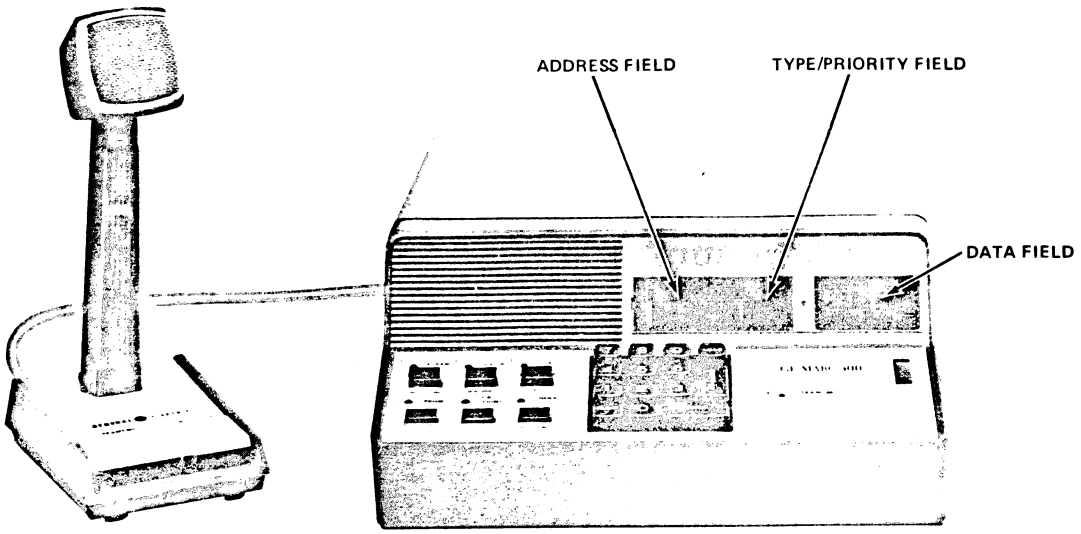


Figure 1 - GE-MARC 500 Paging Terminal

The equipment malfunction must be corrected before using the keyboard; however, the terminal will continue attempting to process pages from the trunk inputs.

A keystroke error display consists of "E's" in the data field and appears when too many digits have been entered or when an incorrect keystroke sequence occurs during normal paging and programming operations.

Paging inputs received on the telephone trunks are processed and transmitted automatically, with pages being displayed when transmitted.

CONSOLE CONTROL PANEL

The control panel is divided into three sections for operator convenience. These include a six-section status and control panel for programming or control functions a keyboard panel containing ten keys (0-9), which are used for address, tone code, or control mode entry, and four keys, CLEAR, LOAD, PAGE, and RECALL, which are used for programming or control functions. The right section (Mobile Dispatch) contains the transmit push-to-talk (PTT) switch and the volume control. A brief summary of the control functions is given below. Controls are identified by front panel nomenclature.

- CLEAR: The CLEAR key is used to clear the terminal. If the operator is entering a subscriber number, pressing the clear key will cause the display to revert to the idle mode. If type/data is being entered, the type and data fields will blank and the data associated with the old subscriber number will be displayed. A second clear will return the terminal to the idle mode (two zeros in the data field).
- PAGE: The PAGE key is used to transmit a properly entered subscriber number.
- LOAD: The LOAD key is used to load data into the terminal memory.
- RECALL: The RECALL key is used for retrieving data from the terminal memory. The contents of the terminal address memory, call-count memory or configuration memory can be stepped through automatically by pressing the RECALL switch down while the terminal is in the program, call count, or configuration modes.

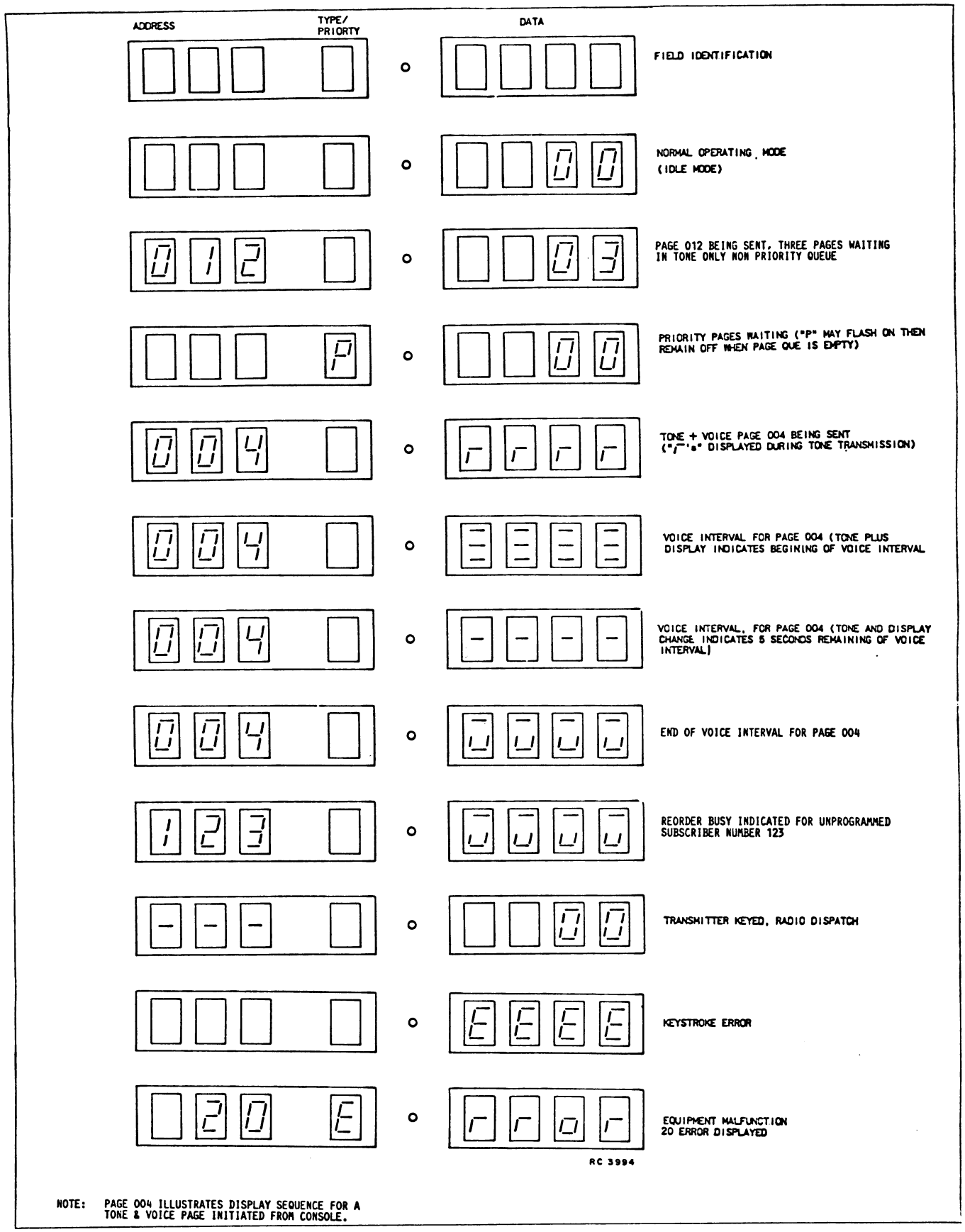
The status and control panel provides the following functions:

- ALARM/MUTE (Optional):

  ALARM - The ALARM indicator will light and the alarm output will operate when a detectable failure occurs within the terminal, when the CPU halts for any reason, or when a transmitter failure occurs.

  The transmitter must be connected to the external alarm input. A power failure will also cause the alarm relay to fail in the "alarm" position.

  MUTE - The MUTE switch cancels the external alarm output; however, the ALARM indicator will stay lit until the problem is corrected. When the MUTE switch is operated the MUTE indicator will light to indicate that the external alarm output is muted.



