Selectone

# Operating Instructions

## MODEL ST-801
## DTMF ANI ENCODER

Manual Number: M500-1860 October 3, 1988 Revision (88051)

## DESCRIPTION

The ST-801 is a subminiature DTMF Automatic Number Identification (ANI) encoder designed for installation in hand-held and mobile radios. Each time you press the radio push-to-talk switch, the ST-801 generates a sequence of DTMF characters to be displayed at a dispatch office or other control point to identify the transmitting station.

The ST-801 Encoder is intended primarily for use with SELECTONE Model ST-822 ANI Display Decoder at the control point, but can be used with other DTMF display units that use a start or synchronizing character at the beginning of the sequence and have compatible digit timing.

Because of our comprehensive warranty policy, field repair should not be necessary. If repair is unavoidable, all parts are clearly labeled on the diagram, and should be available through local component distributors.

Application notes are available or can be developed for most radio models. Please call us if you would like application details for a specific radio.<N>Together, we may be able to save you some time and money.

## WIRING INTERFACE

**Negative (-) Supply (BLACK):** Connect to system negative (-)supply (ground).

**Positive (+) Supply (RED):** Connect to system positive (+) supply, (5.5 to 25Vdc).

**PTT (BLK/YEL):** Connect in parallel with the PTT switch. This point must go to negative (-) supply to key the transmitter.

**Tone Output (WHT/GRN):** Connect in parallel with the microphone audio high input to the transmitter. See INSET "A" in the circuit schematic.

**MIC DIS (BLK/ORG):** Most newer radios use low impedance microphones with a preamplifier that is powered through the microphone high line. A 560 ohm resistor must be added and the MIC DIS wire connected as shown in INSET "A" in the circuit schematic to disable the microphone while the ST-801 is encoding.

## MOUNTING

The ST-801 is supplied with two Velcro strips for mounting so that it can be removed for programming and servicing. Apply the LOOP strip to the back of the PC board, and the HOOK strip on a clean, dry surface in the radio. Press firmly after mounting to ensure good contact of the adhesive. Do not touch the adhesive or attempt to re-position the strips after application.

## ADJUSTMENTS

**Output Level:**
Verify that the jumper in JU1 is connected from the center to pin "**B**". Plug a 12-button keypad (Selectone Model ST-903 or equivalent) into J1, oriented so that the three IC's are visible above the 1-2-3 row on the keypad. Alternate key strokes will now cause the ST-801 to key the transmitter and generate a tone pair as long as the key is pressed. Press the "**3**" button (if the transmitter does not key, release and press again) and, using an FM service monitor, set potentiometer R11 to obtain a peak deviation of 2.5 ±0.5 KHz.

*DTMF signaling will be unreliable if peak deviation exceeds 2/3 of system deviation (3.3KHz). If a repeater is used in the system, verify that DTMF modulation does not exceed 3.0KHz peak deviation at the repeater transmitter.*

**Transmit Delay Time:**
The ST-801 requires insertion of one or more delay characters ahead of the start character to provide the necessary delay time for the radio system. The delay character must not be the same as the start character. We recommend that "**0**" be used as the delay character. Assuming that a 4-digit ID is used, up to 11 zeros can be inserted before the start character, which will give a maximum delay of approximately 750 milliseconds. If this is not sufficient for your radio system, contact our factory for assistance.

Refer to the programming instructions. The delay time of the radio system can be determined quickly and easily if an ST-822 ANI Display is installed at the dispatch office. Configure the ST-822 sequence signal rate for the TEST mode.

Program the ST-801 with the sequence **0123456789**. Send this sequence and check the ST-822 ANI Display Decoder. The first digit to appear in the display is the minimum number of zeros required before the start character in order to display the ID number reliably when transmitting through the actual radio system (i.e., if **4** is the first digit in the display, then **4** zeros are required). Program the unit with one or two zeros more than this to allow a safety margin. You should then be able to use this delay for all ST-801 Encoders used with the same model of radio.

