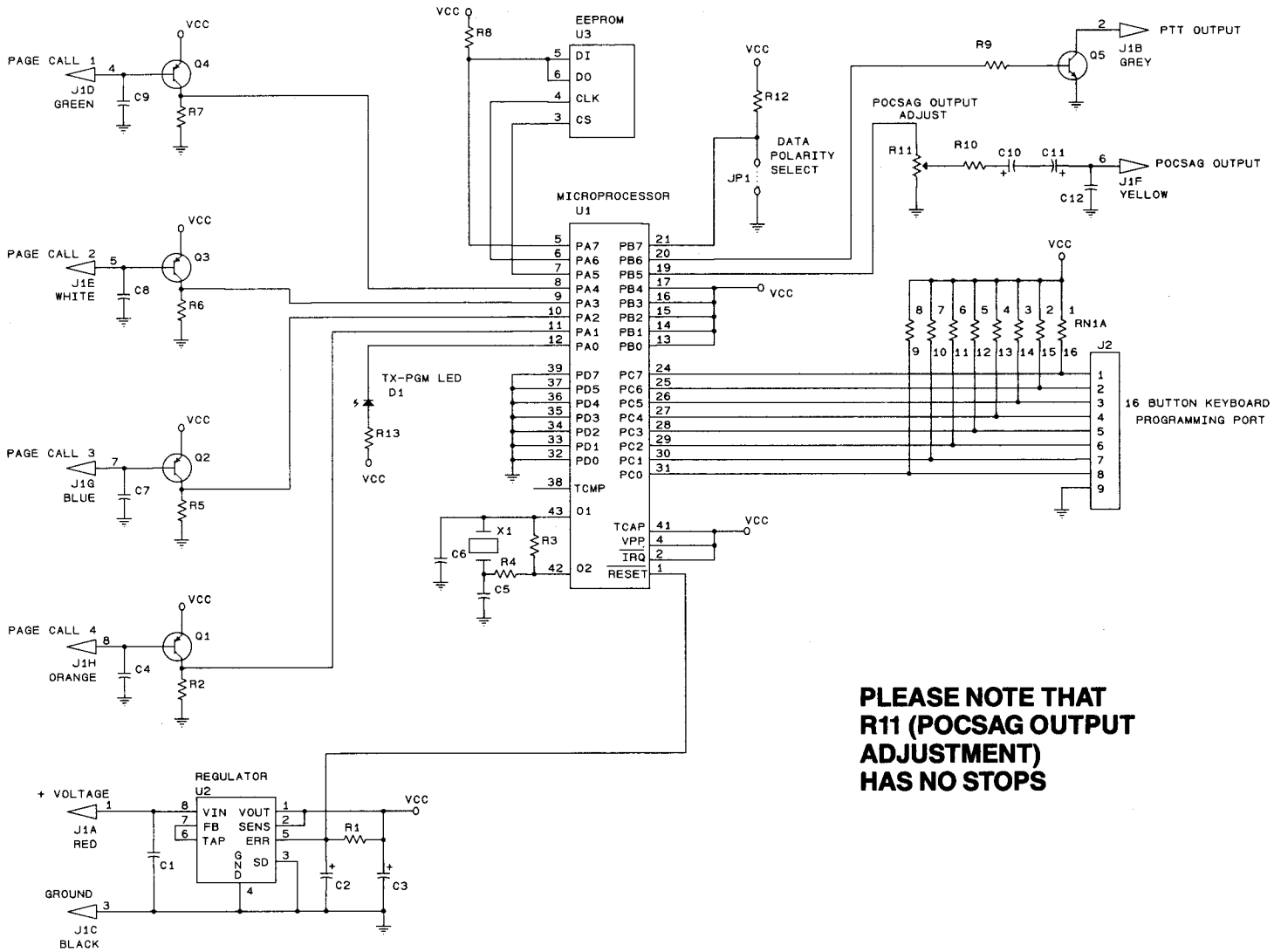


PE-4 INSTRUCTION SHEET



**PLEASE NOTE THAT
R11 (POCSAG OUTPUT
ADJUSTMENT)
HAS NO STOPS**

PARTS LIST

DESIG.	CSI NO.	DESCRIPTION	PRICE	DESIG.	CSI NO.	DESCRIPTION	PRICE
U1	51-6870	MC68HC705C8CFN CMOS Microprocessor, Programmed	43.41 ea.	R4	06-1036	10K, 1/8w, 5% Chip Resistor	.10 ea.
U2	48-2951	LP2951CM Low Dropout Regulator	2.85 ea.	R2,R5,R6, R7,R12	06-4736	47K, 1/8w, 5% Chip Resistor	.10 ea.
U3	51-9346	CAT93C46J1 CMOS EEPROM	2.55 ea.	R1	06-1648	160K, 1/8w, 5% Chip Resistor	.10 ea.
Q1-Q4	48-1140	DTA114EK Digital PNP Transistor	.25 ea.	R3	06-2756	2.7Meg, 1/8w, 5% Chip Resistor	.10 ea.
Q5	48-0056	BCX56 NPN SOT-89 Transistor	.80 ea.	R11	18-5026	5K, 3MM Chip Trimmer Pot	.82 ea.
X1	48-3835	AT38-3.579M Crystal	1.80 ea.	RN1	51-1215	47K x 8 Chip Resistor Network	.75 ea.
D1	48-3200	T1 Red LED	.22 ea.	J1	09-8717	9 Pin Sub-Miniature Header	.87 ea.
C2,C3, C10,C11	19-2226	2.2µf, 16v, 20% Tant. Chip Capacitor	.54 ea.	J2	09-7489	9 Pin Socket	.75 ea.
C1	22-1040	.1µf, X7R, 50v, 10% Chip Mono. Capacitor	.25 ea.	01-1023	9 Pin Plug-In Cable Assembly	2.50 ea.	
C4,C7,C8, C9,C12	22-1510	150pf, NPO, 50v, 10% Chip Mono. Capacitor	.25 ea.	84-1057	PE-4 PCB	7.25 ea.	
C5,C6	22-2200	22pf, NPO, 50v, 10% Chip Mono. Capacitor	.25 ea.	68-2085	PE-4 Instruction Sheet	.50 ea.	
R13	06-8206	820 ohm, 1/8w, 5% Chip Resistor	.10 ea.	75-1002	Double Sided Tape Squares	.07 ea.	
R8,R9,R10	06-2226	2.2K, 1/8w, 5% Chip Resistor	.10 ea.	56-1001	CSI Tuning Tool	.20 ea.	
				38-1006	16 Button Programming Keyboard (Optional)	24.72 ea.	

MODEL PE-4

