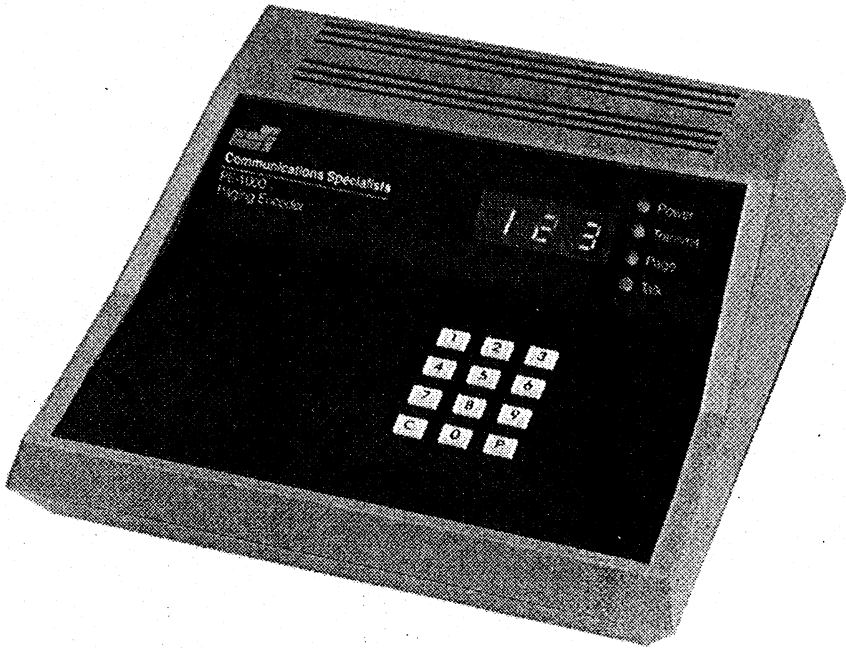


COMMUNICATIONS SPECIALISTS MODEL PE-1000 PAGING ENCODER



COMMUNICATIONS SPECIALISTS, INC.

426 WEST TAFT AVENUE • ORANGE, CA 92865-4296

(714) 998-3021 • FAX (714) 974-3420

Entire U.S.A. (800) 854-0547 • FAX (800) 850-0547

<http://www.com-spec.com>

TABLE OF CONTENTS

DESCRIPTION	PAGE
Features	2
Specifications	3
Introduction	4
Operating Instructions	5
Installation Procedure	7
Programming Sequence	9
Main Board Schematic Diagram	14-15
Programming Supplement for 5-Tone	17
Programming Supplement for REACH*	20
Theory of Operation	22
Block Diagram	24
Display Schematic Diagram	25
Board Layout	26
Parts List	27
Warranty	29

FEATURES

- 100 or 1000 call paging capacity.
- All features are field programmable and included in every unit.
- Non-volatile memory retains programming if power loss occurs.
- Desk top model, measures 7.5" x 7.8" x 2.7"
- Three digit high visibility LED display.
- LED indicators for power, transmit, page cycle, and ready to talk.
- All operating functions entered on front panel keyboard.
- Powered by 120VAC, 50-60 Hz, or 11 to 16 VDC.
- Microprocessor derived paging tones insure stability and high accuracy.
- Automatic PTT and microphone muting.
- Separate keypad button to start paging cycle.
- Single key repage of previous entry.
- Clear key to terminate improperly entered page codes.
- Record of paging activity can be continuously recorded on external serial printer.
- All connections to encoder made through terminal block.
- All standard tone groups from 250.0 Hz to 4000.0 Hz are included.
- Continuous test tone to set transmitter deviation is built-in.
- Self test on power up.
- Automatically reverts to standby mode when not in use.
- Full 1 year warranty when returned to the factory for repair.
- One day delivery.

SPECIFICATIONS

Paging Capacity	1000 calls.
Signalling Formats	Two-tone sequential including GE type 99, Quick Call II, & 1 + 1. (REACH* and 5-tone Sequential PROMS are available at a slight additional cost). Consult factory for other available formats.
Frequency Range	250.0 Hz to 4000.0 Hz.
Frequency Accuracy	Better than .1% below 1000 Hz. .2% above 1000 Hz.
Frequency Stability	Crystal controlled, less than .1 Hz drift.
Frequency Response	Flat or de-emphasized at -6db/oct within .5db.
Output	0 to 4V peak to peak, sinewave.
Output Impedance	5.0K Ohms.
Output Distortion	1% THD.
Output Noise	Down more than 55 db.
Printer Port	TTL output. 300 baud, 1 start bit, 2 stop bits.
Power Requirements	120VAC @ 50-60 Hz. (wall transformer included) or 11-16VDC unregulated @ 500 ma.
Power Consumption	5 Watts.
Operating Temperature	-20°C to +55°C.
Operating Controls	a) 12 button keyboard with page and clear keys. b) 3 digit LED display. c) Power on LED. d) Transmitter keyed LED. e) Page LED, indicates tone transmission. f) Talk LED, indicates PE-1000 is ready for voice message.
Weight	1.3 Lbs.
Control Outputs	Relay contact pull to ground or supply.

INTRODUCTION

The Communications Specialists Model PE-1000 is a desk top paging encoder for use in the land mobile radio signalling industry. The microprocessor based unit can be used for signalling base stations, mobiles, portables and pocket pagers which utilize tone decoders for selective signalling. The PE-1000 is compatible with most two tone sequential paging formats. The flexible design allows the PE-1000 to be used with other paging formats as well. Because of the inherent flexibility, the PE-1000 can be re-programmed to include additional paging formats as they are developed in the future. Microprocessor derived paging tones insure stability and high accuracy.

The use of a non-volatile EEPROM chip allows the user to field configure the PE-1000 to suit the particular needs of the system. This includes the tone groups used, the timing parameters of the paging tones and the group call feature. All programming is accomplished from the front panel keyboard, and can be changed at any time. The PE-1000 is also equipped with a Serial Printer Output which can be connected to the printer option for a hard copy record of the pager codes that have been processed by the encoder. This allows the user to monitor and keep track of the number of calls accumulated.

The PE-1000 comes standard with an easy to use front panel keyboard, a high visibility LED display for pager code readout, automatic PTT keying and microphone muting, and a 1 year factory warranty. All units are burned in and factory tested to insure reliable and dependable operation. State of the art electronics provides superior performance at a substantial cost reduction.

OPERATING INSTRUCTIONS

This section describes how to operate the Communications Specialists Model PE-1000 Paging Encoder. The PE-1000 has an easy to use keyboard with a high visibility red LED display for pager code verification. Additional enunciators display the encoder's current operating mode.

When the PE-1000 is first powered up, the LEDs will display all zeros (000). If the display comes up with any other numbers, please contact your point of sale for information. The PE-1000 should now be custom programmed to your paging system needs by referring to the PROGRAMMING SECTION. If this has already been done, then the PE-1000 is ready for operation.

FRONT PANEL

The front panel keyboard is used for entering the pager code that is to be signalled. When the pager code is entered, the pager code number is displayed on the LED display. When all the pager code numbers have been entered, the PE-1000 will automatically send the page (if the automatic page is enabled), or it will be then necessary to press the PAGE key to initiate the page cycle.

During the page cycle, the TRANSMIT indicator will illuminate showing that the transmitter is keyed. Shortly afterwards the PAGE indicator will illuminate showing that the pager tones are currently being transmitted. When the pager tones have been sent, the PAGE indicator will turn off and the TALK indicator will illuminate for 1 second. If a voice message is required, this LED will cue the operator to begin the voice message. The operator should use the local PTT on the microphone to key the base station transmitter since the PE-1000 will unkey the transmitter after the pager tones have been sent. The page cycle can be terminated at any time by pressing the CLEAR key on the keyboard. The CLEAR key can also be used to clear a pager code that has been improperly entered. When the TALK LED turns off, the PE-1000 is ready for another page sequence. The previous pager number can be re-paged by pressing the PAGE key again, or a new pager number may be entered.