If an ST-822 is not available to be used in the TEST mode but otherwise available for displaying sequences from the ST-801, you will have to experimentally determine the minimum number of zeros that must be used before the start character. Program the ST-801 first with three zeros, send the sequence, then with four zeros, etc. until you find the ID sequence is displaying reliably. Then add one or two more zeros as a safety margin. You should have to do this process with only one encoder; all others in the system using the same type radios should require the same delay.

# PROGRAMMING

Before programming the ST-801, review the requirements of the display unit that will be decoding sequences from the ST-801. Especially, note what character is used as a start character and how many digits are used after the start character as the identification number.

To program a sequence in the ST-801, move the jumper at JU1 from "OPERATE" center to "B" to "PROGRAM" center to "**A**", then plug the 12-button keypad into J1 (Proper pad orientation places the pad over the battery). Press the "*****" once and then the "**1**" key to clear the unit. Next enter the number of zeros required for delay time as determined above, followed by the start character (to enter a "*****" or "**#**", the key must be pressed twice), and then the identification number. To store the entries, press the "*****" once followed by the "**1**" key. If an error is made while entering the sequence, press the "*****" once and then the "**1**" key, and begin the entry again. When the desired sequence has been stored, remove the keypad and place the JU1 jumper back to "OPERATE" center to "B". The ST-801 is now ready for operation.

# PARTS LIST

| SCHEM REF | DESCRIPTTION | PART NUMBER |
|---|---|---|
| BT1 | BATTERY, 2.9V Lithium 008-0001 | |
| C1-2 | CAP .1 uF Z5U 50V 20% | 028-1003 |
| C3 | CAP 10 uF TANT 16V 20% | 034-0000 |
| C4 | CAP 270 pF X7R 50V 10% | 026-2700 |
| C5 | CAP .01 uF X7R 50V 10% | 026-1002 |
| C6 | CAP 1 UF Z5U 50V 20% | 028-1004 |
| C7 | CAP .1 uF Z5U 50V 20% | 028-1003 |
| CR1-3 | DIODE 1N914 SILICON | 066-0000 |
| J1 | CONN 8 PIN FEMALE BERG | 056-0027 |
| Q1 | TRANSISTOR 2N6426 NPN DARL | 210-0001 |
| Q2-3 | TRANSISTOR 2N4401 NPN | 210-0000 |
| R1 | RES 6.8K 1/8W 5% CF | 146-6801 |
| R2 | RES 430K 1/8W 5% CF | 146-4303 |
| R3 | RES 220K 1/8W 5% CF | 146-2203 |
| R4 | RES 6.8K 1/8W 5% CF | 146-6801 |
| R5-6 | RES 100K 1/8W 5% CF | 146-1003 |
| R7 | RES 510 OHM 1/8W 5% CF | 146-5100 |
| R8-9 | RES 100K 1/8W 5% CF | 146-1003 |
| R10 | RES 27K 1/8W 5% CF | 146-2702 |
| R11 | POT 100K 1-TURN THIN | 111-0006 |
| R12 | RES 10K 1/8W 5% CF | 146-1002 |
| R13 | RES 100K 1/8W 5% CF | 146-1003 |
| R14 | RES 6.8K 1/8W 5% CF | 146-6801 |
| R15 | RES 130K 1/8W 5% CF | 146-1303 |
| R16 | RES 10K 1/8W 5% CF | 146-1002 |
| R17 | RES 100K 1/8W 5% CF | 146-1003 |
| R18 | RES 6.8K 1/8W 5% CF | 146-6801 |
| U1 | IC 74HC4053 TRIP ANA SWITCH | 088-0012 |
| U2 | IC MK5375 DTMF REP DIALER | 080-0034 |
| U3 | IC LM358 DUAL OP AMP | 085-0003 |
| VR1 | IC LM2931 5V REG. LOW VD | 086-0000 |
| XJU1 | CONN 3 PIN SIP | 167-0002 |
| XU1A&B | SOCKET 8 PIN SIP | 167-0007 |
| XU2A&B | SOCKET 9 PIN SIP | 167-0008 |
| XU3A&B | SOCKET 4 PIN SIP | 167-0003 |
| Y1 | CRYSTAL 3.579545 MHz | 058-0004 |