MINIATURE 4 CALL POCSAG ENCODER

The Communications Specialists Model PE-4 Miniature 4 Call POCSAG Encoder is a microprocessor based product used for encoding the binary digital paging format known as POCSAG (RPC1). Four PageCall Inputs on the PE-4 allow the device to generate four different address and message POCSAG paging transmissions.

Because of its small size and low power consumption, advanced engineering has resulted in a product that is ideal for base station, mobile and portable two-way FM radio installations. Simple field programming by an external 16 button keyboard allows the radio service shop to configure the four different address and message transmissions.

Section	Description
1.0	Operating Instructions
2.0	Installation Instructions
2.1	Adjustments
2.2	Data Polarity Jumper
3.0	Programming the PE-4
3.1	Programming Example
4.0	PE-4 Specifications

1.0 OPERATING INSTRUCTIONS

A POCSAG transmission is initiated by momentarily pulling one of the PageCall Inputs to ground. As soon as the PE-4 has detected a ground on one of the four PageCall Input lines, the PE-4 will key the associated transmitter. This is indicated by the red LED on the printed circuit board of the PE-4. After a brief delay for transmitter rise time, the PE-4 will generate the POCSAG digital transmission. At the completion of the transmission, the PE-4 will release the transmitter, and turnoff the red LED. The PE-4 is now ready for another page. Each of the four PageCall Inputs on the PE-4 can be individually programmed with different address and message data.