NOTE: PAGE 004 ILLUSTRATES DISPLAY SEQUENCE FOR A TONE & VOICE PAGE INITIATED FROM CONSOLE.

Figure 2 - Typical Displays

- TX MON: Depressing the TX MON switch allows all transmitted audio (except local dispatching and console tone/voice paging) to be monitored through the terminal speaker. The TX MON indicator is on when this switch is activated. In mobile dispatch applications, audio from the base station receiver is monitored regardless of the position of the TX MON switch.

- EXT BUSY/TAKEOVER (Optional):

  EXT BUSY - The EXT BUSY indicator is on when: 1) an input (such as the CAS line) is applied to the external busy input, 2) another transmitter controller is using the transmitter (a parallel transmit detect board must be installed to detect the other controller source) or, 3) if two or more terminals are installed in tandem and the lower priority terminal requests the transmitter from a higher priority terminal but does not receive an acknowledge signal from the priority terminal. Subsequent pages are not transmitted when the EXT BUSY indicator is on.

  TAKEOVER - Depressing the TAKEOVER switch allows the operator to lock out other terminals or devices (i.e., a MASTR Controller) and terminate all transmissions that may be in progress. Subsequent pages will be held in queue. The TAKEOVER indicator is on when this switch is activated.

- PROGRAM: Depressing the PRGM switch once enters the terminal in the program mode, turns the program indicator on, and allows the operator to enter, change, or delete subscriber codes using the keyboard. Pages originated from the keyboard are not accepted when the terminal is in the program mode. To exit the Program mode, release the PRGM key and momentarily press the CLEAR key.

- CALL COUNT (Optional): Depressing the CALL COUNT switch accesses the call count mode and allows the operator to tabulate pages on individual subscriber call counters using the keyboard. The CALL COUNT indicator is on when the switch is selected.

NOTE

The PRGM switch must not be operated at the same time as the CALL COUNT switch. The PRGM and CALL COUNT switch are also disabled when the CONFIGURATION/RESET count switch is operated.

- HOLD (Optional): Depressing the HOLD switch causes subsequent pages to be held in queue until the switch is released. The HOLD indicator is on when the switch is depressed. The HOLD switch may be an alternate-action or momentary-action switch.

- TRANSMIT: The TRANSMIT switch is used for mobile dispatch purposes (parallels the TRANSMIT switch on the microphone). The TRANSMIT indicator is on when the transmitter is keyed for pages, when mobile dispatch transmissions are originated from the paging terminal, and optionally when other terminals connected in parallel key the transmitter.

- VOLUME: The VOLUME control is used to set the speaker audio level.

- CONFIGURATION/RESET COUNT: The CONFIGURATION/RESET COUNT switch (located on rear panel) is a three position center-off spring return slide switch. Holding the switch in the RESET COUNT (up) position enters the terminal in the reset count mode and enables the user (using a unique keyboard operating sequence to prevent accidental erasure) to simultaneously reset all subscriber call counters to zero or to a specific count. Holding the switch in the CONFIGURATION (down) position causes the terminal to enter the configuration mode and allows the user to set system parameters and do trunk programming.

- AC PWR ON-OFF: An ON/OFF slide switch is provided on the rear of the terminal for AC power control. A power indicator is located between the Type and Data display fields.

- MICROPHONE CONTROLS

  TRANSMIT - Keys the transmitters (Parallels TRANSMIT switch on terminal)

  MONITOR - Permits monitoring the radio channel.

PRIORITY PAGES

Any pager may be given priority status by programming the related subscriber number

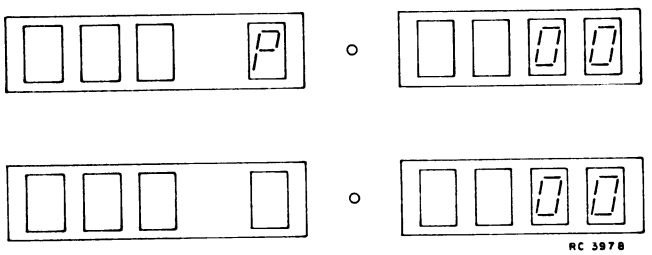
for priority operation. Any subscriber number may be assigned priority status without restriction as to pager type. Pagers may be two-tone tone only, two-tone-plus-voice, six-tone, or six tone second address.

In addition to assigning priority status to any pager, the terminal also may be programmed to assign priority status to pages received on either trunk 1, trunk 2, or from the terminal keyboard. For example, if simultaneous pages were received on trunk 1 (assigned priority) and from the terminal keyboard, the page on trunk 1 would be transmitted first. Trunk input capability is optional and may not be present on all terminals.

GENERAL OPERATION

The GE-MARC 500 Terminal may be used for mobile dispatch (two-way radio communications with mobile units) or paging operations. Paging is generally automatic, i.e., paging information passes through the terminal without requiring any action of the operator. Pages also may be originated by the operator.

Operating status is indicated by the display. If the terminal is processing pages, the pager address will be displayed in the address field. The tone only non-priority queue count will be displayed in the data field and priority pages in queue (tone only and tone + voice) will be indicated by a "P" in the type field. If the terminal is idle "00" will be displayed in the right two digits and all others will be blank.



IDLE TERMINAL

MOBILE DISPATCH

Before originating a call to a mobile unit, ALWAYS monitor the radio channel to avoid interfering with communications already in progress. Normally, all received audio from the base station is monitored, however, if Channel Guard is provided in the communications system the audio does not pass through to the speaker. To monitor the channel depress and hold the MONITOR switch at the base of the microphone. You need not wait until the terminal is idle to monitor the mobile channel. The channel will be monitored immediately following the page that was in progress. Subsequent pages are held in queue until the MONITOR switch is released. In tone control systems, actual monitoring will continue until the transmitter is keyed.

In summary then, when initiating a call to a mobile radio, first monitor the channel to determine if the channel is busy. After ascertaining the channel is not busy, depress and hold the TRANSMIT switch and wait until dashes appear in the address field. The dashes will be displayed as soon as the current page is complete and indicates to the operator that the message may be transmitted.

If a reply is expected, press the HOLD switch down until communications with the mobile are terminated. This causes all subsequent pages to be held in queue until the mobile dispatch sequence has been completed. The pages in queue will be transmitted automatically following release of the HOLD switch.

An alternative to operating the HOLD switch is a built-in interval timer and carrier sensor (optional) using the external busy input. The external busy input inhibits paging while it is active. The timer provides a delay after each transmission or after removing the EXT BUSY input (if the terminal and base station are connected for CAS sensing) before allowing the terminal to resume paging. The delay is settable from 0 to 45 seconds in 5-second increments. The delay interval is set by programming the "Paging Delay After External Busy and Dispatch" as defined in the Configuration Table. This allows the mobile and the terminal operator to communicate with each other without being interrupted by pages. If the interval is set for 10 seconds, the mobile has 10 seconds to reply to the dispatch call and vice versa. The time interval can be extended in 10 second increments by momentarily pressing the TRANSMIT switch when more time is desired.

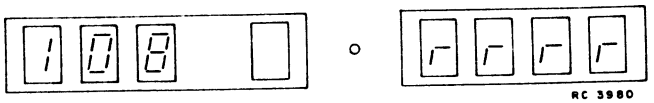
PAGING

Pages can be categorized into three types: tone only, tone-plus-voice and GE Universal Group call. Pages may be originated locally or by remote telephone with remote pages being handled automatically.

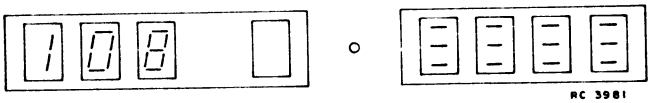
When originating local pages enter the subscriber number and momentarily depress the double wide PAGE key. (The subscriber number will appear in the address field and the other fields will blank.) If the number

entered was a valid tone only page the page will be placed in queue and the terminal will return to the normal operating mode displaying the queue count and page being transmitted. The pages are transmitted according to established priority.