Please note that when the page cycle has started, the PE-1000 keyboard is disabled for the duration of the page. The only exception to this, is the CLEAR key, which is always active. Also, the PE-1000 will not respond to an improperly entered pager number. If insufficient digits are entered, the PAGE key will not respond, and the PE-1000 will wait until all digits have been entered.

A record of the pager code numbers sent during the day can be recorded by using the PRINTER OPTION connected to the PE-1000. When each pager code number is transmitted, the PE-1000 will send the data to the printer and a hard copy printout will be available. This option is activated by connecting the printer to the PE-1000 and applying power to it.

STAND-BY MODE

The STAND-BY MODE is a power savings feature of the PE-1000. If the PE-1000 has not been used for a period to exceed 1/2 hour, the PE-1000 will shut off the LED display and go into the STAND-BY MODE. The PE-1000 is activated again by pressing any key on the front panel. During the STAND-BY MODE, the POWER indicator remains on to indicate that power is applied to the PE-1000.

SUMMARY OF OPERATION

1. Apply power to the PE-1000.
2. Custom program the PE-1000 as described in the PROGRAMMING SECTION, if necessary.
3. Enter the pager code number on the keyboard.
4. If Automatic Page is not enabled, press the PAGE key.
5. The page cycle is now in progress.
6. When the TALK LED illuminates, start the voice message if required.
7. When the TALK LED turns off, the PE-1000 is ready for another page.

INSTALLATION

This section describes how to interface the PE-1000 Paging Encoder to a transmitter. All connections are made to the 10 position terminal block, TB-1 inside the unit. Use shielded wire for all audio signals. After all connections are completed, proceed to JUMPER CONFIGURATIONS and then to ALIGNMENT PROCEDURE. Installation should be done by a qualified technician.

Open the PE-1000 enclosure by first removing the 4 screws on the bottom of the unit. The circuit board has to be removed by first removing the 3 mounting screws from the top cover ONLY if the configuration jumpers need to be changed. All other adjustments can be made from the solder side of the circuit board through the adjustment holes without removing the circuit board.

INSTALLATION PROCEDURE

Pin Number	Description
1	DC POWER +V — Connect continuous +11.0vdc to +16.0vdc to this pin. Use the wall power supply included. The positive line on the power supply has the white stripe. External DC power from the base station power supply can also be used if available.
2	DC POWER GROUND — Use this pin as the DC return for the power supply ground line. This is the other black wire from the wall power supply, or a ground wire from the base station DC power supply.
3	PTT OUTPUT — Connect this pin to the transmitter's main PTT line. This pin normally keys to ground for transmit when the transmit LED illuminates on the PE-1000 front panel. If +V (+12vdc) is required to key the transmitter, then move jumper JP-1A to JP-1B. JP-1 is located near the PTT Relay.
4	MIC INPUT — Connect the base station microphone audio line to this pin. This will route the mic audio through the PE-1000 and back out on pin 6. This will switch the mic out of the circuit when the PE-1000 is in the page cycle.
5	GROUND — Use this pin as a ground for all audio lines and use it as the main ground line back to the transmitter. Note that pins 2, 5 and 10 are common.
6	TX AUDIO — Connect this pin using shielded cable to the audio or microphone input on the paging transmitter. Under normal conditions, the mic audio will be routed through the PE-1000 and will come out on this pin. During the page sequence, the mic will be switched out of the circuit, and the PE-1000 output will be switched into the circuit. This will eliminate any loading effects.
7	RX AUDIO INPUT — Not used in PE-1000
8	RX AUDIO INPUT — Not used in PE-1000

- 9 **PRINTER OUTPUT** — This output can be used to keep a record of all paging activity that accumulates. The Printer Output sends data to the printer each time a page is processed. Connect this pin to the serial input line on the printer, pin 4. Use Radio Shack Model TP-10 (26-1261).
- 10 **GROUND** — Use this pin as a common ground line to the printer, pin 3.

JUMPER CONFIGURATIONS

JP1 — PTT POLARITY

See the **INSTALLATION PROCEDURE**, pin #3.

JP2 — DTMF JUMPER

This jumper is not used in the PE-1000

JP3 — AUDIO DE-EMPHASIS

The PE-1000 normally provides a flat tone output (JP3 OUT). This is to provide the proper interface levels to a typical FM transmitter. If the transmitter used has a pre-emphasis circuit, then add JP3 to provide a de-emphasized tone output which rolls off at -6db/oct (JP3 IN). The output of the transmitter as viewed on a service monitor should be flat to within 1 Khz. deviation across the range.

ALIGNMENT

Hold down the **PAGE** key, and apply power to the PE-1000. When the **PAGE** key is held down during power up, the PE-1000 will go into the **PROGRAM MODE**. This is confirmed by dashes (- - -) across the LED display.

Now press the the digit "2" and then the **PAGE (ENTER)** key and the PE-1000 will go into the transmit mode, and generate a 600 hz. audio tone into the transmitter. Now adjust R7 for 3.0 Khz. to 4.0 Khz deviation as seen on a service monitor set to the transmitter's RF frequency. When the adjustment is complete, press the **CLEAR** key to unkey the transmitter and reset the PE-1000.

If you should encounter any problems in making this adjustment, it may be because of an impedance mismatch. This can be corrected by inserting a 100K resistor in the place of R8, near the PTT relay, and then re-adjusting R7.

This completes the alignment procedure. The PE-1000 enclosure can now be re-assembled. Now proceed to the **PROGRAMMING SECTION** for programming the paging system operating parameters.

PROGRAMMING

This section explains how to program the Communications Specialists Model PE-1000 Paging Encoder. The PE-1000 is a very flexible device, and permits the user to take advantage of modern state of the art non-volatile memory chips. This allows the user to configure the paging system parameters for optimum performance.

The programmable features of the PE-1000 encoder include the following items:

1. The duration of the pre-transmit delay
2. The duration of the paging tones
3. The duration of the Inter-tone delay (if any)
4. The Group Call or diagonal tone feature
5. The Automatic Page feature
6. The call capacity
7. Talk cycle queing
8. Alert Tones
9. Code Plan selection
10. Tone Group selection (100 call only)
11. Duration of Group Call

The duration for each of the different timing parameters can be programmed in increments of one millisecond (1 ms.). Therefore, when programming a time duration, take the time delay in milliseconds, and enter that number on the keyboard during the Programming Sequence. *Use the PAGE key as the ENTER key for programming operations.* A particular parameter can be bypassed without changing the currently programmed value by pressing the ENTER key when the parameter number is displayed.

The PE-1000 is programmed with a number of "default" values which can be used if desired. The "default" value is whatever value was last programmed in the PE-1000. If the "default" value is changed, it is recommended that the new values be written in the manual next to the DEFAULT values shown below. Use the CLEAR key to exit the programming mode at any time. Please note that since the PE-1000 has 3 display digits, some of the data entered may shift left off the display.

ACCESSING THE PROGRAM MODE

To enter the program mode, hold down the PAGE key (now called the ENTER key), and apply power to the PE-1000. The PE-1000 will now show dashes across the display. Press the digit "1" followed by the ENTER key, and the PE-1000 is ready to start the programming sequence. All user input to the keyboard is shown in BOLD print.

TWO TONE SEQUENTIAL FORMAT

The following section is for the standard 2-tone sequential format. Please refer to the appropriate insert for other formats.