2.0 INSTALLATION INSTRUCTIONS

Installation of the PE-4 should be done by a qualified two-way radio technician. When installing the PE-4 be careful not to twist or bend the printed circuit board as this can damage the surface mount components. In addition, use static protection techniques while handling the unit. Be sure that all power is removed before installing or programming the PE-4. When soldering to the PE-4 printed circuit board, always use a low wattage soldering iron to prevent damage to the board. The following paragraphs describe each of the external connections on the PE-4:

+ POWER (RED)

This wire should be connected directly to a filtered source of continuous positive DC voltage in the range of +6.0VDC to +20.0VDC. This connection should be made "downstream" from the power switch, and the power supply filter components in the radio set. If a regulated source of DC voltage is available, it may be used. Using a quiet and stable source of DC voltage inside the radio set will reduce the possibility of picking up power supply noise.

GROUND (BLACK)

The Ground wire should be connected to a location inside the radio set which will supply a DC power ground return to the PE-4. To eliminate ground loops and power supply noise, the ground return to the PE-4 should be the same power supply ground used in the transmit audio stages.

PTT OUTPUT (GREY)

The PTT Output line is an open collector transistor that pulls to ground to key the transmitter during a page. To install the PTT Output line on the PE-4, connect it to the PTT line inside the radio set. The PE-4 will now control the Transmit PTT line.

POCSAG OUTPUT (YELLOW)

Please note that since POCSAG uses binary base band signalling, best results are obtained when using a transmitter that utilizes a 'direct FM' modulator circuit. The use of a 'phase modulated' transmitter is not recommended and can result in poor system operation.

This output generates the POCSAG digital output. The most common place to connect this line is directly to, or just prior to the modulation stage in the transmitter. Typical connections would be to the center of the deviation pot, to the varactor diode in the modulator circuit, or to the manufacturer's suggested connection point. The point where the POCSAG encoder is injected into the transmitter must not have any capacitors to ground larger than 1000pf or the output waveform will probably be distorted. This connection point can vary from radio to radio. Do not connect the POCSAG output to the microphone input as the microphone audio stages will distort and attenuate the digital signal.

If voice is used on the same transmitter, you may have to install a series resistor to reduce the loading effects of the PE-4 POCSAG Output depending on the interface impedance. This is evident in the case of connecting to the center of a 100K deviation pot. In this case, a 100K series resistor will compensate for the impedance difference. In addition, a slight adjustment of the voice deviation may be required to compensate for the POCSAG output circuit loading.

PageCall Input 1 (GREEN)
PageCall Input 2 (WHITE)
PageCall Input 3 (BLUE)
PageCall Input 4 (ORANGE)

These four inputs are used as a trigger input to initiate the POCSAG transmission. Any one of the four inputs may be pulled to ground to start the POCSAG transmission. A momentary pull to ground is required to start the sequence. Therefore, a SPST momentary switch is recommended. Connect one pole of the switch to ground, and the other pole to the desired PageCall Input on the PE-4. Each PageCall Input is capable of generating a unique POCSAG address and message.

2.1 ADJUSTMENTS

The POCSAG Output Adjustment, R11, sets the level of the POCSAG Output. A very small slotted alignment tool should be used to make the adjustment on the PE-4 PCB. To adjust the POCSAG Output level to the correct deviation, activate the PE-4 by momentarily grounding one of the PageCall Inputs, and while watching a deviation scope tuned to the transmit output frequency, carefully adjust the POCSAG Output Adjustment. The deviation level of the POCSAG Output should be set to +/- 4.5 khz for 25 Khz channel spacing. There are not stops on R11.

A deviation scope on a service monitor is best for adjusting the POCSAG deviation. The POCSAG waveform on the scope will

appear as a square wave. If the POCSAG signal does not appear as a square wave, this indicates that the interface connection is incorrect, and must be changed to a more suitable location, possibly closer to the varicap modulator with no capacitors to ground.