# OPERATING SPECIFICATIONS

| | |
|---|---|
| Operating Voltage: | 5.5 to 25Vdc |
| Operating Current: | Less than 1.6mA during standby<br>Less than 5.0mA during encoding |
| Operating Temperature: | Exceeds EIA spec. (-30º C to +60º C) |
| Signaling Format: | Standard DTMF - 12 characters |
| Sequence Length: | 1 to 16 characters |
| Signaling Rate: | 14.8 ±1 characters per second<br>49% tone on: 51% tone off ratio |
| Output Impedance: | Open circuit during standby;<br>400 ohms during encoding |
| PTT: | PTT transition from (+) supply to (-) supply nitiates encoding. Key output is open-collector Darlington, 250mA @ 24Vdc, energized for the duration of the encoded sequence. |
| Mic DIS Output: | Open-collector transistor, 100mA @ 24Vdc, energized for the duration of the encoded sequence. |
| Case Dimensions: | 1.5" L x 1.2" W x 0.44" H<br>(3.81 cm x 3.05 cm x 1.12 cm) |
| Interface: | 18" Flying leads |

## WARRANTY POLICY

All standard Selectone products are guaranteed to meet or exceed published performance specifications and are warranted against defects in material and workmanship for a period of five years from the date of purchase. Special configurations and non-standard systems are warranted for a period of one year.

If any standard Selectone product fails to operate within the first 90 days from the date of purchase, Selectone will immediately send a replacement unit post-paid via airmail or UPS Blue Label (air), and will issue full credit, including freight, upon the return of the defective unit(s). For special warranty replacement service , call Selectone Customer Service Department TOLL FREE at 1-800-227-0376. C.O.D. customers must return the defective equipment prior to exchange or will receive the replacement C.O.D. with credit issued only on the return of the defective equipment.

After 90 days, this warranty is specifically limited to correction of the defects by factory or replacement of faulty equipment or parts.

All warranty repairs must be performed at the Selectone factory in Hayward, California. No credit will be given for unauthorized repair work attempted by the customer. Any unauthorized alterations or modification of the equipment , damage external source, or removal or alteration the serial number label or date code, will void the warranty. Specifically exclude from this warrant are batteries, LED's, fuses, lamps, and damage caused by lightning, power surges, or mechanical abuse.

Equipment for repair may be returned to the factory without prior written authorisation: however, a note must be sent with the packing list briefly describing the nature of the defect.