If the subscriber number entered is a valid tone-plus-voice page, the number will remain displayed and the page will be transmitted according to the established priority. The terminal operator will hear ringing from the console speaker and see "r's" in the data field (as shown below), while waiting for the transmitter and while the tone sequence is being transmitted. The terminal will sound a short beep from the speaker and display three dashes in each digit of the data field to alert the operator when the voice messages can begin.

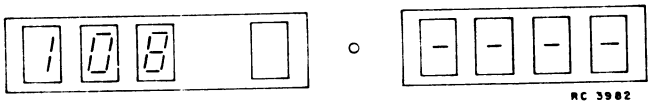


DISPLAY - Tone-Plus-Voice, Page 108
Tones Being Transmitted



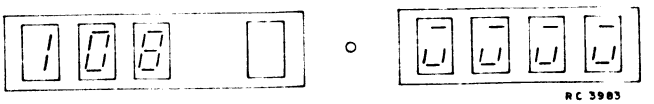
DISPLAY - Voice Interval, Page 108

It is not necessary to press the TRANSMIT switch during the voice interval. The terminal will key the transmitter. Five seconds before the end of the voice interval, the terminal will sound a warning beep and the three dashes in each digit of the data field will change to one dash in each digit of the data field.



DISPLAY - Voice Interval For Page 108
Five Seconds Remaining

At the end of the voice interval the terminal will sound reorder busy from the speaker (a busy tone) and flash "U" in each digit of the data field for five seconds and then return to the idle mode.

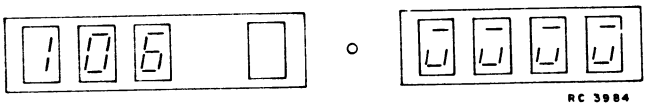


DISPLAY - Reorder Busy

The operator may cancel the page before transmission, terminate the voice interval, or terminate the reorder busy tone by momentarily pressing the CLEAR key.

If the subscriber number entered is a GE Universal Group call all pagers within the group are alerted although only one subscriber number is entered. If the group call contains tone only pages, each subscriber number within the group will be displayed as the associated tones are transmitted. If the group call includes a voice interval only the number entered is displayed and the operating sequence is the same as tone-plus-voice interval.

If the subscriber number entered is unprogrammed (type 0), the terminal will display the number entered, sound reorder busy, and flash "U" in each digit of the data field for five seconds. This too can be terminated early by monentarily pressing the CLEAR key.



DISPLAY - Invalid Subscriber Number 106

TERMINAL PROGRAMMING

DISPLAY

Address digits are displayed in the address field from left to right as they are entered. When three digits have been entered (two for configuration mode) the data code associated with the address appears in the type and data fields.

KEYBOARD FUNCTIONS

Ten keyboard keys (0-9) and three function keys CLEAR, LOAD and RECALL are used for programming or control functions.

- 0-9 - The 0-9 keys are used to enter the coded data into terminal memory.

- CLEAR - The CLEAR key is used to clear the address or type and data fields. If the operator is entering a subscriber number, pressing the CLEAR key will cause the display to revert to the idle state. If type/data is being entered the type and data fields will blank and the data associated with the old subscriber number will be displayed. A second clear will return the display to the idle state.

- LOAD - The LOAD key is depressed to load data into the terminal memory.

- RECALL - The RECALL key is used for retreiving call count, tone code, or other data from the terminal memory.

- PAGE - THE PAGE key transmits properly entered subscriber numbers.

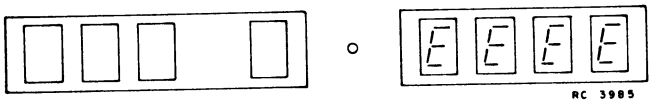
Automatic Recall

The contents of the terminal address memory, call-count memory or configuration memory can be stepped through automatically by holding the RECALL switch down with the terminal in the desired mode. After the RECALL key has been depressed for 1.5 seconds, the address will increment by one. After the first increment the address will increment at a programmed rate as defined by configuration parameter 12. The preset rate is 0.8 seconds and may be programmed over a range of 0.01 to 2.5 seconds.

The data displayed will depend on whether the PRGM or the CALL COUNT switch is enabled. When the CONFIGURATION/RESET COUNT switches and RECALL key are depressed, the configuration parameters will be stepped through in a similar manner. The sequence may be started at any point by entering the desired address (or configuration parameter) and pressing the RECALL key.

KEYSTROKE ERROR

If the operator makes a keystroke error (entering too many digits or an incorrect key sequence) "E's" are displayed in the data field. Momentarily pressing the CLEAR key will clear the "E's" from the display and the terminal will revert to the condition just previous to the error sequence.



DISPLAY - Keystroke Error

PROGRAM MODE

NOTE

When the terminal is first received, the state of the battery and memory will not be known. The terminal should be turned on for a minimum of 24 hours to fully charge the battery before placing the terminal in service. This will prevent the loss of subscriber and configuration information in the event of a momentary power interruption during the battery charging period.

The program mode is entered by momentarily pressing the PRGM key. The program indicator will light. The terminal will remain in the program mode until the PRGM key is released. Operating in the program mode allows the user to enter, delete, change, or verify type and tone code information assigned to subscriber numbers.

GE Type 99 and Motorola compatible group calls can be programmed as standard pages. In addition GE Universal Group call permits sequentially numbered subscribers of any type mix to be paged by entering a single subscriber number.

Paging requests received on the trunk inputs are accepted and processed when the terminal is in the program mode; however, pages can not be originated from the console keyboard.

NOTE

A permanent record should be kept of all subscriber code assignments for future reference. The record should include each address, the type and priority code, and the tone code assigned. A sample Pager Tone Code and Priority Assignment chart is located in the back of this manual.

Zeroing Subscriber Numbers

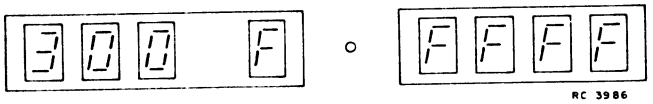
To "ZERO" a location (set type and data field to all zero's) enter the address followed by one "zero" and then depress the LOAD key. This sequence automatically loads zeros into all data positions for the address displayed. Addresses may initially contain random data some of which may appear as non-numeric characters. Therefore all locations should be zeroed manually upon installation of the terminal.

Subscriber Coding

Depress the PRGM key and observe that the program indicator is lit. Enter the

three digit subscriber numbers. They will be displayed in the address field. Any type or tone data assigned to the location will appear in the type and data fields. The type and data fields may now be loaded or changed as desired.

In a 250 subscriber number system, if the subscriber number entered addresses memory that is not installed "F's" will be displayed in the Type and Data fields.



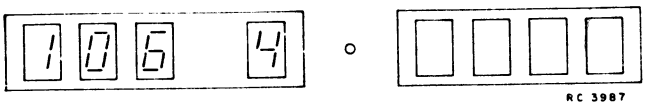
DISPLAY - Non Existent Memory

NOTE

Mapping digits allowed are restricted to "0-4". In the standard configuration the 500 series numbers are mapped to the "000's" location, "600's" to "100's" etc.

Type Digit Programming (Tone Format and Priority)

The type digit is entered following the subscriber number. The type digit assigns the tone format and priority to which the associated pager will respond. The ten type digits, 0-9, the tone code, and priority code assigned to each digit are defined in Figure 3. When the type digit is entered it will appear in the type field, and the data field will blank. Enter the new tone code as described in the following paragraphs.