PARAMETER PROGRAMMING SEQUENCE

PARAMETER — 01 AUTOMATIC PAGE DEFAULT = OFF

The LED display now shows which parameter is to be programmed (-01). Automatic page allows the user to enter the pager code number without pressing

the PAGE key to start the page sequence. Thus, to send a page, the user will enter the pager code number and the PE-1000 will automatically start the page sequence. The PAGE key can be used to re-page a number which is already in the LED display. If automatic page is not desired, then the PAGE key will have to be pressed to start any page sequence. Use the following numbers to program this parameter:

0 ENTER	Automatic page off
1 ENTER	Automatic page on
ENTER	Use default value

PARAMETER — 02 TALK CYCLE DEFAULT = ON

The LED display now shows (-02) for parameter 2. This parameter is used for programming the TALK CYCLE. The TALK CYCLE is used for queing the user that a voice message may be given when the TALK LED illuminates. This LED stays on for approximately 1 second and then resets. If the paging system uses tone only pagers, then the TALK CYCLE can be turned off. Press the following keys to program this parameter:

0 ENTER	Talk cycle off
1 ENTER	Talk cycle on
ENTER	Use default value

PARAMETER — 03 PAGING CAPACITY DEFAULT = 100 CALL

The LED display now shows (-03) for parameter 3. This parameter programs the paging capacity of the PE-1000. Two choices are available. These are 100 call, or 1000 call. Thus, for 100 call capacity, 2 digits are required for the pager code number, and 3 digits are required for the 1000 call capacity encoder. Use the following keys to program this parameter:

0 ENTER	100 call capacity
1 ENTER	1000 call capacity
ENTER	Use default value

PARAMETER — 04 ALERT TONES DEFAULT = NONE

This parameter programs any ALERT TONES that may be desired for alerting the person carrying the pager. The ALERT TONES are sent after the paging tones have been completed. The following alert tones are available for programming:

0 ENTER	No alert tones
1 ENTER	5 beeps
2 ENTER	Warble tone
ENTER	Use default value

PARAMETER — 05 PRE-TRANSMIT DELAY DEFAULT = .5 SEC.

This parameter keys the transmitter and waits for a programmed amount of time before the paging tones are sent. This is to allow the transmitter to come up to full power and stabilize before the paging tones are sent. The value of 0.5 seconds is recommended for most applications. Enter the delay time in milliseconds, and then press the ENTER key.

EXAMPLE:

250 ENTER	Programs the delay time for 250 ms.
ENTER	Uses default value.

PARAMETER — 07 CODE PLAN
SELECTION

DEFAULT = 00

This parameter sets the CODE PLAN used for paging. Refer to Table A, on page 13. Enter the two digit number from the top of CODE PLAN TABLE A that corresponds to the plan desired. 100 call encoders will use CODE PLAN A (00).

EXAMPLE:

01 ENTER This value will program the PE-1000 to use CODE
PLAN B from Table A.
ENTER Use default code plan

PARAMETER — 08 TONE GROUP
SELECTION

DEFAULT = GROUP 2 (2)

This parameter is only used with 100 call capacity encoders. First determine which group (1, 2, 3, 4, 5, 6, A, A', B', C') you want to use from the top of TABLE B. Enter one of the following 10 numbers on the keyboard followed by the ENTER key. If you want group 1, enter the number 1. If you want group 2, 3, 4, 5, or 6, just enter that number. If you want group A, enter 0. If you want A', enter 7. If you want B', enter 8. If you want C', enter 9.

EXAMPLE:

4 ENTER This will program the PE-1000 to group 4.
ENTER Use default tone group.

PARAMETER — 09 TONE A DURATION

DEFAULT = 1 SEC.

This parameter is used for programming the duration of the first tone sent in the 2 tone sequential format. Enter in the time duration of the first tone in milliseconds, then press the ENTER key.

EXAMPLE:

500 ENTER Sets the duration of tone A to .5 seconds.
ENTER Uses last programmed value for default.

PARAMETER — 10 INTERTONE DURATION

DEFAULT = 250 MS.

This parameter programs the delay between the first tone and the second tone in the 2 tone sequential format. Enter in the delay time in milliseconds.

EXAMPLE:

0 ENTER Sets the delay time to zero (0).
ENTER Use default value.

PARAMETER — 11 DURATION OF TONE B

DEFAULT = 3.0 SEC.

This parameter programs the duration of the second tone (tone B). Enter in the delay in milliseconds.

EXAMPLE:

1000 ENTER Sets the duration of tone B to 1.0 second.
ENTER Use default value.

PARAMETER — 12 GROUP CALL OPTION DEFAULT = ON

This parameter programs the group call option. Group call is used for alerting multiple pagers all at the same time. Enter in the following data to program GROUP CALL:

EXAMPLE:

0 ENTER	Group call is disabled and the diagonal tone is used for group call numbers.
1 ENTER	Group call is enabled.
ENTER	Use default value.

**PARAMETER — 13 GROUP CALL DEFAULT = 8 SEC.
DURATION**

This parameter is used only if group call is enabled in parameter — 12. To program in the group call duration, enter in the time in milliseconds.

EXAMPLE:

5000 ENTER	The group call duration will be 5.0 seconds.
ENTER	Use the default value.

This completes the programming sequence for the 2 tone sequential paging format. To exit the program mode, press the CLEAR key, and the PE-1000 is now ready to accept pager code numbers. Please note that the new parameters just programmed in the PE-1000 are stored in a non-volatile memory chip, and will remain there until new programming data is entered by repeating the programming sequence. These new parameters now become the default values.