2.2 DATA POLARITY JUMPER

The Data Polarity Jumper on the PE-4 PCB, JP1, controls the polarity of the POCSAG Output. The polarity of the POCSAG transmission can be set for either normal polarity or inverted polarity. The transmit polarity for any given radio is dependant on the number of stages in the radio that may 'invert' the POCSAG signal. Since there is no easy way to determine what polarity to use, it must be determined experimentally. If a solder bridge is installed across the Data Polarity Jumper, JP1, this will invert the POCSAG transmission. Otherwise the POCSAG code will be transmitted in the normal data polarity. After installation and adjustments, try to communicate with one of your pagers on the radio system. If communication is not possible, then install a solder bridge across the Data Polarity Jumper to invert the transmission.

3.0 PROGRAMMING THE PE-4

PLEASE NOTE: FACTORY PROGRAMMING WILL BE PROVIDED AT NO CHARGE IF REQUESTED BY THE CUSTOMER.

This section of the instructions describes how to program the PE-4 to suit the needs of your radio system. These programming features are designed to be programmed by the installing technician. All programming information is retained in a non-volatile EEPROM. The PE-4 may be programmed before or after it is installed in the associated radio set. The PE-4 is programmed by using an external 16 button keyboard (38-1006 at \$24.72 ea.) connected to the Programming Port, J2 on the PE-4 PCB. When programming the unit, be careful not to damage the PE-4 printed circuit board. When you have completed programming the PE-4 remove power from the unit, and only then remove the programming keyboard.

To access the PE-4 Programming Mode, use the following procedure:

1. To place the PE-4 into the Programming Mode, place one finger underneath J2 on the PE-4 printed circuit board, and carefully insert the pins of the 16 button programming keyboard into J2 such that the red LED on the PE-4 printed circuit board is visible (the printed circuit board is not covered up).
2. Now apply power to the PE-4.
3. Press any key on the programming keyboard. Upon release of the key, the red LED will blink indicating access to the Programming Mode.

The following table lists the default data stored in the Model PE-4 EEPROM when received from the factory. The one special programming code '9#' can be used to re-initialize the PE-4 EEPROM, and return the unit to the factory default state.

INPUT	PROGRAM CODE	PAGER ADDRESS	PAGER MESSAGE
PageCall 1	1#	0123456	11
PageCall 2	2#	0123456	22
PageCall 3	3#	0123456	33
PageCall 4	4#	0123456	44

RETURN PE-4 TO FACTORY DEFAULT VALUES 9

To program the address and message data for a PageCall Input, press the one digit program code number as shown in the table above that corresponds to the PageCall Input to be programmed. Follow this key with the '#' key.

Now enter on the keyboard the 'seven digit address' number of the unit to be paged. Follow the seven digit number with the '#' key.

Finally, enter on the keyboard the desired message data to be displayed on the pager. UP TO 10 DIGITS of information can be entered. After the last digit is entered, press the '#' key one last time. After the last '#' key is pressed, the red LED on the PE-4 will blink indicating that the programming sequence was accepted. If the red LED blinks before the sequence is completed, this indicates that an error has been detected, and the programming code, address data, and message data must be entered again.

When programming display data, the keys 0 through 9, A, B, C, D and *, may be used. The alpha keys are defined as follows:

- 'A' key will display the character '[' (left bracket)
- 'B' key will display the character ']' (right bracket)
- 'C' key will display a space character
- 'D' key will display a hyphen character
- '*' key will display the character 'U' (urgency)

3.1 PROGRAMMING EXAMPLE

The PE-4 must signal one numeric display POCSAG pager and one tone-only POCSAG pager. The address for the numeric display pager is '1300426' and the address for the tone-only pager is '0013530'. The numeric display pager, upon receipt of a page, must display the telephone number '998-3021'. Since the other pager is a tone-only pager, no message data can be displayed. The numeric display pager is to be assigned to PageCall Input #1, and the tone-only pager is to be assigned to PageCall Input #4.