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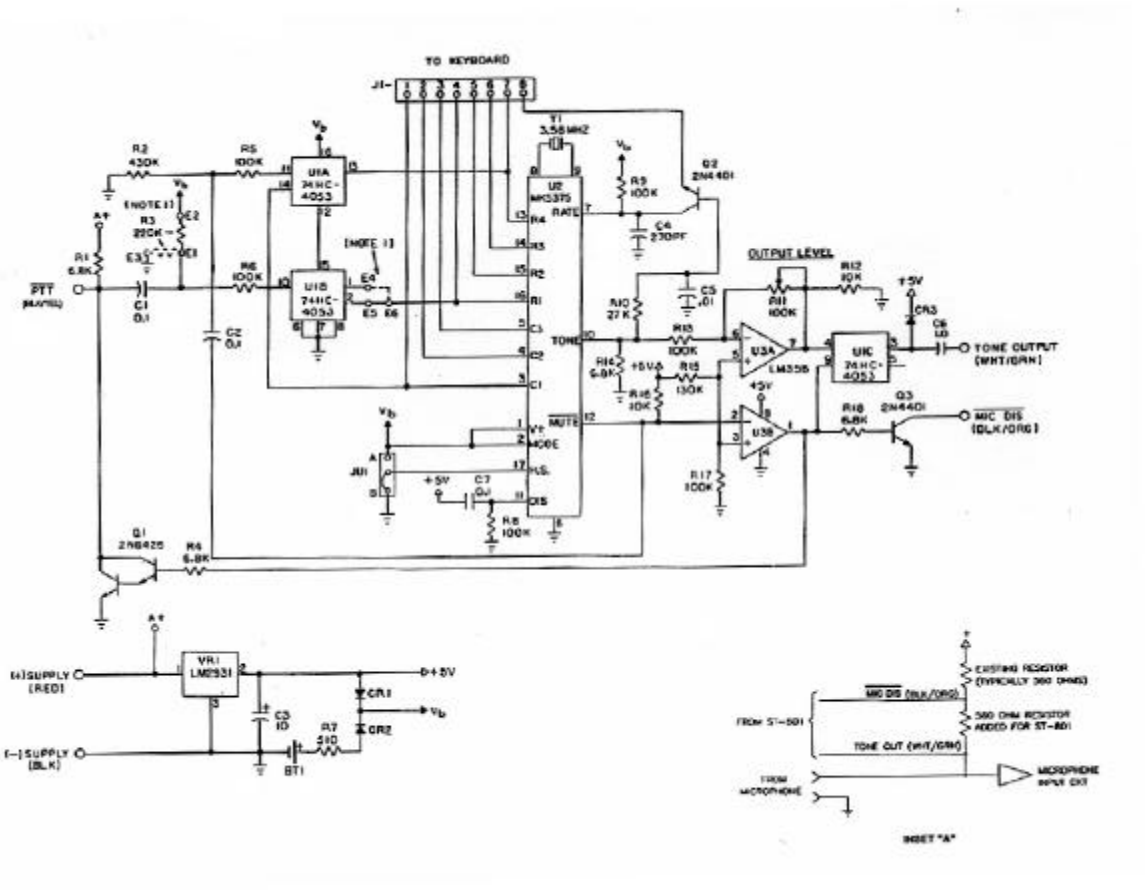


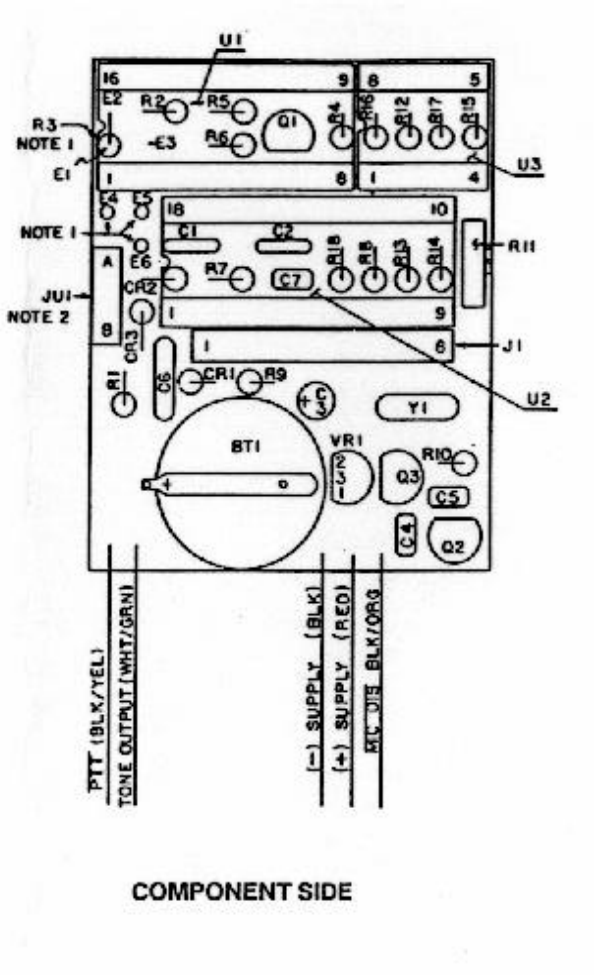


COMPONENT SIDE

**Notes:**

1. **If configured for ID at the end of PTT (OPTION 1), R3 is connected from E1 to E3 and E4 is connected to E6. The Trace between E5 and E6 must be cut.**
2. **PROGRAM = JU1 Center to A**
   **OPERATE = JU1 Center to B**

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