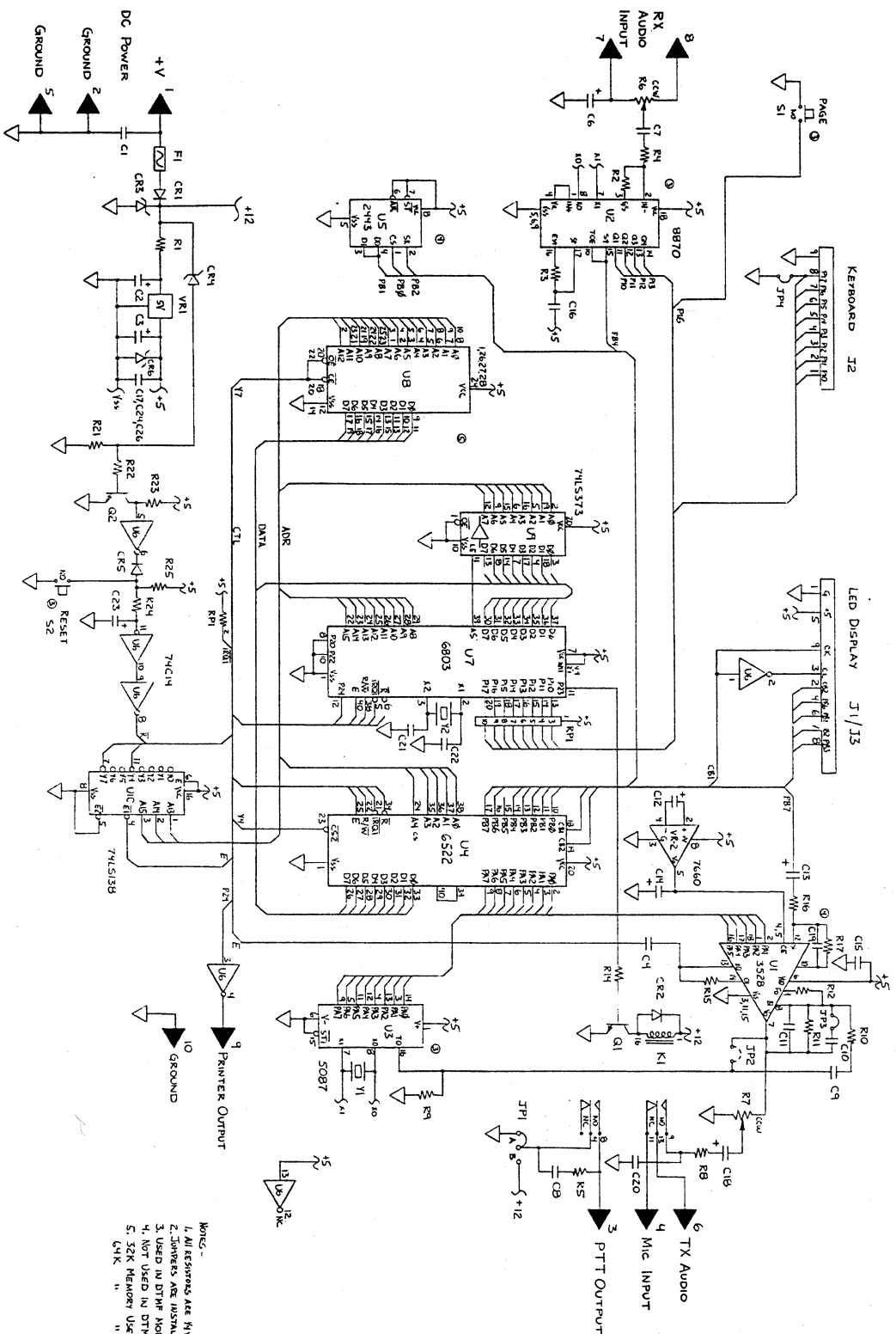
**TABLE A
CODE PLAN TABLE**

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22																								
CODE PLAN	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	Y	GE																								
LEADING DIGIT	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b																							
0	A	A	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	A	A	A ¹	A ¹														
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	2	3	2	3	2	4	2	4	2	5	3	4	3	4	3	5	4	6	A	A	B ¹	A ¹							
2	2	2	2	2	2	2	2	2	1	3	1	3	1	3	1	4	1	4	1	4	1	5	1	5	2	2	2	2	2	2	2	2	2	2	2	4	3	4	3	5	3	6	4	B	B	B ¹	B ¹
3	3	3	3	3	1	2	1	2	1	2	3	3	3	3	3	3	3	4	1	4	1	5	1	3	3	3	3	3	3	4	2	4	2	5	2	3	3	3	3	3	3	5	6	Z	Z	A ¹	B ¹
4	4	4	1	2	4	4	1	5	2	1	4	4	3	1	3	1	4	4	4	4	1	6	4	4	3	2	3	2	4	4	4	4	2	6	4	4	4	4	3	6	4	4	A	B	C ¹	C ¹	
5	5	5	1	3	1	4	5	5	1	6	3	1	5	5	1	6	5	5	3	2	5	5	2	6	5	5	2	6	5	5	5	3	6	5	5	5	5	5	5	A	Z	C ¹	A ¹				
6	6	6	2	1	2	1	2	1	6	6	1	4	1	5	6	6	1	5	6	6	6	6	2	4	2	5	6	6	2	5	6	6	6	6	6	6	6	6	6	6	6	B	A	C ¹	B ¹		
7	A ¹	A ¹	3	1	4	1	5	1	6	1	4	1	5	1	6	1	4	2	5	2	6	2	4	5	6	2	6	2	4	5	6	3	6	3	6	3	4	5	Z	A	A ¹	C ¹					
8	B ¹	B ¹	2	3	2	4	2	5	2	6	3	4	3	5	3	6	5	4	4	6	5	6	3	4	3	5	3	6	5	4	4	6	5	6	5	4	6	5	6	5	4	B	Z	B ¹	C ¹		
9	C ¹	C ¹	3	2	4	2	5	2	6	2	4	3	5	3	6	3	5	1	6	4	6	5	4	3	5	3	6	3	5	2	6	4	6	5	5	3	6	4	6	5	6	5	Z	B	B ¹	C ¹	

Table A identifies which tone groups are used in each of the various CODE PLANS available. The "ab" indicates which tone groups are used for "Tone A" and "Tone B." Table B lists the tones used in each of the groups. The diagonal tone is substituted for Tone A when the group call option is disabled.

**TABLE B
GROUP NUMBER**

TONE#	1	2	3	4	5	6	A	B	Z	A ¹	B ¹	C ¹
0	330.5Hz	569.1Hz	1092.4Hz	321.7Hz	553.9Hz	1122.5Hz	358.9Hz	371.5Hz	346.7Hz	682.5Hz	652.5Hz	667.5Hz
1	349.0Hz	600.9Hz	288.5Hz	339.6Hz	584.8Hz	1153.4Hz	398.1Hz	412.1Hz	384.6Hz	592.5Hz	607.5Hz	712.5Hz
2	368.5Hz	634.5Hz	296.5Hz	358.6Hz	617.4Hz	1185.2Hz	441.6Hz	457.1Hz	426.6Hz	757.5Hz	787.5Hz	772.5Hz
3	389.0Hz	669.9Hz	304.7Hz	378.6Hz	651.9Hz	1217.8Hz	489.8Hz	507.0Hz	473.2Hz	802.5Hz	832.5Hz	817.5Hz
4	410.8Hz	707.3Hz	313.0Hz	399.8Hz	688.3Hz	1251.4Hz	543.3Hz	562.3Hz	524.8Hz	847.5Hz	877.5Hz	862.5Hz
5	433.7Hz	746.8Hz	953.7Hz	422.1Hz	726.8Hz	1285.8Hz	602.6Hz	623.7Hz	582.1Hz	892.5Hz	922.5Hz	907.5Hz
6	457.9Hz	788.5Hz	979.9Hz	445.7Hz	767.4Hz	1321.2Hz	668.3Hz	691.8Hz	645.7Hz	937.5Hz	967.5Hz	952.5Hz
7	483.5Hz	832.5Hz	1006.9Hz	470.5Hz	810.2Hz	1357.6Hz	741.3Hz	767.4Hz	716.1Hz	947.5Hz	977.5Hz	962.5Hz
8	510.5Hz	879.0Hz	1034.7Hz	496.8Hz	855.5Hz	1395.0Hz	822.2Hz	851.1Hz	794.3Hz	977.5Hz	997.5Hz	982.5Hz
9	539.0Hz	928.1Hz	1063.2Hz	524.6Hz	903.2Hz	1433.4Hz	912.0Hz	944.1Hz	881.0Hz	997.5Hz	1017.5Hz	1002.5Hz
DG	569.1Hz	979.9Hz	569.1Hz	569.1Hz	979.9Hz	979.9Hz	569.1Hz	979.9Hz	569.1Hz	742.5Hz	742.5Hz	742.5Hz



- Notes:-
 1. All resistors are 1/4W 5% E.R. RI
 2. Values are in ohms unless shown
 3. Used in other models only
 4. Not used in other models
 5. 5K Memory User Inside Numbers
 6. 47K " " Outside "

**MAIN BOARD
 SCHEMATIC DIAGRAM**

PROGRAMMING SUMMARY

1. Enter the program mode by applying power to the PE-1000 with the PAGE key pressed.
2. Enter in the digit, "1" and then the PAGE key.
3. Parameter -01 will be displayed.
4. Now program in the new data by referring to the following table:

Parameter #	Function
1	Programs the automatic page feature 0 = no 1 = yes
2	Programs the talk cycle 0 = no 1 = yes
3	Programs the call capacity 0 = 100 call 1 = 1000 call
4	Alert tone programming 0 = no alert tone 1 = 5 beeps 2 = warble
5	Pre-transmit delay (ms.)
7	Code plan selection (Enter in 2 digits)
8	Tone group selection (for 100 call only)
9	Duration of tone A (ms.)
10	Intertone delay (ms.)
11	Duration of tone B (ms.)
12	Group call selection 0 = no 1 = yes
13	Duration of Group Call (ms.)

5. Exit the program mode at any time by pressing the CLEAR key.

NOTE: POWER-UP ERROR CODES

5E = Return to default
A1 = EEPROM Bad
A2 = Keyboard Bad

PE-1000 PROGRAMMING SUPPLEMENT FOR 5 TONE SEQUENTIAL ENCODERS

This supplement describes how to program the PE-1000 Paging Encoder for the 5 tone sequential format.

PARAMETER PROGRAMMING SEQUENCE

Enter the program mode and program the parameters numbered 1 thru 5 as described in the PROGRAMMING SECTION (page 9) of the PE-1000 manual. Then refer to the following text for programming the parameters that are specific to the 5 tone sequential format.

