

GENERAL

The ST-803 is a microprocessor controlled, subminiature, ANI (Automatic Number Identification) encoder. The signaling format is DTMF (Dual Tone Multi-Frequency) and is intended for use with the Selectone Model ST-822 ANI decoder or a similar device. The use of surface mount construction techniques and microprocessor control provide the user with an ANI encoder that is both highly sophisticated and extremely small. Though the ST-803 is intended for use as a unit identification device for two-way radio applications, its small size and user programmability provide flexibility that allow it to be used in a multitude of other applications including; remote control, remote equipment status reporting, and many others limited only by the imagination of the prospective user. The device is field programmable using a keypad programmer purchased separately (ST-905).

ANI - Automatic Number Identification

The ST-803 is triggered by the operation of the PTT (Push-To-Talk) switch of a host two-way radio transmitter, the ST-803 responds by sending a sequence of DTMF digits on activation and/or on release of the PTT switch.

ENI - Emergency Number Identification

When triggered by an input signal separate from the ANI trigger, the ST-803 will key the host transmitter and send a second and independent sequence of DTMF digits. When properly programmed this sequence may be interpreted as an emergency code by the base station decoder. Once triggered, the ENI code will be sent repeatedly, or only once if JU5 is installed. With proper installation, the ST-803 is intelligent enough to merge the emergency transmission with other traffic on the radio channel without collision. It is also possible to program the ST-803 to provide a period of "open microphone" transmit time after the first ENI sequence. This feature can be useful to a dispatcher who is trying to determine the nature of the emergency that is being declared.

Microphone Muting

To prevent voice corruption of the ANI or ENI sequence, the ST-803 DTMF TONE OUTPUT is normally high impedance (500K), and switches to a low impedance (300 Ohms) during an ANI/ENI sequence. For non-powered microphones this will provide a low swamping load to effectively disable the microphone. For powered microphones an open collector output (MICROPHONE MUTE OUTPUT) which conducts to (-)SUPPLY during the ANI/ENI sequence is also provided. This output is used to deprive the microphone element of current disabling it during the ANI/ENI sequence.

Time-Out Timer

One of the many uses of the ST-803 is to prevent radio system abuse, not only by identifying abusers, but also by preventing a single user from monopolizing air time. The time-out timer included in the ST-803 can be programmed to limit the duration of any single transmission. When the limit time has been exceeded the transmitter will be turned off. The ST-803 then provides an alert tone which can be coupled to the receive audio section of the radio to notify a user that the transmission has been terminated.

SPECIFICATIONS

Operating Voltage: 5.2Vdc to 30Vdc
Operating Current: $\leq 6\text{mA}$ dc at all operating voltages

Inactive Open Collector

Output Sink Currents

All Outputs: $< .2\text{mA}$ with $V_{ce} \leq 25\text{Vdc}$

Active Open Collector

Output Sink Currents

PTT Output: $\geq 40\text{mA}$ dc $V_{ce} \leq .4\text{Vdc}$

Mute Output: $\geq 40\text{mA}$ dc $V_{ce} \leq .4\text{Vdc}$

Logic Output

Limit Timer Alert Tone

Inactive: HCCMOS output Logic LO with a 22K series resistor

Active: 2KHz square wave pulsed ON 500mS then OFF 500mS, HCCMOS output with a 22K series resistor

Tone Output Level: Adjustable 0 to $> 4\text{ V}$ p-p composite DTMF signal with $< \pm 1\text{dB}$ twist

Tone Output Impedance

Nonsignalling: $> 500\text{K}$

Signalling: $< 300\text{ Ohms}$

Input Logic Levels

PTT Input: Logic HI $\geq 3.4\text{Vdc}$, Logic LO $\leq .9\text{Vdc}$

ENI Activate Input: Logic HI $\geq 3.4\text{Vdc}$, Logic LO $\leq .9\text{Vdc}$

ENI Reset Input: Logic HI $\geq 3.4\text{Vdc}$, Logic LO $\leq .9\text{Vdc}$

BUSY Input: Logic HI $\geq 3.4\text{Vdc}$, Logic LO $\leq .9\text{Vdc}$

Size: 1.4"L x 0.83"W x 0.25"H
(0.20"H without connector)
36mm x 21mm x 6mm

INSTALLATION

IMPORTANT!!