DISPLAY - Subscriber Number and Type Digit

Type Digit	TONE AND PRIORITY
0	Unprogrammed
1	Two Tone, Tone Only - No Priority
2	Six Tone, - No Priority
3	Six Tone, Second Address - No Priority
4	Two Tone, Tone + Voice - No Priority
5	Two Tone, Tone Only - With Priority
6	Six Tone - With Priority
7	Six Tone, Second Address - With Priority
8	Two Tone, Tone + Voice - With Priority
9	Universal Group Call

Figure 3 - Type Digit Identification

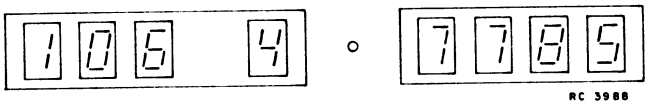
Tone Code Programming

Any three digit subscriber number may be assigned any two-tone pager code or any single or dual address six-tone code. When two-tone pages are being programmed, the data field contains the two 2-digit numbers describing the two tones (Refer to Table 2, Tone Code Conversion).

When six-tone pages are being programmed the data field contains the digits describing the last four digits of the pager code. The preamble and first tone of the pager code must be the same and are programmed through location 10 as described in the Configuration Table. Six-tone programming does not require the use of the Tone Code Conversion Table since the digits define the tones that are to be transmitted. Tones for six-tone pagers should be entered exactly as they appear on the pager. The terminal automatically takes care of transmitting repeat tones when two adjacent tones are the same.

Determine the pager code from the pager itself where the tone code identification number is located on the pager. After determining the pager code refer to Tone Code Conversion Table 8 to determine the tone code digits to be entered. To program a subscriber number, enter the subscriber number, and the new type and tone code data.

When the four new tone code digits are entered, press the LOAD key. The type and data fields will blank as the terminal loads the data into memory. After one-half second the terminal will display the new data.



DISPLAY - Two-Tone Code

Where: Subscriber number = 106

Type Digit = 4 (two-tone + voice interval)

Tone Code = 7785 (1st tone 547.5 Hz)
(2nd tone 922.5 Hz)

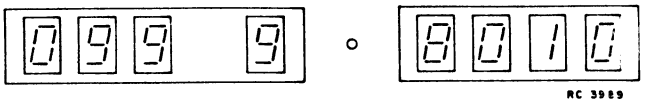
Group Call

There are three types of group calls: GE Universal, GE Type 99 and Motorola compatible.

- GE Universal - Sequentially transmits a group of subscriber numbers. Any mix of pager types may be included. Group calls must be assigned the subscriber number immediately preceding the group of sequential subscriber numbers forming the group call. (Example: Location 99 may be programmed as a group call paging subscriber number 100 through 110; location 167 paging subscriber number 168 through ..., etc.) Any number of group calls may be created and any number of subscriber numbers may be assigned to a group (up to the limit of the subscriber memory).

  When the operator encodes the group call sequence, the first digit position (left) of the data field display will indicate the priority and type data as defined in Figure 4.

  The remaining three digits of the data field will indicate the number of subscriber numbers in the group. An example of a group call format containing 10 subscriber numbers is given and decoded below. This group consists of subscriber numbers 100-109.



DISPLAY - Group Call

Where: (1) Digits "099" in the address field identifies the group call location. Paging begins with subscriber number 100.

(2) Digit "9" in the type field identifies location 99 as a group call.

(3) Digit "8" in the data field indicates that pagers within the group include tone-plus-voice interval with priority.

(4) Digits "010" indicates 10 sequential subscriber numbers are to be paged.

When all group call data has been entered, press the LOAD key. The data are then loaded into memory in the same manner described for Tone Coding.

- GE Type 99 - Requires the use of specially configured pagers. Subscriber numbers are programmed in the same way as tone pages using the appropriate tone codes found in the Tone Code Conversion section of this manual.

1st Digit Data Field	PRIORITY AND TYPE
0, 1	No Priority, Tone only
2, 3	No Priority, Tone + Voice Interval
4, 5, 6, 7	Priority, Tone Only
8, 9	Priority, Tone + Voice Interval
NOTE: Tone only and tone-plus-voice pages may be mixed in any group call. The presence or absence of the voice interval and the priority status is determined by the first digit in the data field.	

Figure 4 - Group Call Priority Assignments (GE Universal)

- Motorola Compatible - Requires the use of specially configured pagers. Subscriber numbers are programmed in the same way as tone pages using the appropriate tone codes found in the Tone Code Conversion Table. If the first tone and second tone are both programmed to the second tone required by the pager, the terminal will automatically transmit nine seconds of the second tone, thereby creating a group call.

When all programming has been completed the operator must exit the program mode to resume normal operation. To exit the program mode push and release the PRGM key followed by the CLEAR key.

CALL COUNT MODE

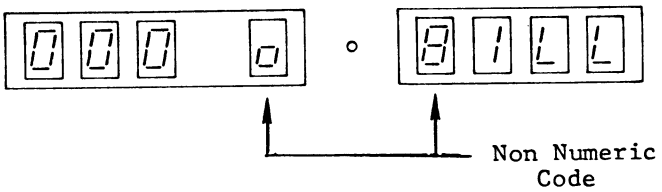
When the CALL COUNT switch is pressed, the operator may display the call count of any subscriber number. When a three-digit number is entered, the subscriber number (which passes through the mapping function) is displayed in the address field. The three-digit call count is displayed in the three right most digits of the data field. A subscriber's call count may be changed by entering the desired 3 digit count followed by LOAD. The subscriber number may be advanced by pressing the RECALL key.

RESET COUNT MODE

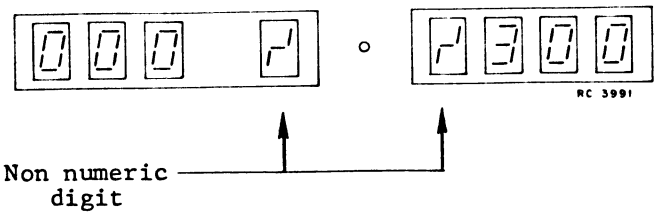
Holding the CONFIGURATION/RESET COUNT switch on the rear of the terminal "up" to the RESET COUNT position allows the operator to preset all of the Subscriber Call Counters to zero or to a predetermined count. To prevent the call counters from accidently being erased, a unique sequence of operations must be followed to simultaneously set the counters. The procedure is as follows:

1. Hold the CONFIGURATION/RESET COUNT switch in the up position.
2. Enter three zeros. The zeros will appear in the address field. A non-numeric code will appear in the type and data field.
3. Enter the count to which the counters are to be set (three zeros or the selected three-digit number). The three digits will appear in the data field. A unique (non-numerical) digit will appear in the left digit of the data field.
4. Press the LOAD key.
5. Release the CONFIGURATION/RESET COUNT switch and momentarily press the CLEAR key.

Figure 5 - Rear Panel Switches



DISPLAY - Reset Count, Zero's Entered



DISPLAY - Reset Count, Counters Preset to Count 300

CONFIGURATION MODE PROGRAMMING

The configuration mode is enabled by holding the CONFIGURATION/RESET COUNT switch down to the position marked CONFIGURATION while programming the desired system parameters using the keyboard. The parameters are numbered from 00 to 39 and when entered will appear in the address field. The data stored for the given parameter is displayed in the type digit location. If a new value is entered, the new value will be displayed in the data field. Press the LOAD switch. The data field will blank and the newly entered digit will reappear in the type field. This blanking action indicates that the terminal has placed the new data in memory.

All operating sequences described in the programming mode apply also to the configuration mode. Terminals are shipped preprogrammed to the standard configuration state, which is permanently recorded in memory. If an error is detected in the configuration memory block during the diagnostic routine, the standard configuration will be loaded from permanent memory (PROM) into the user memory (RAM). Otherwise, customer-entered configuration changes will remain in memory even if the AC power is turned off. If a configuration failure does occur, an error message will be displayed.