The 5 tone sequential format consists of a sequence of 5 tones generated in continuous succession. Each tone is normally 33 milliseconds in duration. The PE-1000 pre-sets the values of the first tone, the second tone, and for 100 call encoders, the third tone, in the following programming sequence. Thus, for 100 call encoders, the operator can change the values of the fourth and fifth tone in the paging format. This produces the 100 codes possible. For 1000 call encoders, the operator can change the values of the third, fourth, and fifth tones. When ordering 5 tone pagers, care must be observed that the Preamble Tone (if used), the first tone, the second tone, and the third tone (for 100 call encoders), all match. For example, the following pager codes are compatible on a 100 call encoder.

1-23456 1-23488 1-23460 1-23411 1-23400

If the Dual Function feature is utilized, then the total paging capacity of the encoder is reduced by 50% since each pager uses two pager codes for the two alert tones. All pagers should have even numbers for the last digit of the pager cap code if the Dual Function feature is used. For example, the following pager code is allowed:

First alert — 1-23456 even
Second alert — 1-23457 odd

PARAMETER — 07 PREAMBLE TONE DEFAULT = OFF

This parameter programs the PE-1000 to send the Preamble Tone which is used with 5 tone pagers which utilize "Battery Saving," or "Power Saving" features. The Preamble is at the beginning of the 5 tone sequence, and consists of a tone with a duration of 673 milliseconds followed by a 65 millisecond "no tone" gap, and then the 5 tone sequence. Program this parameter by entering the following keys:

EXAMPLE:

0 ENTER	Disables the Preamble Tone
1 ENTER	Enables the Preamble Tone
ENTER	Uses the default value

PARAMETER — 08 PREAMBLE TONE DEFAULT = NONE

This parameter sets the tone frequency of the Preamble Tone. If the Preamble Tone was disabled in Parameter — 07, then this Parameter will be skipped. Now enter in the tone number in the left hand column of Table C (page 19) for the frequency desired for the Preamble Tone.

EXAMPLE:

3 ENTER	Programs the Preamble Tone to Tone 3 which is 1023.0 Hz. from the EIA tone group in Table C.
0 ENTER	Programs 600.0 Hz. for Preamble Tone
ENTER	Uses the default value

**PARAMETER — 09 PROGRAMMING DEFAULT = TONE 1
TONE 1**

This parameter programs the tone frequency of the first tone in the 5 tone sequence. Refer to Table C and enter in the number for Tone 1:

EXAMPLE:

5 ENTER	Programs 1305.0 Hz. for Tone 1
ENTER	Uses the default value

**PARAMETER — 10 PROGRAMMING DEFAULT = TONE 2
TONE 2**

This parameter programs the tone frequency of the second tone in the 5 tone sequence. Program this parameter the same as the previous parameter.

**PARAMETER — 11 PROGRAMMING DEFAULT = TONE 3
TONE 3**

This parameter programs the tone frequency of the third tone in the 5 tone sequence. This parameter is only used for 100 call capacity encoders, since only 2 digits are required for the pager code number. Program this parameter the same as the previous parameter.

PARAMETER — 12 DUAL FUNCTION DEFAULT = OFF

This parameter is used with 5 tone pagers which have the "Dual Function" feature. These pagers have the ability to sound off two different alert tones which are used to relay two different messages to the user. All even numbered pager codes will be programmed as the first alert. The next higher odd number is the second alert tone for the same pager. Pagers that have odd numbers for the base code number will not operate properly. For example, cap code 1-12344 would be the first alert, and cap code 1-12345 would be the second alert. If the DUAL FUNCTION feature is disabled, then all cap code are active.

EXAMPLE:

0 ENTER	Disables the DUAL FUNCTION
1 ENTER	Enables the DUAL FUNCTION
ENTER	Uses default value

PARAMETER — 13 REPEAT SEQUENCE DEFAULT = 1

This parameter programs the number of times that the 5 tone sequence is sent. In many cases, it is desirable to send the paging tones more than once in order to reduce the possibility of a missed page due to poor signal conditions. Enter in the number of times (1-9) that the pager code sequence should be sent.

EXAMPLE:

2 ENTER The 5 tone sequence will be automatically repeated 2 times.

ENTER Use default value

PARAMETER — 14 DURATION OF TONES 1-5 DEFAULT = 33 MS.

This parameter programs the length, in milliseconds, of each tone in the 5 tone sequence. The Preamble Tone (if used) is not effected. The duration of the tones should not be changed for most applications. There are only a few foreign applications that require different timing. To program the duration of the tones, enter the time in milliseconds and press the ENTER key.

EXAMPLE:

70 ENTER Programs the duration of the tones to 70 milliseconds.

ENTER Uses the default value

PARAMETER — 15 TONE GROUP SELECTION DEFAULT = EIA (1)

This parameter programs the tone frequencies used for paging. Most applications in the United States use the EIA tone format for paging. For other tone formats, select the FORMAT NUMBER from Table C along the top row and enter this number followed by the ENTER key.

EXAMPLE:

2 ENTER Programs the tone format for the ZVEI1 tone group.

ENTER Uses the default value

This completes the programming sequence for the 5 tone sequential paging format. Now exit the program mode by pressing the CLEAR key.

TABLE C. Five tone sequential frequencies

FORMAT #	1	2	3	4	5
TONE #	EIA	ZVEI1	CCIR/EEA	CCIT	EURO
0	600 Hz.	2400	1981	400	980
1	741	1060	1124	697	903
2	882	1160	1197	770	833
3	1023	1270	1275	852	767
4	1164	1400	1358	941	707
5	1305	1530	1446	1209	652
6	1446	1670	1540	1336	601
7	1587	1830	1640	1477	554
8	1728	2000	1747	1633	511
9	1869	2200	1860	1800	471

PROGRAMMING SUPPLEMENT FOR REACH* 2 TONE FORMAT

This supplement describes how to program the PE-1000 Paging Encoder for the REACH* 2 tone sequential format.

PARAMETER PROGRAMMING SEQUENCE

Enter the program mode and program the parameters numbered 1 thru 5 as described in the PROGRAMMING SECTION (page 9) of the PE-1000 manual. Then refer to the following text for programming the parameters that are specific to the REACH* 2 tone format.

PARAMETER — 07 CODE GROUP DEFAULT = GROUP
 SELECTION 100 (1)

This parameter is only used with 100 call capacity encoders. If the capacity of the PE-1000 is programmed for 1000 call capacity, then this parameter will be skipped. To program in the CODE GROUP used in the PE-1000, select the CODE GROUP required for tone A and tone B from the REACH* CODE ASSIGNMENT CHART found in a REACH* Service Manual. Then select the high order digit that corresponds to the CODE GROUP required. Enter this number on the keyboard followed by the ENTER key.

EXAMPLE:

4 ENTER This will select CODE GROUP 400.
ENTER Use default CODE GROUP.

PARAMETER — 08 TONE A DURATION DEFAULT = 2.2 SEC.

This parameter is used for programming the duration of the first tone sent in the 2 tone sequential format. Enter in the time duration of the first tone in milliseconds, then press the ENTER key.

EXAMPLE:

125 ENTER Sets the duration of tone A to 125 Ms.
ENTER Uses last programmed value for default.

PARAMETER — 09 DURATION OF DEFAULT = 800 MS.
 TONE B

This parameter programs the duration of the second tone. Enter in the tone duration in milliseconds.

EXAMPLE:

125 ENTER Sets the duration of tone B to 125 Ms.
ENTER Use default value.

PARAMETER — 10 REPEAT SEQUENCE DEFAULT = 1

This parameter programs the number of times that the 2 tone sequence is sent. In many cases, it is desirable to send the paging tones more than once in order to reduce the possibility of a missed page due to poor signal conditions. Enter in the number of times (1 thru 9) that the pager code sequence should be sent.