The ST-803 comes packed in protective anti-static material. Do not remove the unit from the material until you are ready to install it. Electrostatic discharge can cause damage to the unit before you handle the card, please touch an unpainted metallic surface of the radio (ground).

While it is possible to program the ST-803 after physical installation in the radio it is recommended that you program the unit before installation. Refer to the PROGRAMMING section of this manual for complete programming instructions.

MOUNTING

Use of a double-sided adhesive pad eliminates hardware requirements. Mount the unit on a clean, dry surface, oriented to allow easy routing of the wiring to the radio. Press firmly after mounting to ensure good adhesive contact. Do not touch the adhesive or attempt to re-position the unit after mounting. If use of the adhesive pad is not practical, we have included a length of polyester tubing which may be used to insulate the unit from contact with other parts of the radio. The product has been designed for maximum immunity to RF interference. However, you should locate the unit as far as possible from the radio's RF power stages. To further minimize RF problems, twist the leads together and maintain all leads at minimum length.

INTERFACE TO THE RADIO

Interface to the host radio is made using a thirteen wire, color coded cable. This cable includes a subminiature connector to allow easy field programming or unit replacement as required. The electrical interface of the ST-803 is relatively simple and can be accomplished easily by a two-way radio service technician familiar with the host radio. Selectone also has application notes providing detailed installation instructions for many different radios. If you have any doubt as to where to connect the ST-803 to your particular radio give us a call. Our application staff is happy to provide whatever help you may need.

The following interface suggestions organize the installation of wires into **ESSENTIAL**, **OPTIONAL**, and **NOT USED** groups. If trouble is encountered during the installation of the device the unit should perform its basic functions with only the essential wires connected. Once basic operation is established the optional wires can be added one at a time to test the operation of the optional features.

ESSENTIAL CONNECTIONS

[3] POSITIVE (+) SUPPLY (RED)

Connect to (+) supply (5.5 – 30Vdc), or to regulated +5Vdc ($\pm 10\%$) if required. (See the JUMPER OPTION TABLE for +5Vdc operation).

[9] NEGATIVE (–) SUPPLY (BLACK)

Connect to system (–) supply (GND).

[6] PTT INPUT (YELLOW)

Connect to the transmitter PTT switch.

[13] DTMF TONE OUTPUT (WHT/GRN)

Connect to the microphone audio amplifier as shown in the MODIFIED MICROPHONE CIRCUIT drawing.

[10] PTT OUTPUT (BLK/YEL)

If the LIMIT TIMER function is not required connect this wire to the same point the PTT INPUT is connected. To avoid continuous transmitter keying the LIMIT TIMER function will have to be programmed to "OFF". Consult the programming section of this manual to make this setting.

If the LIMIT TIMER function is to be used, the ST-803 must be placed in series with the PTT signal from the PTT switch. Break the existing connection from the PTT switch to the transmitter. Connect this lead to the transmitter keying circuit.

OPTIONAL CONNECTIONS

[4] MICROPHONE MUTE OUTPUT (WHT/ORG)

Connect to the microphone element current limiting resistor as shown in the MODIFIED MICROPHONE CIRCUIT drawing. Radios using dynamic microphones should not require use of this lead. Call Selectone for assistance if you are uncertain how to make this connection. **This connection is required in service but is optional for the purposes of troubleshooting during installation.**

[12] ENI ACTIVATE INPUT (GREEN)

Connect to a momentary switch closure to ground that signals the presence of an emergency situation. An example would be a hidden foot switch for use in case of a robbery. **Necessary only if the ENI feature is used.**

[11] ENI RESET INPUT (BLUE)

Connect to a momentary switch closure to ground that signals the resolution of an emergency condition. The PTT INPUT signal from the microphone also performs this function. **Necessary only if the ENI feature is used and an alternative reset method other than microphone PTT is required.**

[1] TIME OUT ALARM TONE OUTPUT (WHT/BLU)

Connect to the input of the receive audio power amplifier. This connection assumes that it is downstream of the squelch muting point and feeding a powered audio stage. Necessary only if the time-out timer feature is used and may not be feasible at all in some radios.