Table 1 below lists all settable parameters and identifies the standard terminal configuration. Space is provided to record any variances from the standard configuration. It is important to record all variances to facilate re-entering those parameters which were previously entered as nonstandard.

NOTE

When the terminal is first received power up the terminal for 24 hours before programming to allow the memory backup battery to charge.

Table 1 - Configuration Parameters

PARAMETER	DESCRIPTION	TYPE DIGIT LIMITS	PREPROGRAMMED FACTORY STANDARD	USER DIGIT
00	Mapping digit for 0	0-4*	0	
01	Mapping digit for 1	0-4*	1	
02	Mapping digit for 2	0-4*	2	
03	Mapping digit for 3	0-4*	3	
04	Mapping digit for 4	0-4*	4	
05	Mapping digit for 5	0-4*	0	
06	Mapping digit for 6	0-4*	1	
07	Mapping digit for 7	0-4*	2	
08	Mapping digit for 8	0-4*	3	
09	Mapping digit for 9	0-4*	4	
10	Preamble and first digit for six-tone pages	0-9	0 (600 Hz preamble tone and first digit tone for 6 tone pager)	
11	Priority Trunk: Console = 0 Trunk 1 = 1 Trunk 2 = 2 No Trunk = 3-9	0-9	0 (Console priority)	

* Use of digits 5 thru 9 may cause memory errors.

PARAMETER	DESCRIPTION	TYPE DIGIT LIMITS	PREPROGRAMMED FACTORY STANDARD	USER DIGIT
12	Display retrieve rate: 0 = 0.01 seconds 1 = 0.03 seconds 2 = 0.13 seconds 3 = 0.29 seconds 4 = 0.52 seconds 5 = 0.81 seconds 6 = 1.1 seconds 7 = 1.6 seconds 8 = 2.0 seconds 9 = 2.5 seconds	0-9	5 (automatic display retrieve at a 0.81 second sequence rate)	
13	Trunk phantom flag: No Phantom = 0, 4, 8 Trunk 1 only = 1, 5, 9 Trunk 2 only = 2, 6 Trunk 1 and 2 = 3, 7	0-9	0 (no trunk phantom)	
14	Trunk 1 phantom digit	0-9	0 (not applicable)	
15	Trunk 2 phantom digit	0-9	0 (not applicable)	
16	Camp on ringing interval, 10 second increments	0-9	4 (40-second camp on ringing)	
17	Interdigit abandonment interval, 5 second increments	0-9	2 (10-second interdigit abandonment interval)	
18	Chain Dial Flag: * No chain dial = 0 Chain dial enabled = 1-9	0-9	1 (chain dialing enabled)	
19	Transmit bring up interval, 100 ms increments	0-9	4 (0.5 second transmitter bring up interval)	
20	Duration of first tone, 500 ms increments	0-9	2 (1.0 second first tone)	
21	First tone to second tone gap 50 ms increments	0-9	2 (0.10 seconds gap between first and second tones)	
22	Duration of second tone, 500 ms increments	0-9	4 (2.0 second; second tone)	
23	Second tone to voice interval, 500 ms increments	0-9	0 (0.0 second interval between go ahead tone and voice interval)	
24	Duration of voice interval 21 minutes = 0 5 second increments = 1-9	0-9	3 (15 second voice interval)	
25	Duration of interval between two-tone codes, 200 ms increments	0-9	5 (1 second gap between two-tone pages)	

* Available on End-to-End and DCK only

PARAMETER	DESCRIPTION	TYPE DIGIT LIMITS	PREPROGRAMMED FACTORY STANDARD	USER DIGIT
26	Number of two-tone, tone only code repeats	0-9	0 (no two-tone only page repeats)	
27	Number of two-tone, tone-plus-voice code repeats	0-9	0 (no two-tone code repeats for tone-plus-voice pages)	
28	Number of six-tone code repeats	0-9	2 (Two six-tone code repeats)	
29	F1/F2 Transmit Control: F1 Page/dispatch = 0 F1 Page and F2 dispatch = 1 F2 Page and F1 dispatch = 2, 4, 6, 8 F2 Page and F2 dispatch = 3, 5, 7, 9	0-9	0 (Page and dispatch on F1)	
30	Paging delay after external busy and dispatch, 5 second increments	0-9	0 (0.0 second delay after external busy and dispatch)	
31	Minimum allowable duration between REQ inputs (REQ = request from a second GE-MARC 500 Terminal) 5-second increments	0-9	0 (0.0 second minimum duration between REQ inputs)	
32	Morse code identification: 0 = No Morse Code ID 1 = ID After Every Series of Transmissions, 600 Hz Tone 2 = ID After Every Series of Transmissions, 1200 Hz Tone 3 = ID After Every Series of Transmissions, 1800 Hz Tone 4 = ID Every 14 Minutes, 600 Hz Tone 5 = ID Every 14 Minutes, 1200 Hz Tone 6 = ID Every 14 Minutes, 1800 Hz Tone 7 = ID Every 28 Minutes, 600 Hz Tone 8 = ID Every 28 Minutes, 1200 Hz Tone 9 = ID Every 28 Minutes, 1800 Hz Tone	0-9	2 (Morse ID with 1200 Hz tone after every series)	
33	First Digit of Test Page	0-9	0 (Not applicable)	
34	Second Digit of Test Page	0-9	0 (Not applicable)	
35	Third Digit of Test Page	0-9	0 (Not applicable)	

PARAMETER	DESCRIPTION	TYPE DIGIT LIMITS	PREPROGRAMMED FACTORY STANDARD	USER DIGIT
36	Test Page Interval: 0 = No Test Page 1-9 = Test Pages in 15 second increments	0-9	0 (Test Page not enabled)	
37	Spare:		0 (Not applicable)	
38	Spare:		0 (Not applicable)	
39	Spare:		0 (Not applicable	

Special Instructions

F1/F2 TRANSMIT - In station configurations having transmitters on two different frequencies for mobile dispatching and paging, the GE MARC 500 terminal must be programmed to select the correct transmitter. The terminal can be programmed to transmit all possible combinations of F1 and F2. Refer to parameter 29 of the Configuration Table for programming data.

TANDEM OPERATION - Two or more terminals may be used with the same transmitter. These terminals gain access to the transmitter with a handshaking arrangement of requests and grants. Basically, one terminal has top priority and the other terminals are daisy chained to the priority terminal. Each terminal is of lower priority than the preceding terminal. When a terminal needs the transmitter it requests permission from the next highest terminal. This request is passed from one terminal to the next until it gets to the top terminal. When the top terminal is through with the transmitter (if using it) the terminal will pass a grant down the daisy chain (if a terminal of higher priority now needs the transmitter it will grab the grant and use the transmitter before passing the grant down). When the initiating terminal receives the grant it will use the transmitter. A built-in timer requires the terminal to release the transmitter and make a request at programmable time intervals. This timer prevents one terminal from locking up the system. If only one terminal is used the interval should be set to '0' (parameter 31). The practical limitation in a fairly busy system is three terminals.

While the lower priority terminal is waiting for acknowledgement after sending a REQUEST, its EXT BSY indicator is on.

TEST PAGE - At times it may be advantageous to send the same page continuously at some specified interval (for example, to test area coverage). The test page allows the user to enter three digits of the pager's subscriber number and the digit which describes the interval between pages (15 second increments). Refer to configuration parameters 33 thru 36. To turn the test page off, enter "0" for the interval. The test page may be of any type including group calls. All pages received during transmission of test page will be placed in the proper queue and transmitted after the test page.

TRUNK OPERATION

The GE-MARC 500 may receive page requests from two telephone trunk interfaces in addition to the console. The terminal may be equipped with several different types of interfaces. The call initiation procedure is somewhat different for each. A general description of the calling procedure is given below followed by descriptions of each type interface.