EXAMPLE:

2 ENTER The 2 tone sequence will be automatically repeated
2 times.

ENTER Use default value.

This completes the programming sequence for the REACH* 2 tone format. Now exit the program mode by pressing the CLEAR key.

*(REACH is a registered trademark of Reach Electronics)

THEORY OF OPERATION

This section describes the theory of operation of the Communications Specialists Model PE-1000 Paging Encoder. Please refer to the block diagram on page 24 and the schematic diagrams on pages 14, 15, and 25 for additional details.

MICROPROCESSOR SYSTEM

The PE-1000 uses the 6803 microprocessor chip, U7, for system control. Instructions are fetched from the memory chip, U8, and are then transferred to U7 for execution. Port lines on U7, and U4 transfer analog and digital signals to the outside world. These signals are then used to decode data from the keyboard, send data to the LED display, and to generate tone signals for paging.

The device decoder chip, U10 is used to select which peripheral device is to be on the system bus at any given time. All of the non-volatile data is stored in the EEPROM, U5. On power up, the microprocessor retrieves the data in U5 to determine what operating parameters to use. This is done by a high speed serial data transfer on the Port lines PB0, PB1 and PB2. When new program information is entered on the keyboard, the microprocessor will then transfer the data back into the EEPROM where it remains until another power up condition is sensed. Thus, power losses do not effect the operating parameters of the PE-1000.

All of the paging tones are generated by the microprocessor system. Since the main clock signal for the system is crystal controlled, the accuracy and stability of the paging tones is extremely good. The paging tones for all the different code plans and tone groups are stored in the memory chip, U8. Thus, when a page request is received, the microprocessor will first look into the internal RAM to calculate which code plan to use, it will then fetch the pager number requested. Finally the microprocessor will calculate the table offsets in the code plans, and proceed to generate the tones for that pager number.

LOW PASS FILTER

The low pass filter, U1 takes the square wave output of U4 and converts it to a low distortion sine wave by filtering out all of the high frequency components above the fundamental frequency. The cutoff frequency of U1 is determined by the digital output information supplied by Port A on U4. This sine wave is then buffered by an internal op-amp and the output is either flat, or de-emphasized by C10. The resultant output is fed into R7 and switched through relay K1.

KEYBOARD AND LED DISPLAY

The keyboard outputs a 2 of 7 digital code to the microprocessor Port 1. This output is then decoded to the corresponding key. The information received is sent to the LED display, located on the display circuit board, and the key pressed then appears on the right hand display digit. The data sent to the LED display is in a serial format which is generated by the output Port B in U4. The efficiency of the display circuitry is very good since the LED display is multiplexed. This is controlled by the display driver chip, U1. Current limiting resistors are provided to reduce the peak segment current.

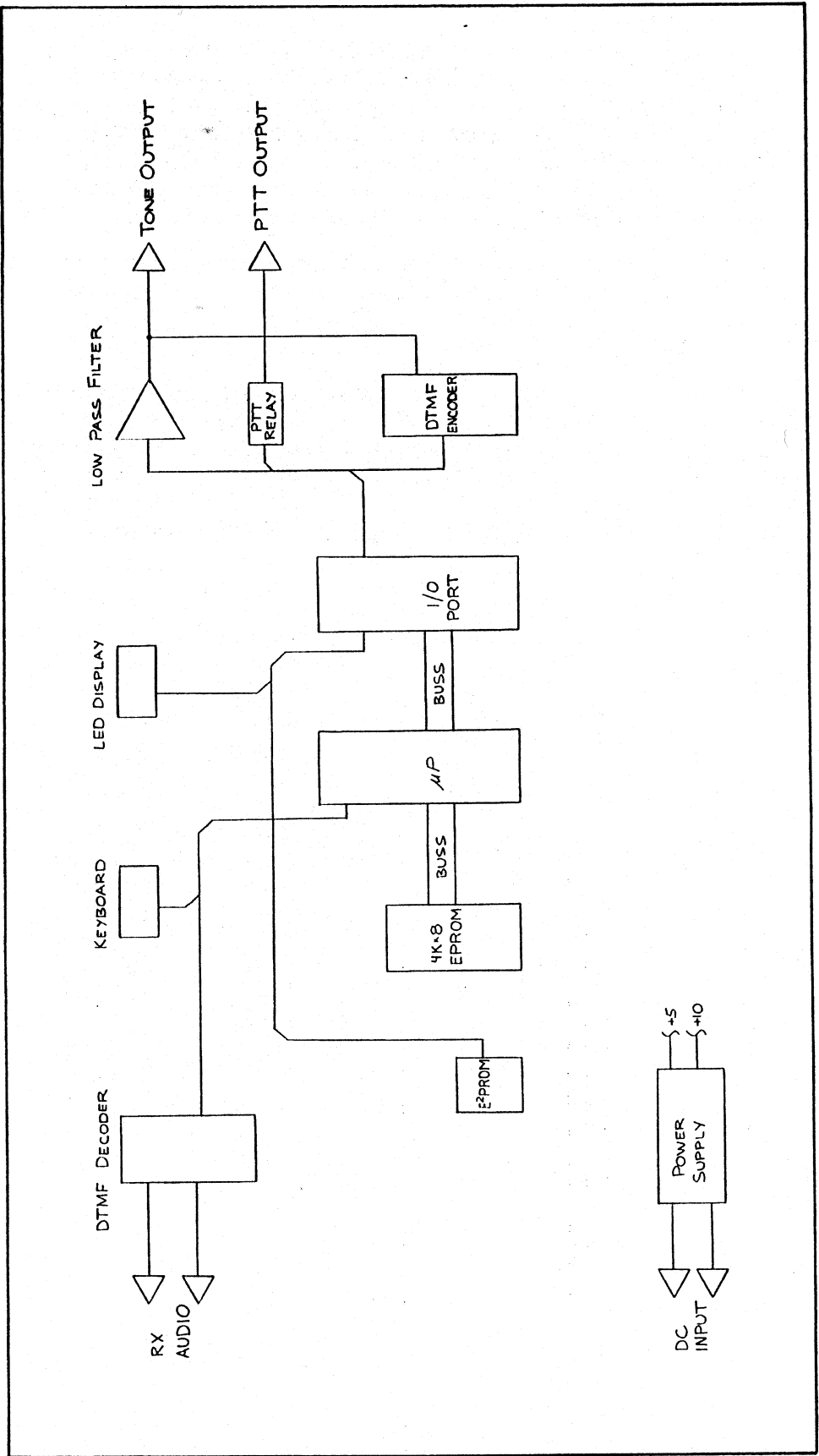
POWER SUPPLY

When power is first applied to the encoder, diode CR4 is forward biased when the input voltage rises above the minimum specification. This turns on transistor Q2 and within 200 ms. capacitor C23 is charged high enough to turn on the inverter, U6 and force the main system reset signal go to logic high. When this happens, the operating program in U8 takes control, and the system is initialized. If the voltage at the terminal block is below the minimum specification, then the entire system will be inhibited and held in the reset mode.

