SME OPERATING MANUAL

SECTION 1.0

INTRODUCTION

1.1 The Data Signal, Inc. DATA-TONE* series of keyboard and sub-miniature encoders generate the twelve or sixteen dual tone combinations required for standard TOUCH-TONE**operation. The subminiature encoder (SME) is specifically designed for those applications where space is at a premium, such as handi-talkies, and is the smallest encoder currently available. The SME is highly resistant to RF and generates its tones by digital techniques and is crystal controlled for high accuracy and stability.

1.2 The encoder is capable of encoding all digits normally associated with standard Bell System encoding-decoding schemes. Each digit is comprised of two audio frequencies generated simultaneously. Provision is also made so that each encoder is capable of generating the single tone frequencies of the dual tone format for test and alignment purposes

1.3 The Data Signal DATA-TONE encoder series features the Motorola MC14410 CMOS integrated circuit. This integrated circuit can generate all 16 digits used by the Bell System. The circuit requires a keyboard with matrix of either 2 of 7 or 2 of 8. The advantages of using the MC14410 as the tone generator are its excellent frequency accuracy and stability, high and low group level control, and the ability to make use of a subminiature HC-43 1 Mhz. crystal. This crystal is currently the smallest frequency determining device available for digital tone encoders.

SECTION 2.0

CIRCUIT OPERATION

2.1 The operation of the SME is straight forward and reliable. Switch closures from the keyboard or keypad, pull the appropriate Row and Colum Pins on the IC to ground. This programs the IC's internal divide by N frequency dividers for generating the low and high group tones. Internal digital to analog conversion takes place and the two digitally synthesized tones are routed to Pins 2 and 15 of the IC. The low tone from Pin 2 and the high tone from Pin 15 are combined externally by a resistive summing and filtering network. No adjustment of the tone frequency is necessary due to the accuracy provided by the crystal oscillator.

2.2 The relative amplitude difference of the high and low group tones is approximately 3 dB with the high group being the stronger. This relationship can be changed by the selection of different values of

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resistance for R3 and R4, an inherent advantage of the MC 14410. In most cases this is not necessary, however, some transmitter microphone audio circuits are not flat through the 600-2000 Hz. range and adjustment may be necessary if severe rolloff is noted. The high tones are purposely made stronger so that when they enter the phone system they will be correctly decoded by the local exchange. This is because the distributed capacitance of the phone line attenuates the higher frequencies more than the low ones.

2.3 An additional feature of the MC 14410 is the ability to generate single tones for test and alignment purposes. When the two adjacent keys are depressed simultaneously a single tone will result. Two adjacent keys in any vertical column will generate the single tone associated with that column. Two adjacent keys in any horizontal row will generate the single tone associated with that row. See the schematic for the column and row frequencies.

2.4 The SME encoders come prewired and require only the connection of the SME to the keyboard and/or associated transmitter.

SECTION 3.0

SME/KEYBOARD CONNECTIONS

3.0 ASSEMBLY

3.1 Compare the rear of your keyboard with the rear view drawing included with the keyboard. Locate the cluster of rectangular shaped solder foot pads or islands on the keyboard. These pads are used to solder the SME connecting wires to the keyboard. On the rear view of the keyboard note that the solder islands are numbered from right to left.

3.2 Locate and mount the SME encoder where desired in your unit. Then carefully proceed to connect the 8" wires to your keyboard as follows:

Check Off		Style A & B Keyboard	Style C Keyboard	Style D Keyboard		IC Pin Number
( )	Blue	1	1	1	to	3
( )	Blue	2	2	2	to	4
( )	Blue	3	3	3	to	5
( )	Blue	4	4	4	to	6
( )	Blue	5	7	5	to	14
( )	Blue	6	6	6	to	13
( )	Blue	7	5	7	to	12
( )	Blue	*	-	8	to	11
( )	Black	8	8	9	to	8

* Not used on 12 button keyboard, remove wire from SME.

3.3 You should now be ready for keyboard mounting and final assembly.

3.4 There are many different ways to install the SME/DATA SIGNAL keyboard. Your ingenuity will determine yours. Make sure that no solder shorts or installation shorts are encountered before and during close up.

SME/TRANSMITTER CONNECTIONS

You should now have three remaining wires to be connected. These three 10" wires connect ground and power to the SME and audio from the SME to the transmitter.

There are three methods of connecting power to the SME, they are each discussed below, select the best for your application and connect the 10" black and red wires accordingly.

1. PTT Switched Voltage: This connection is used when the PTT applies power to the transmitter when keyed. Connect the Red wire to the switched side of the PTT and the Black wire to power ground.

2. PTT Switched Ground: This connection is used when the PTT applies ground to the transmitter when keyed. Connect the Black wire to the switched side of the PTT and the Red wire to power.