[5] CHANNEL BUSY INPUT (BLK/ORG)

Connect to the output of the squelch control circuit (not CTCSS decode). This should be a signal which transitions from less than 0.9Vdc to greater than 3.4Vdc when the squelch opens and closes. Do not connect to a point that is coupled to the audio path. This point should signal the presence of carrier (busy) on the radio channel regardless of CTCSS tone. Polarity of the signal whether from high to low or low to high can be set with JU4 (see the JUMPER OPTION TABLE). **Connection is necessary only if ENI, carrier sensing collision avoidance, is required, but must be accounted for during programming.**

CONNECTIONS NOT USED IN RADIO INSTALLATION

[2] PROGRAMMING DATA INPUT/OUTPUT (VIOLET)

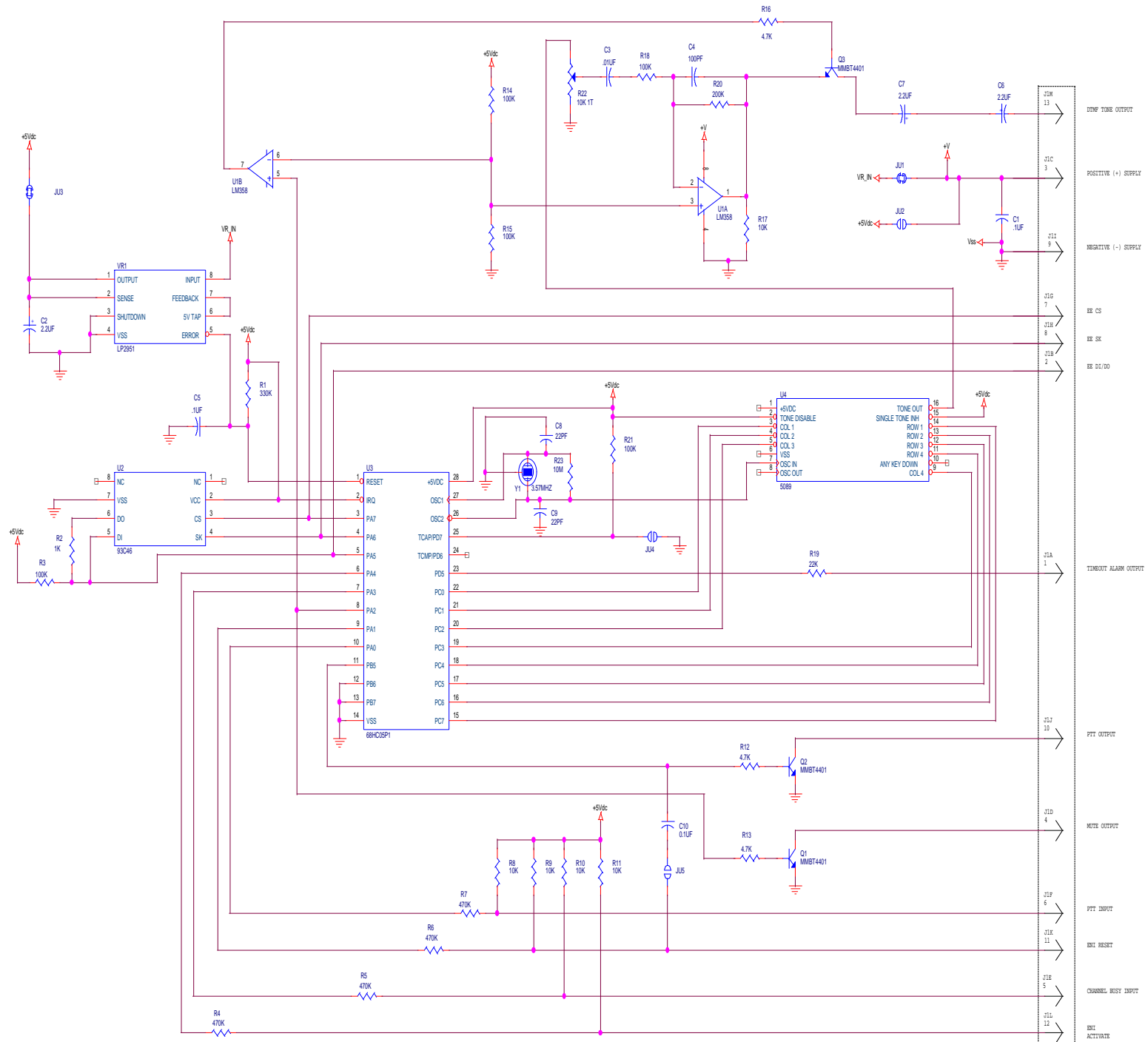
This connection is made only to the ST-905 programming keypad and is not used in the radio installation.