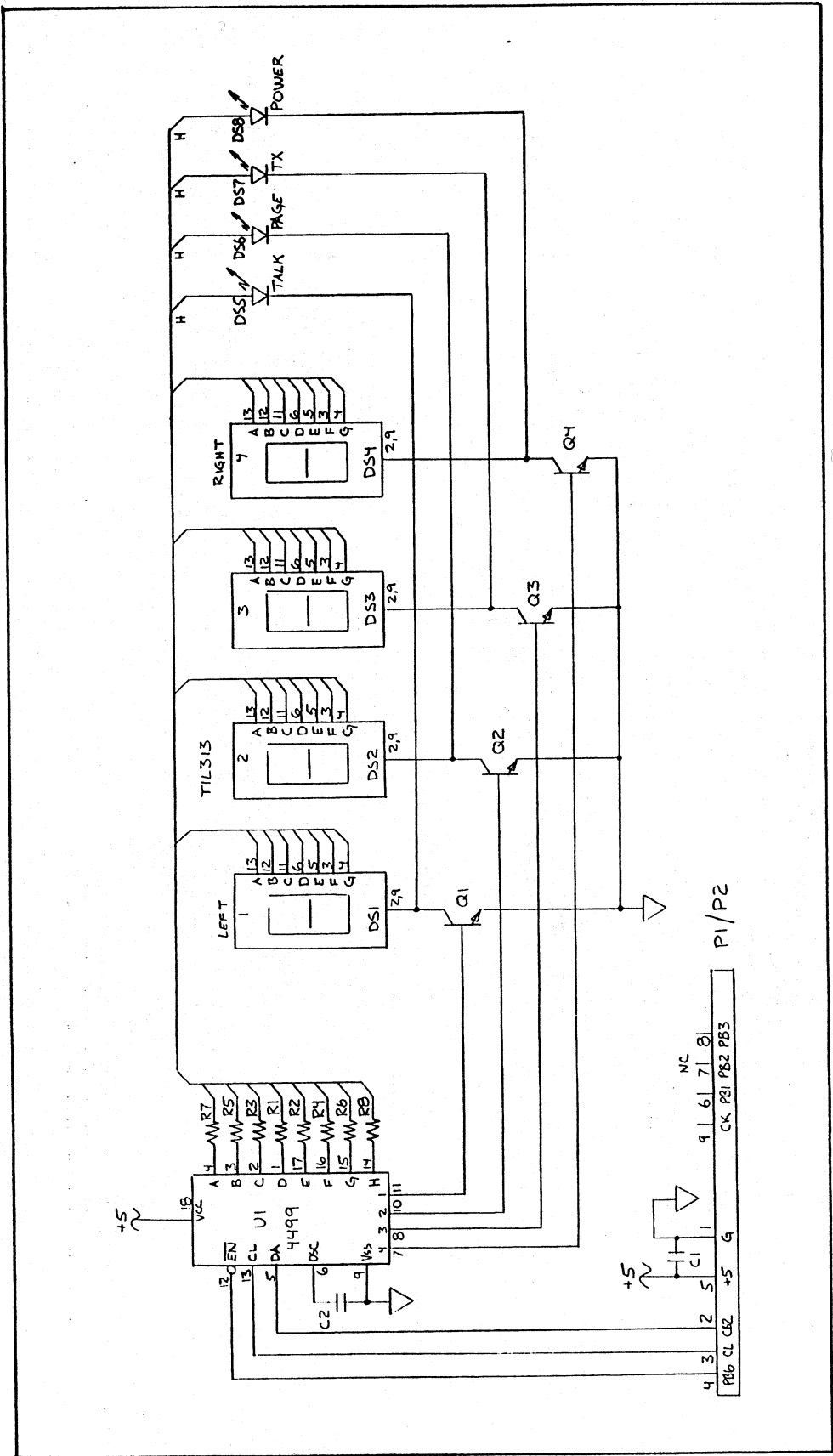
VR1 and VR2 supply the regulated voltage to the microprocessor unit and the low pass filter. VR-2 supplies U1 with -5 volts.

PRINTER OUTPUT

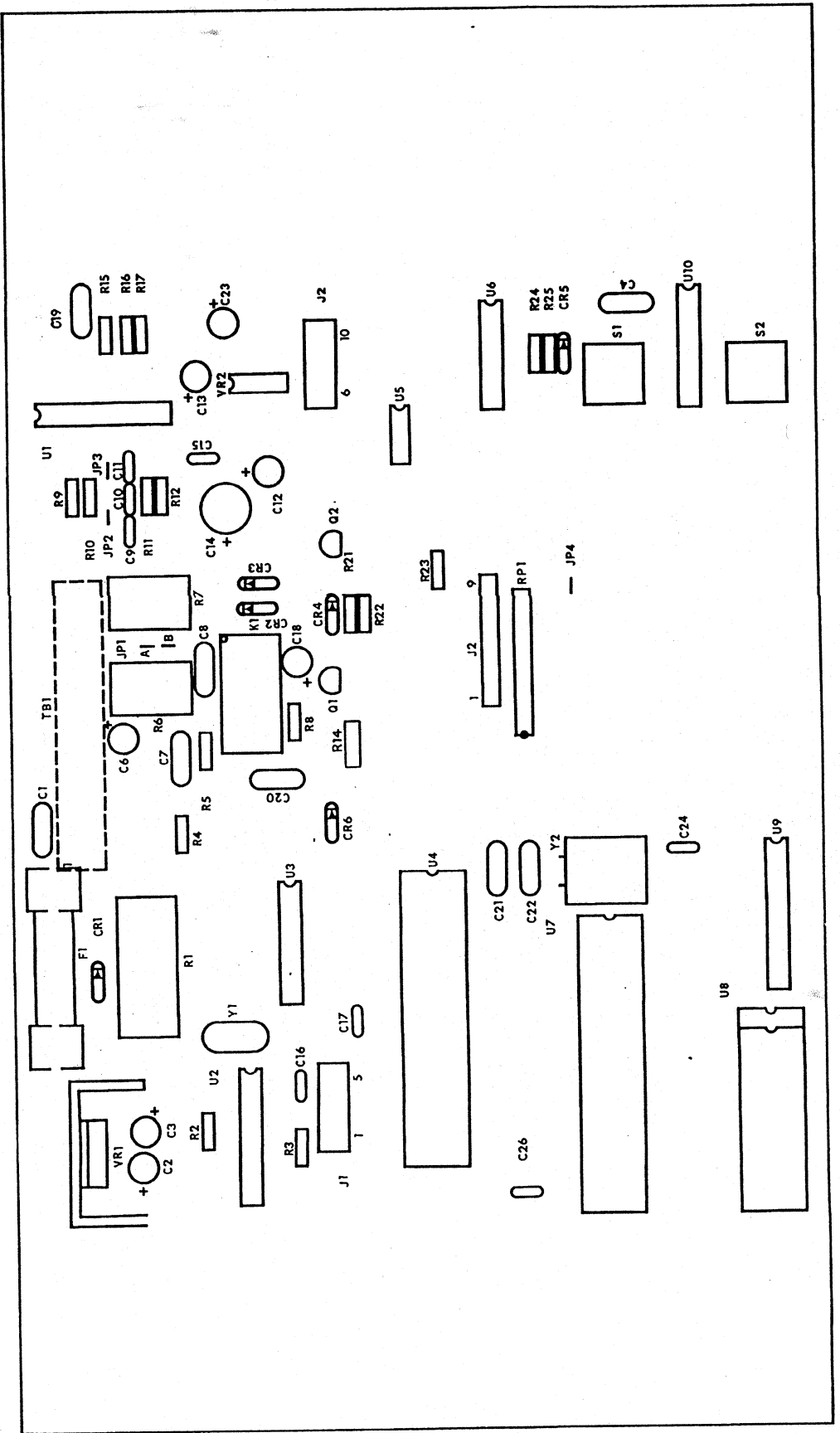
The printer output on TB-1 pin 9 is sent in a standard serial format compatible with the Radio Shack Model TP-10 (26-1261). Each time a pager code is sent, the pager code displayed will be printed on the attached printer. Please note that it is unlikely that the printer output line on the PE-1000 will be compatible with any other type printer, since this output is not RS-232C compatible. The output format for the printer is 1 start bit, 2 stop bits, and no parity, at a 300 baud serial rate.