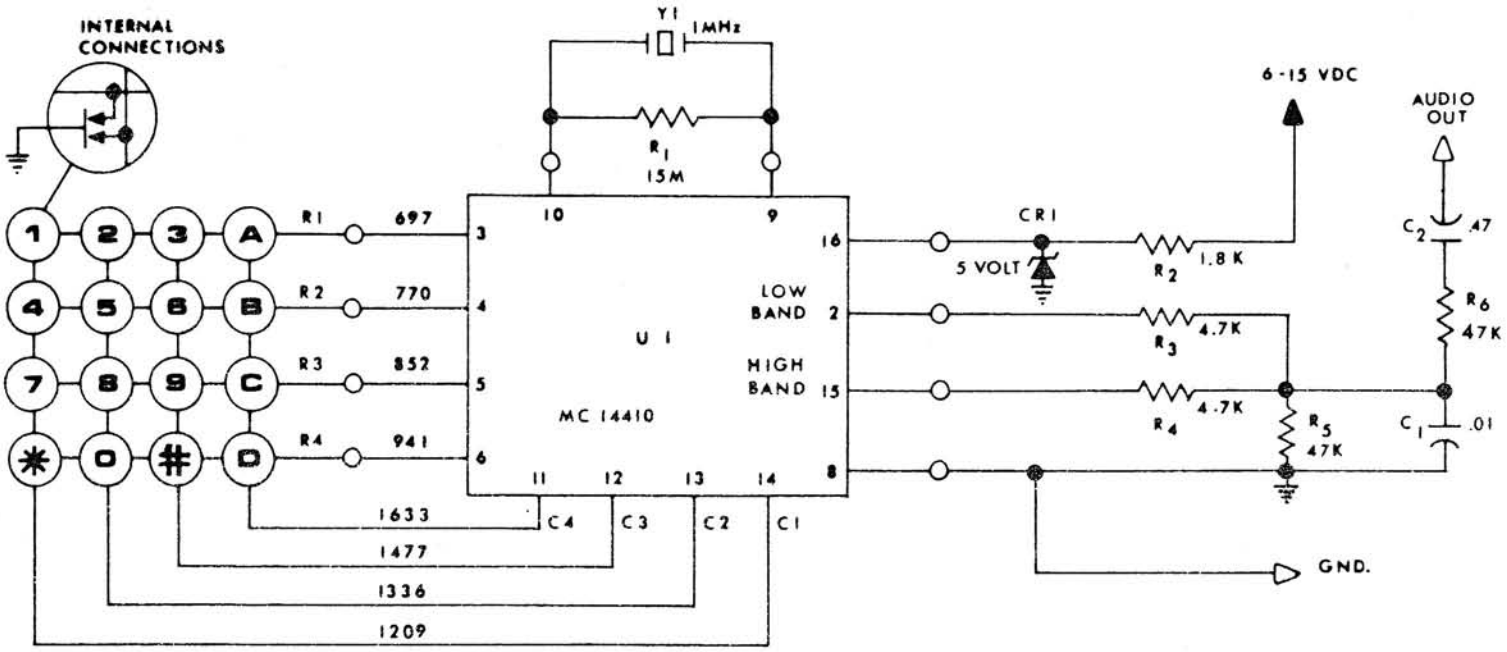
3. Direct Connections: This connection is used when sufficient power is available to power the SME continuously. The SME draws approximately 5 mA in this mode. Connect the RED wire to the power switch and the Black wire to the power ground.

The Green wire remains, it will be connected to the audio circuitry of the transmitter.