This information is programmed into the PE-4 by first entering the Programming Mode as described in the previous section, and then entering the following digit sequence:

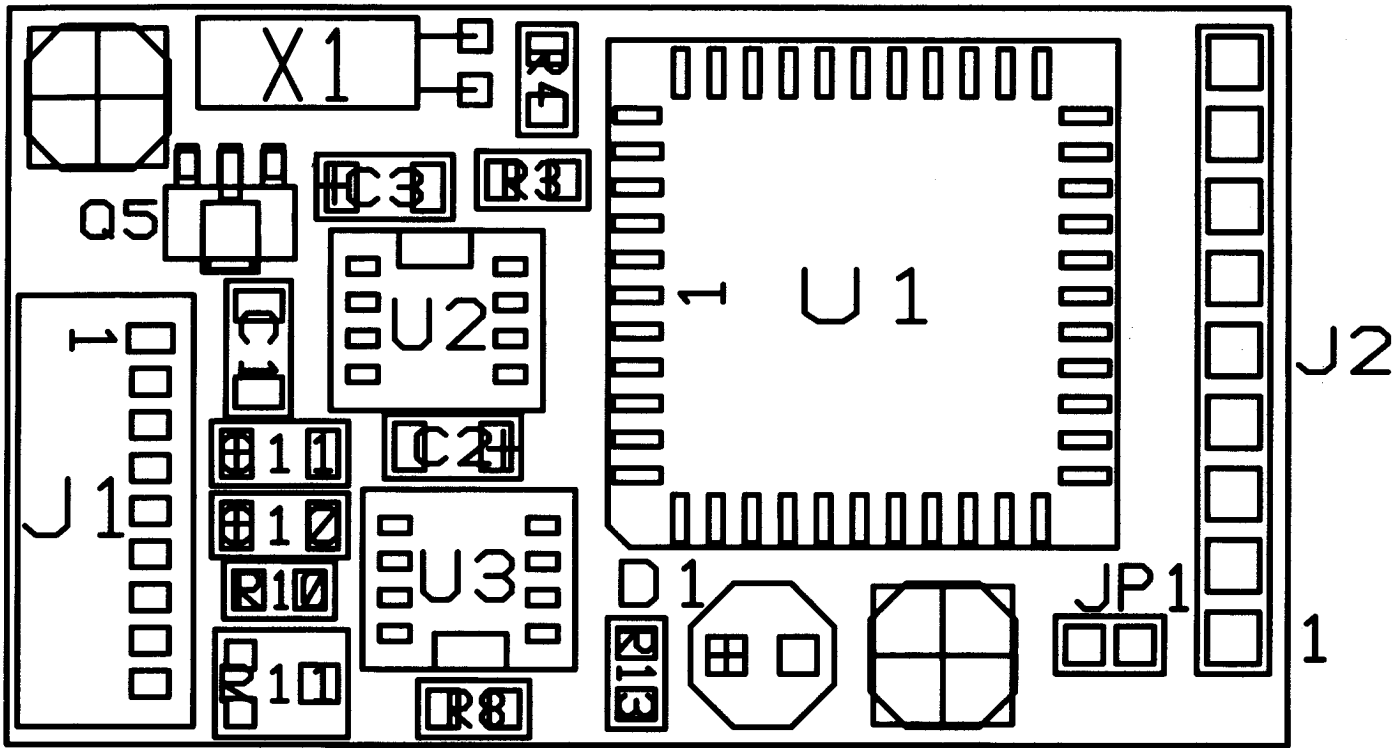
For the display pager: 1# 1300426# 998D3021# —LED blinks
For the tone-only pager: 4# 0013530# # —LED blinks

4.0 SPECIFICATIONS

Number of Calls	4
Page Activation	by momentary pull to ground
Paging Format	POCSAG (RPC#1)
Data Rate	512 b/s
Data Stability	crystal controlled
Encode Output Z	2.2 K ohms AC coupled
Encode Output Level	Adjustable from 0V to 5.0V
POCSAG Programming	by external 16 button keyboard
TX PTT Output	Open collector transistor
Temperature Range	-30°C to +65°C
Supply Requirements	6.0 to 20.0 VDC @9 Ma.
Size	1.775" x 1.025" x 0.35"
Price	\$99.95 ea. Service Station Net
Accessories	38-1006 16 button programming keyboard \$24.72 ea. Service Station Net

NOTE: For those not desiring to purchase the 38-1006 keyboard, FACTORY PROGRAMMING WILL BE PROVIDED AT NO CHARGE.

TOP SIDE PARTS LAYOUT



BOTTOM SIDE PARTS LAYOUT