GENERAL OPERATION

The user originates a page by dialing a two or three digit number into the terminal. The exact procedure for doing this varies with the interface type. The user is allotted a specific time interval to enter each digit. If he fails to do so, he is returned five seconds of reorder busy and is then disconnected. This interval is called the Interdigit abandonment interval and its duration is programmed in the Configuration Table. If the user is using a pushbutton DTMF telephone (End-to-End or DCK only) he can use the # key to clear incorrect entries and allow him to re-enter the number. The next action taken by the GE-MARC 500 depends upon the type of page entered by the user.

If the page is not programmed the terminal will return five seconds of reorder busy. The terminal will disconnect after reorder busy unless the interface is End-to-End or DCK and chain dialing is enabled, after which it will return dial tone again. (Reorder busy is reduced to three seconds when chain dialing is enabled.)

If the page is a tone only page, the user will receive ringing until the page is to be placed in queue, and then an acceptance beep when the page is placed in queue. Typically the queue will not be full so the beep will be heard immediately after the last digit is dialed, except that one ring is guaranteed with DID interfaces. If the queue is full the terminal will provide ringing up to the camp-on ringing interval programmed in the Configuration Table. If the queue remains full, the terminal returns five seconds of reorder busy and disconnects the caller. Normally the terminal waits three seconds after the acceptance beep, returns five seconds of reorder busy and disconnects the caller. However, if the interface is End-to-End or DCK and the chain dialing flag is set in the Configuration Table, dial tone will be returned immediately and the user can dial a new page.

If the page is a tone-plus-voice page, the user will receive ringing until the pager tones have been transmitted. If the page is not transmitted during the camp-on-ringing interval, the terminal will return five seconds of reorder busy and disconnect. If the page is transmitted the user will hear a go ahead beep and should begin the voice message at that time. The user will also hear a warning beep five seconds before the end of the voice interval. At the end of the voice interval, the terminal will return five seconds of reorder busy and will normally disconnect. However, if the interface is End-to-End or DCK and the chain dialing flag is set, dial tone will be returned after reorder busy and the user can dial a new page. Also if the interface is End-to-End or DTMF DCK, the user can terminate the voice interval by pressing the # key and dial tone will be returned. The method of originating calls to the terminal depends upon the type of trunk installed. Generally this is known and specified when the terminal is ordered. However most trunk types use the same hardware and the type is determined by the location of a jumper. The primary restriction is that DTMF receiver hardware must be present to receive End-to-End or DCK DTMF signaling. A brief description of call origination for each type is given below.

DID (SELECTOR LEVEL/DIAL PULSE TRUNK)

Dial Pulse is the preferred method of interface for common carrier systems. With dial pulse, each subscriber has his own telephone number i.e., subscriber A has 528-7014 and subscriber B has 528-7045. The last three (or two in a small system) digits dialed are fed directly to the GE-MARC 500 and are used as the subscriber number subject to translation by the trunk mapping function. After the last digit of the phone number is dialed, the sequence described under general operation will take place. Note that the user normally will not be charged by the telephone company for dialing unprogrammed numbers (for toll or message unit billing purposes).

END-TO-END OPERATION (AND RDMZR COUPLER)

With End-to-End, the user first dials a telephone number that is common for all users, such as 528-7000. The user may hear one or two rings while the terminal is answering the line. When the terminal answers, it returns dial tone to the user, and he must dial in the 2 or 3 digit subscriber number from a DTMF pushbutton telephone. Operation proceeds as described in the general description. Note that the user will be charged for all calls to the terminal.

DCW OPERATION DIAL

The DCW interface is used to connect to a PBX for in-plant paging systems. The user normally dials an access code, such as '8' and the PBX normally returns a second dial tone. The user then dials in the 2 or 3 digit subscriber number which is passed on to the GE-MARC 500. Operation proceeds as described in the general description.

DCK OPERATION DTMF

The DCK interface is used for connecting to a PBX for an in-plant paging system. The user normally dials an access code, such as '8' and is connected to the GE-MARC 500. The terminal returns dial tone and the user dials in the two or three digit subscriber number. Operation proceeds as described in the general description. Note that either rotary dial or DTMF pushbutton telephones can be used if the trunk interfaces are equipped for DTMF/DIAL operation.

OTHER INTERFACES

Refer to the Installation section of the Maintenance Manual when custom trunk installations are required.

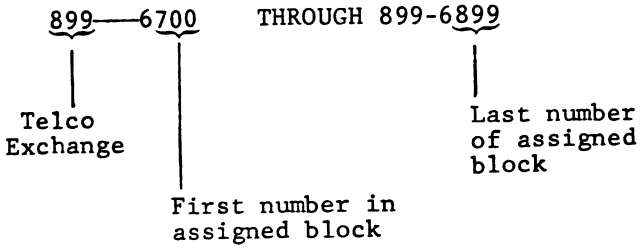
PARAMETERS AND DEFINITIONS

Mapping

Normally the 3 digit number entered by the user is the same as the physical memory

location in which the pager code resides. Locations range from 0-249 or 0-499 with the memory expansion. In some instances, particularly for DID interfaces, the user may not be able to obtain telephone numbers in that range. The mapping function allows the user to program the terminal to translate any 100-number block of input numbers to any other 100-number block within the 0-249 (0-499 optional) limit of the subscriber memory. For example, if the local telephone company assigns the user a block of 200 numbers consisting of 700-899, it is necessary to translate this block of 200-numbers to the 0-199 series of subscriber numbers or if the terminal is equipped with the optional memory to any two 100-number blocks from 000 to 500.

A 200-number block is determined from the assigned telephone numbers as follows:

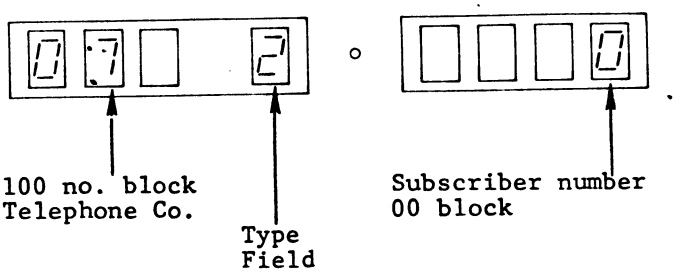


As shown the assigned 200-number block is 700 through 899. The process of translating these numbers to a lower block of subscriber numbers is referred to as input mapping. The input mapping process to translate these numbers to the 000 through 199 location is as follows:

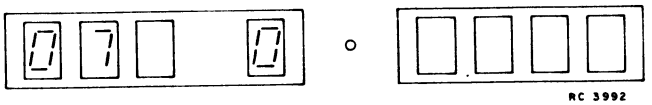
1. Refer to the Configuration Table. Note that the parameters 00 through 09 represent 100-number blocks of input numbers 0-9 respectively. The value programmed in each parameter is the physical memory 100-block to which the input number is mapped.

2. While holding the CONFIGURATION/RESET COUNT switch in the CONFIGURATION position (down) enter 07 using the keyboard, 07 should be displayed in the address field and "2" in the type digit field. (2 was entered as part of standard configuration.) Now enter "0". This digit should be displayed in the right hand digit of the data field. Press LOAD. The data field will blank and the 0 will reappear in the type field. This indicates the terminal has processed the request and is programmed to translate the 700 number input block to the 0-99 subscriber number (physical memory) block.

3. Repeat step 2 for the 800 number block using the following: 0, 8, 1, LOAD. Wait for transfer of digit "1" to type field and then release CONFIGURATION/RESET COUNT switch.



After pressing the LOAD key the following display appears:



Phantoming

When two digit telephone numbers are supplied from the Telephone Co. Central Office, the third (most significant) digit must be phantomed in. Any digit from zero through nine may be used for the phantom digit. The phantom digit is assigned by the terminal user on a per trunk basis. Refer to the Configuration Table for the entry codes.