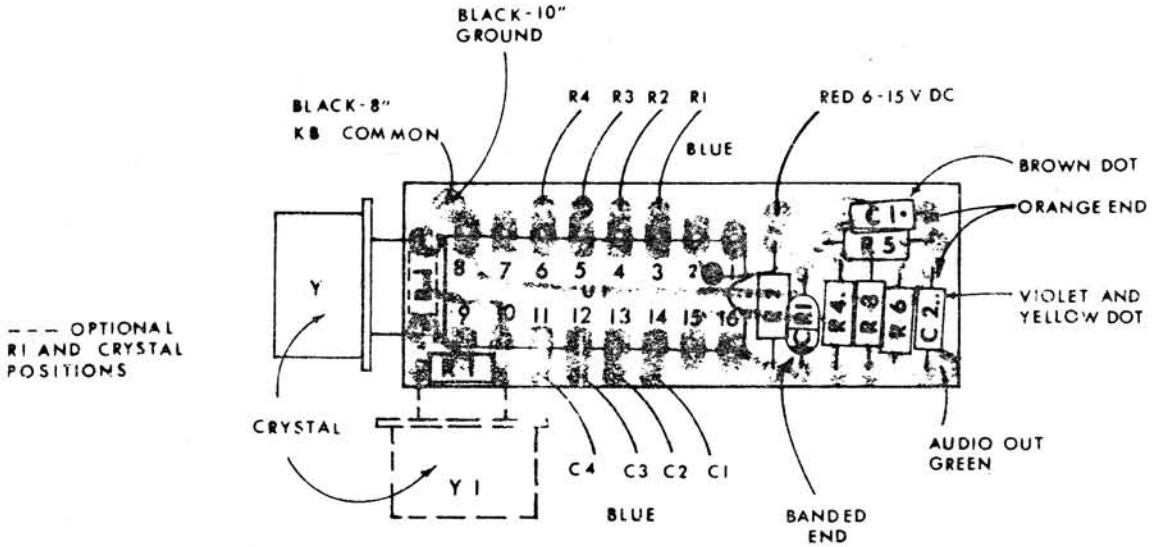
AUDIO HOOKUP--GREEN WIRE

The output audio for the encoder is set at a fixed level. Depending on the impedance that the unit must look into, these levels will change. In most cases, the high impedance audio output can interface directly to the audio input in parallel with the existing microphone. This connection is the simplest and easiest hookup. Once the green wire of your encoder is connected, check to see if it has loaded down or decreased normal voice deviation. If not, proceed to send tones and check the deviation level. If over-deviation (excessively loud tones) are noted, the drive can be reduced by connecting the green wire to a variable resistor and the variable resistor to the microphone circuit. With both the microphone and tone encoder in the circuit, adjust the variable resistor to a value where over deviation does not occur. Measure the value of the variable resistance and substitute a small fixed resistor in its place. If both the microphone and tone levels are low, it will be necessary to adjust the transmitter deviation control a bit to bring the levels up. Most of these checks can be performed on the air through a repeater or simplex with another person listening.

The Data Signal subminiature encoder is designed specifically to enhance or emphasize the high group tones. This is to allow the tones to enter the phone system which normally rolls off the higher tones due to the distributed capacitance of the phone line. However, some transmitter microphone circuits also exhibit roll off, especially on the low end of the low tone group. If dialing occurs normally for those numbers other than digits 1, 2 and 3, the 697 Hz. may be being attenuated by the microphone circuit. The solution would be to remove the low frequency roll off capacitance in the transmitter's microphone circuit or to decrease the value of the resistor from Pin 2 of the encoder. This value may be reduced down to 1K ohm to bring the low tone levels up. Adding resistance in parallel with the existing resistor is the easiest way.



SCHEMATIC DIAGRAM



COMPONENT LAYOUT

WARRANTY

The product covered in this manual is warranted to be free of defects in materials and workmanship for a period of 90 days from date of shipment. The unit has been factory tested and logged prior to release. This warranty is void if the unit is modified, subjected to excessive supply voltages or high RF fields, or if it is misused in any way. Any unit found to be defective must be returned to us within 10 days.

SQUARE SME MOUNTING INSTRUCTIONS

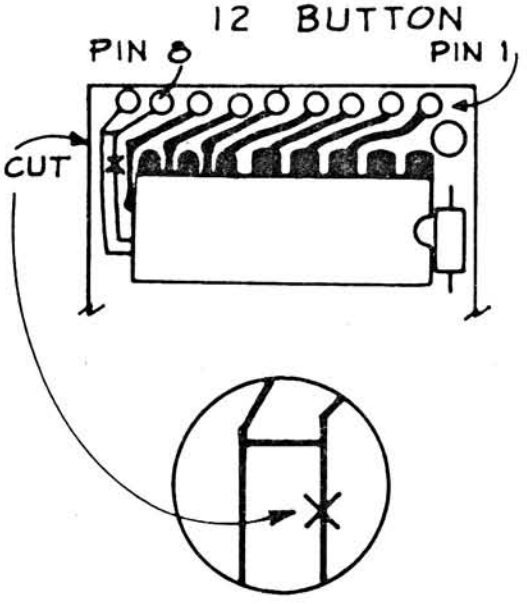
Refer to Section 3.0 of the SME Operating Manual and use the following instructions for assembly of the Square SME.

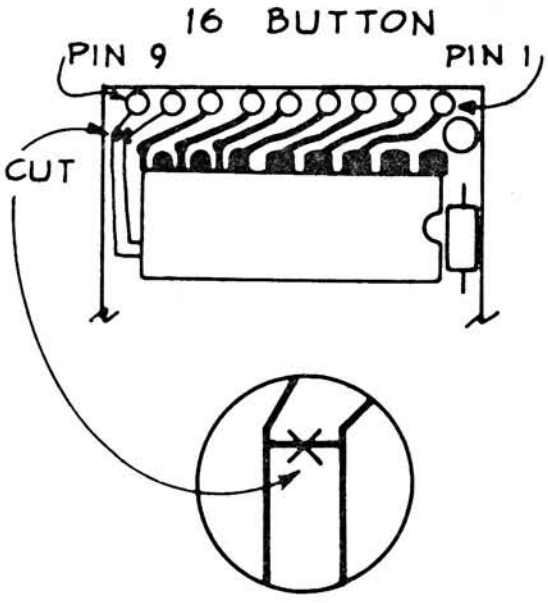
The Square SME Encoder is designed to mount directly to the DATA SIGNAL or Digitran 12 or 16 button keyboard. Therefore, to mount the encoder, place unit against the keyboard solder pads or pins and solder in place.

Since the square SME is designed for either the 12 or 16 button keyboards, a modification must be performed on each Square SME prior to connection to the keyboard. This modification is shown below:

Position the encoder as shown and cut the p.c. run accordingly.

NOTE: When the 12-button encoder is used, the number 9 pin is not connected.





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