BLOCK DIAGRAM



DISPLAY SCHEMATIC DIAGRAM



BOARD LAYOUT

PARTS LIST

PAGING ENCODER MODEL PE-1000 COMPONENTS PARTS LIST REVISION 1-4-85

CSI						
DESIG.	PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
U7	51-6803	8 BIT MICROPROCESSOR	MOT	MC6803P	1	12.39 ea.
U4	51-6522	PROG. INTERFACE PORT	ROCKWELL	R6522P	1	9.45 ea.
U8	51-2732-A	MOTOROLA-GE 2-TONE SEQ. PROM			1	25.00 ea.
U8	51-2732-B	5-TONE SEQUENTIAL PROM			1	25.00 ea.
U8	51-2732-C	REACH* 2-TONE SEQ. PROM			1	25.00 ea.
U8	51-2732-D	32K CUSTOM PROGRAMMED PROM			1	Call Factory
U9	51-4373	TRANSPARENT LATCH	MOT	74LS373N	1	2.25 ea.
U10	51-4138	DEVICE DECODER	MOT	74LS138N	1	1.10 ea.
U1*	51-4499	4 DIGIT DISPLAY DRIVER	MOT	MC14499P	1	5.76 ea.
U6	51-4584	HEX SCHMITT TRIGGER	MOT	MC14584BCP	1	.68 ea.
U1	51-3528	LOW PASS FILTER	AMI	S3528P	1	13.50 ea.
U5	51-2443	EEPROM	XICOR	X2443P	1	5.28 ea.
VR1	48-4011	5.0 V 5% VOLTAGE REGULATOR	MOT	MC7805CT	1	2.19 ea.
VR2	48-7660	VOLTAGE CONVERTER	INTERSIL	ICL7660CPA	1	5.13 ea.
Q1,Q2, Q1-Q4*	48-4401	NPN TO-92 TRANSISTOR	MOT	2N4401	6	.21 ea.
CR1,2,5	48-4002	SILICON DIODE	MOT	1N4002	3	.09 ea.
CR4	48-5237	8.2 V 1/2 WT. 10% ZENER	MOT	1N5237A	1	.12 ea.
CR3	48-4746	18.0 V 1 WT 10% ZENER	MOT	1N4746	1	.15 ea.
CR6	48-4735	6.2 V 1 WT. 5% ZENER	MOT	1N4735A	1	.15 ea.
K1	80-1003	DPDT 2A 12 V RELAY	ITT	RZ-12C	1	5.10 ea.
DS2-DS4*	48-2003	.3" RED 7 SEG. DISPLAY	TI	TIL313	3	3.00 ea.
DS5-DS8*	48-3200	RED T1 LED	TI	TIL209A	4	.22 ea.
Y2	48-4000	4.00 MHZ CRYSTAL	FOX	FOX040	1	2.01 ea.
F1	65-1003	3/4 A. 1.25" FUSE	BEL FUSE	3AG750	1	.39 ea.
	65-1004	PCB FUSE HOLDER	BEL FUSE	FC-101	2	.10 ea.
T1	25-1011	12V .5A DC WALL POWER SUPPLY	SHOGYO		1	7.95 ea.
C14	23-1012	100 UF ELEC. 25V RADIAL	PAN	ECEA1EV101S	1	.15 ea.
C2,C3, C12,C23	23-1001	10 UF ELEC. 25V RADIAL	PAN	ECEA1EV100S	4	.15 ea.
C13	23-1053	1 UF ELEC. 50V RADIAL	PAN	ECEA1HV010S	1	.15 ea.
C18	23-1052	1 UF ELECT. N/P 50V RADIAL	PACCOM	EVN1M50AA	1	.45 ea.
C1	24-1030	.01 UF CERAMIC DISC	CENTRALAB	CK-103	1	.12 ea.

PARTS LIST (Continued)

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
C8,C20, C19	24-1020	1000 PF CERAMIC DISC	CENTRALAB	DD-102G	3	.14 ea.
C21,C22, C4	24-2400	24 PF CERAMIC DISC	CENTRALAB	DD-240	3	.20 ea.
C1*,15, 17,24,26	21-2240	.22 UF MONO. CAP Z5U	CENTRALAB	CZ20C224M	5	.23 ea.
C2*,C10	21-1030	.01 UF MONO. CAP X7R	CENTRALAB	CW15C103K	2	.14 ea.
C11	21-1020	1000 PF. MONO. CAP X7R	CENTRALAB	CW15C102K	1	.23 ea.
R1	06-3R01	3.0 OHM 5WT RESISTOR	TRW	PW5-3.0-5%	1	.28 ea.
R1-R8*, R5,R24	06-6804	68 OHM 1/4WT 5% CAR. FILM			10	.10 ea.
R8,14,21, 22,23	06-4724	4.7K 1/4WT 5% CAR. FILM			5	.10 ea.
R16, R17,R25	06-1534	15K 1/4WT 5% CAR. FILM			3	.10 ea.
R11,R12	06-4734	47K 1/4WT 5% CAR. FILM			2	.10 ea.
R15	06-1064	10MEG 1/4WT 5% CAR. FILM			1	.10 ea.
RP1	51-1218	10 PIN 4.7K SIP NETWORK	CTS	770-10-1-R4.7K	1	.57 ea.
R7	18-5023	5K POT 10 MM. 20%	CTS	U260R502B	1	.36 ea.
	84-1100	MAIN PCB			1	18.42 ea.
	84-1101	DISPLAY PCB*			1	4.83 ea.
TB1	31-1053	10 PIN TERMINAL BLOCK	ELECTROVERT	25.102.1053	1	4.55 ea.
KY1	38-1005	12 BUTTON KEYBOARD	DIGITRAN	KL0462	1	23.28 ea.
J2	09-4508	FEMALE KEYBOARD CONNECTOR	SAMTEC	SSA-108-S-T	1	1.62 ea.
J1,J3	09-2055	LED DISPLAY CONNECTOR	MOLEX	22-02-2055	2	.61 ea.
P1*,P2*	09-2051	FEMALE LED DISPLAY CONNECTOR	MOLEX	22-03-2051	2	.45 ea.
	09-8540	40 PIN IC SOCKET	WELCON	802-7401642	2	.54 ea.
	09-8524	24 PIN IC SOCKET	WELCON	802-7241642	1	.33 ea.
	09-8520	20 PIN IC SOCKET	WELCON	802-0201642	1	.30 ea.
	09-8518	18 PIN IC SOCKET	WELCON	802-0181642	1	.24 ea.
	09-8516	16 PIN IC SOCKET	WELCON	802-0161642	1	.30 ea.
	09-8514	14 PIN IC SOCKET	WELCON	802-0141642	1	.20 ea.
	09-8508	8 PIN IC SOCKET	WELCON	802-0081642	2	.18 ea.
	15-1011	ENCLOSURE TOP			1	12.00 ea.
	15-1012	ENCLOSURE BOTTOM			1	6.00 ea.
	75-1001	BLACK RUBBER FOOT	CABLE COM	GD-5-BLK	4	.05 ea.

PARTS LIST (Continued)

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
	33-1014	FRONT PANEL			1	10.41 ea.
	43-1009	4-40 .312" THD AL SPACER	HH SMITH	9229	4	.20 ea.
	43-1010	#6 1.0" RND NL SPACER	HH SMITH	4043	2	.19 ea.
	03-1014	#6 x 1/4" PHIL PAN HEAD SCREW			1	.05 ea.
	03-1015	#6 x 1 1/4" PHIL PAN HEAD SCREW			2	.05 ea.
	03-1016	#6 x 1/2" PHIL FLAT HEAD SCREW			2	.05 ea.
	03-1017	#6 x 1" PHIL FLAT HEAD SCREW			2	.05 ea.
	03-1002	4-40 1/4" PHIL PAN MACHINE SCREW			5	.05 ea.
	03-1001	4-40 .25" HEX NUT			1	.05 ea.
	43-1011	TO-220 HEATSINK	THERMALOY	6230B-TT	1	.69 ea.
	68-2057	INSTRUCTION MANUAL			1	3.00

*Located on LED Display Board

WARRANTY

The PE-1000 is warranted to be free from defects for a period of five (5) years from the date of purchase.

Just return the unit to the factory and we will repair or replace it (at our option) at no charge.