Interdigit Abandonment Time

The interdigit abandonment is the time the terminal will wait for the user to enter the first (or next) digit. If the user fails to enter digits rapidly enough, the terminal will disconnect or attempt to disconnect the user. The time is programmable from 0 to 45 seconds in five-second increments and is factory preset to ten seconds.

Camp-On-Ringing

The camp-on-ringing interval is the interval the terminal will keep the user on a trunk waiting for a voice interval. If the voice interval has not begun when the camp on ringing interval elapses, the terminal will disconnect or attempt to disconnect the user. Camp-on-ringing time is programmable from 0 to 90 seconds in 10-second increments and is factory preset to 40 seconds.

Chain Dialing

The chain dial flag will allow a person calling in on an End-to-End line or a DCK line to page more than one pager without redialing, if this option is enabled (enabled if digit other than 'Ø' is in location 18). After the user has received an acknowledge tone (if tone only) or after completion of the voice interval, dial tone will be returned to the caller. The caller can then enter a new page. The terminal will drop the caller only if there is no input for the duration of the interdigit timeout.

SYSTEM ERROR MESSAGES

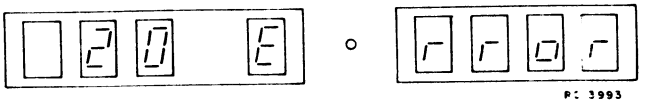
Critical system parameters are monitored by the terminal error detection circuitry to alert the user to an equipment malfunction. Should an "Error" message be displayed, (optional alarm indicator and relay will operate) check the type of error and take appropriate action. If errors 20-21 are displayed, the affected subscriber memory contents may not be valid and should be checked. If error 22 is displayed, the standard Configuration Table has been restored and any non-standard parameters must be reentered after the problem is corrected. It is not unusual for errors 20-22 to be displayed when the terminal is turned on for the first time.

It is possible that errors 10 and 40-47 may occur infrequently because of power glitches. It is also possible that errors 20 and 21 will occur if power is removed at the instant a call counter is being updated. If this occurs the contents of the call counter may be incorrect.

If any other errors occur or if the above errors occur frequently, the terminal should be serviced.

Some system parameters are monitored continuously while others are monitored only when the equipment is first turned on. Those that are monitored only at equipment turn on are tone test and RAM test. These messages are 10, 71 thru 73 and 81 thru 83. All other parameters that may cause an Error message are monitored continuously.

If a system error is detected, a two digit error code is displayed in the address field, the letter "E" in the type field and "rror" in the data field as shown below. Record the error message and have the malfunction corrected.



Equipment Error Message (Typical)

The CLEAR key may be pressed to clear the error message and the alarm output. A description of the error messages and their associated error code is given in Figure 6.

ERROR CODE	DESCRIPTION
10	RAM test error.
20	Check Sum error in low subscriber memory. (0-249)
21	Check Sum error in high subscriber memory. (250-499)
22	Check Sum error in configuration memory.
40	CRC error in PROM 0.
41	CRC error in PROM 1.
42	CRC error in PROM 2.
43	CRC error in PROM 3.
44	CRC error in PROM 4.
45	CRC error in PROM 5.
46	CRC error in PROM 6.
47	CRC error in PROM 7.
51	No programming plug in input register card 1.

ERROR CODE	DESCRIPTION
52	No programming plug in input register card 2.
60	Transmit verify error, transmitter does not key.
61	Transmit verify error, transmitter does not release.
71	Tone test correct second pass, failed first pass.
72	Tone test correct third pass, failed first two passes.
73	Tone test failed all three passes.
81	Same as error message "71" plus RAM error "10".
82	Same as error message "72" plus RAM error "10".
83	Same as error message "73" plus RAM error "10".

Figure 6 - Error Code Identification

TONE CODE CONVERSION

The following conversion tables must be used to convert pager tone codes (except six-tone pagers) to a tone code acceptable to the GE-MARC 500 Paging Terminal. General Electric Type 99 pagers use a four digit number to indicate the frequency while Motorola pagers use either a three or four digit number. In general the first one or two digits of the code determine the tone groups of the two tones, while the last two digits determine the tone within the group for the first and second tone respectively.

The GE-MARC 500 Paging Terminal requires a four digit number consisting of two two-digit tone numbers. The first two-digit number describes the first tone and the second two digits describe the second tone.

Refer to the applicable conversion table when entering tone data.

GE TYPE 99 PAGERS

The first two digits of the pager code determine the tone groups of the two tones, while the third and fourth digits determine the tones within the groups. Note that GE-MARC 500 tone groups 7, 8, and 9 correspond to Type 99 groups A, B, and C respectively, as referred to in other publications.

Given a code, refer to Table 2 and select the GE-MARC 500 tone code corresponding to the format and first numeric digit of the pager code. Substitute the second numeric digit for x and the third numeric digit for y. For GE-MARC 500 codes with the first two digits identical to the second two digits, substitute 09 (diagonal tone) for the first two digits.

EX: (1) Pager Code X-375
From Table 1: 7x8y
GE-MARC 500 code: 7785

(2) Pager Code: X-233
From Table 1: 8x8x
Converted code: 8383 (note identical first and second tone)
GE-MARC 500 code: 0983 (diagonal tone substituted)

FORMAT	X	Y	Z $\frac{64}{400}$	Z $\frac{16}{100}$
1st DIGIT				
0	7x7y	8x8y	7x7y	9x9y
1	8x7y	9x8y	9x7y	
2	8x8y	9x9y	9x9y	
3	7x8y	8x9y	7x9y	
4	9x9y			
5	9x7y			
6	9x8y			
7	7x9y			
8	8x9y			

NOTE: x = second numeric digit of pager code
y = third numeric digit of pager code

Table 2 - GE Type 99 Tone Code Plan

MOTOROLA CODING SCHEMES - WHERE COMPATABILITY IS NECESSARY

When encoding tones for Motorola pagers refer to the "Index of Encoding Methods" to determine the method used and then to the related instruction on how to determine the tone code to be entered in the terminal.

NOTE

See data file bulletin 5000-3A for code plan recommendations and group call coding.

PAGER CODE TYPE	ENCODING METHOD USED
Three-digit code (703)	General Encoding Method
Three-digit code where the second and third digits are the same (455)	General Alternate Pager Encoding Method
Three-digit code with a letter prefix (B403) or four-digit code (1036)	High Capacity Encoding Method
Three-digit code with or without a letter prefix and another three digit code where the second and third digits are the same (R336/266)	Group Call Encoding Method

Table 3 - Index of Encoding Methods, For Compatability With Motorola Pagers

General Encoding Method

Given a code, use Table 4 and the first digit of the pager code to determine the GE-MARC 500 code by substituting the second digit of the pager code for x and the third digit for y.

EX: Pager code: 703
From Table 4: 4x5y
GE-MARC 500 code: 4053

FIRST DIGIT OF PAGER CODE	GE-MARC 500 TONE CODE
1	1x1y
2	2x2y
3	1x2y
4	4x4y
5	5x5y
6	2x1y
7	4x5y
8	5x4y
9	2x4y
0	4x2y
A	3x3y

NOTE: x = second digit of pager code
y - third digit of pager code

Table 4 - General Encoding Plan, Motorola Compatible

General Alternate Pager Encoding Method

The first digit selects the first tone code and the tone group from which the second tone is selected. See Table 5. The second digit of the pager code is the second digit of the second tone.

EX: Pager code: 455
From Table 5: 354y
GE-MARC 500 code is: 3545

FIRST DIGIT OF ALTERNATE PAGING CODE	GE-MARC 500 CODE
1	351y
2	352y
3	362y
4	354y
5	355y
6	361y
7	365y
8	364y

NOTE: y = second digit of pager code

Table 5 - General Alternate Pager Code Plan

High Capacity Encoding Method

For 4-digit codes, conversion is similar.

Find the GE-MARC 500 code in Table 6 that corresponds to the first two digits of the pager code. Then substitute the third digit of the pager code for x and the fourth digit of the pager code for y. Motorola code type "y" is not implemented.

EX: Pager code: B403
From Table 6: 1x2y
GE-MARC 500 code is: 1023

EX: Pager code: 1036
From Table 6: 4x2y
GE-MARC 500 code is: 4326

Group Call Encoding Method

The first 3 or 4 digit code is encoded as described above and is the pager individual call code. The first two digits of the second code are the group call tone number of the pager and must be the same as the individual call second tone. Program the individual call subscriber number as described under the General Encoding and High Capacity Encoding Methods. Program the GE-MARC 500 second tone code as both the first and second tone of the group call subscriber number. This causes the GE-MARC 500 to transmit the programmed tone for nine seconds when the subscriber number is paged.

EX: Pager code: R336/266
From Table 4: 4x2y
Individual GE-MARC 500 code: 4326
Group call GE-MARC 500 code: 2626

OTHER CODING SCHEMES

Other coding schemes may be used by pager vendors to describe their paging tones, so a Table of GE-MARC 500 frequencies and associated tone codes is included as Table 7.

Columns 1 and 2 are commonly used vendor Tone Group and tone number designations. Column 3 is the GE-MARC 500 tone code and column 4 is the GE-MARC 500 tone frequency.

SECOND DIGIT	FIRST DIGIT																						
	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	1	2	3	4
0																					4x2y	6x6y		6x1y
1	1x1y	1x1y	1x1y	1x1y	1x1y	1x1y	1x1y	1x1y	1x1y	1x1y	2x3y	2x3y	2x3y	2x4y	2x4y	2x5y	3x4y	3x4y	3x5y	4x6y	1x1y	1x5y	1x3y	6x2y
2	2x2y	2x2y	2x2y	2x2y	1x3y	1x3y	1x3y	1x4y	1x4y	1x5y	2x2y	2x2y	2x2y	2x2y	2x2y	2x2y	4x3y	4x3y	5x3y	6x4y	2x2y	5x1y	3x1y	6x3y
3	3x3y	1x2y	1x2y	1x2y	3x3y	3x3y	3x3y	4x1y	4x1y	5x1y	3x3y	3x3y	3x3y	4x2y	4x2y	5x2y	3x3y	3x3y	3x3y	5x6y	1x2y	1x4y	2x3y	6x4y
4	1x2y	4x4y	1x5y	2x1y	4x4y	3x1y	3x1y	4x4y	4x4y	1x6y	4x4y	3x2y	3x2y	4x4y	4x4y	2x6y	4x4y	4x4y	3x6y	4x4y	4x4y	4x1y	3x2y	6x5y
5	1x3y	1x4y	5x5y	1x6y	3x1y	5x5y	1x6y	5x5y	1x6y	5x5y	3x2y	5x5y	2x6y	5x5y	2x6y	5x5y	5x5y	3x6y	5x5y	5x5y	5x5y	2x5y	3x4y	1x6y
6	2x1y	2x1y	2x1y	6x6y	1x4y	1x5y	6x6y	1x5y	6x6y	6x6y	2x4y	2x5y	6x6y	2x5y	6x6y	6x6y	3x5y	6x6y	6x6y	6x6y	2x1y	5x2y	4x3y	2x6y
7	3x1y	4x1y	5x1y	6x1y	4x1y	5x1y	6x1y	4x5y	6x1y	6x1y	4x2y	5x2y	6x2y	4x5y	6x2y	6x2y	4x5y	6x3y	6x3y	4x5y	4x5y		3x5y	3x6y
8	2x3y	2x4y	2x5y	2x6y	3x4y	3x5y	3x6y	5x4y	4x6y	5x6y	3x4y	3x5y	3x6y	5x4y	4x6y	5x6y	5x4y	4x6y	5x6y	5x4y	5x4y		5x3y	4x6y
9	3x2y	4x2y	5x2y	6x2y	4x3y	5x3y	6x3y	5x1y	6x4y	6x5y	4x3y	5x3y	6x3y	5x2y	6x4y	6x5y	5x3y	6x4y	6x5y	6x5y	2x4y		3x3y	5x6y

NOTE: x = third digit of pager code
y = fourth digit of pager code

Table 6 - Four Digit Encoding Plan, Motorola Compatible

TONE GROUP	TONE NUMBER	GE-MARC 500 CODE	FREQUENCY (Hz)
1	0	10	330.5
	1	11	349.0
	2	12	368.5
	3	13	389.0
	4	14	410.8
	5	15	433.7
	6	16	457.9
	7	17	483.5
	8	18	510.5
	9	19	539.0
2	0	20	569.1
	1	21	600.9
	2	22	634.5
	3	23	669.9
	4	24	707.3
	5	25	746.8
	6	26	788.5
	7	27	832.5
	8	28	879.0
	9	29	928.1
3	0	30	1092.4
	1	31	288.5
	2	32	296.5
	3	33	304.7
	4	34	313.0
	5	35	953.7
	6	36	979.9
	7	37	1006.9
	8	38	1034.7
	9	39	1063.2
4	0	40	321.7
	1	41	339.6
	2	42	358.6
	3	43	378.6
	4	44	399.8
	5	45	422.1
	6	46	445.7
	7	47	470.5
	8	48	496.8
	9	49	524.6

TONE GROUP	TONE NUMBER	GE-MARC 500 CODE	FREQUENCY (Hz)
5	0	50	553.9
	1	51	584.8
	2	52	617.4
	3	53	651.9
	4	54	688.3
	5	55	726.8
	6	56	767.4
	7	57	810.2
	8	58	855.5
	9	59	903.2
6	0	60	1122.5
	1	61	1153.4
	2	62	1185.2
	3	63	1217.8
	4	64	1251.4
	5	65	1285.8
	6	66	1321.2
	7	67	1357.6
	8	68	1395.0
	9	69	1433.4
A (7)	0	70	682.5
	1	71	592.5
	2	72	757.5
	3	73	802.5
	4	74	847.5
	5	75	892.5
	6	76	937.5
	7	77	547.5
	8	78	727.5
	9	79	637.5
B (8)	0	80	652.5
	1	81	607.5
	2	82	787.5
	3	83	832.5
	4	84	877.5
	5	85	922.5
	6	86	967.5
	7	87	517.5
	8	88	562.5
	9	89	697.5

Table 7 - GE-MARC 500 Two-Tone Code to Tone Frequency Conversion

Table 7 - Continued

TONE GROUP	TONE NUMBER	GE-MARC 500 CODE	FREQUENCY (Hz)
C	0	90	667.5
(9)	1	91	712.5
↓	2	92	772.5
	3	93	817.5
	4	94	862.5
	5	95	907.5
	6	96	952.5
	7	97	532.5
	8	98	577.5
	9	99	622.5
Diagonal Tone		09	742.5

TONE NUMBER	GE-MARC 500 CODE	FREQ. (Hz)
0	0	600
1	1	741
2	2	882
3	3	1023
4	4	1164
5	5	1305
6	6	1446
7	7	1587
8	8	1728
9	9	1869
R	*	459

* inserted automatically by GE-MARC 500

Table 8 - GE-MARC 500 6 Tone Code to Frequency Conversion

Address	Type	Data	Notes	Address	Type	Data	Notes
000				033			
001				034			
002				035			
003				036			
004				037			
005				038			
006				039			
007				040			
008				041			
009				042			
010				043			
011				044			
012				045			
013				046			
014				047			
015				048			
016				049			
017				050			
018				051			
019				052			
020				053			
021				054			
022				055			
023				056			
024				057			
025				058			
026				059			
027				060			
028				061			
029				062			
030				063			
031				064			
032				065			

Figure 7 - Pager Tone Code and Priority Assignments