[8] PROGRAMMING CLOCK INPUT (BLK/BRN)

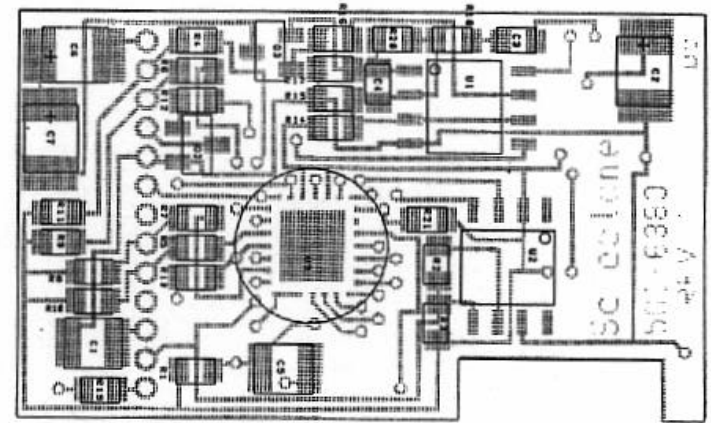
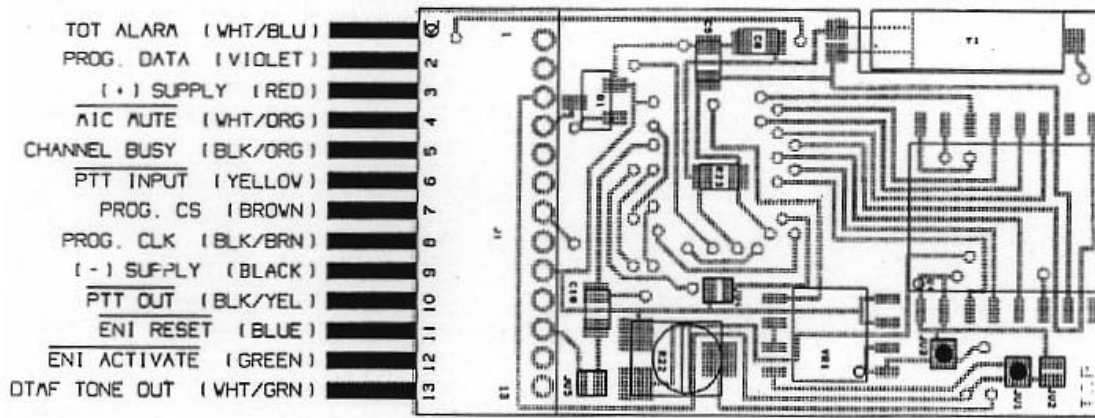
This connection is made only to the ST-905 programming keypad and is not used in the radio installation.

[7] PROGRAMMING CHIP SELECT INPUT (BROWN)

This connection is made only to the ST-905 programming keypad and is not used in the radio installation.

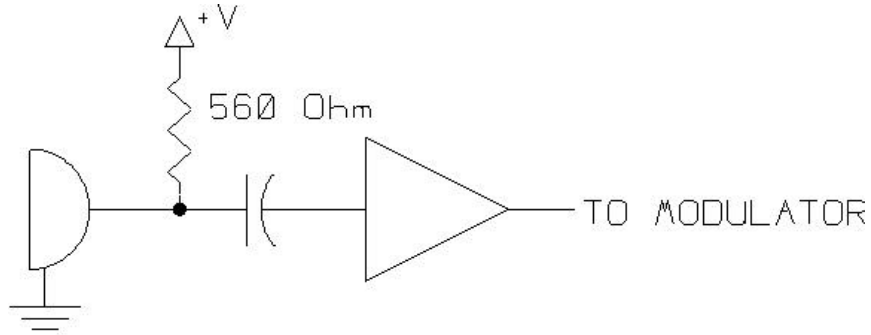


COMPONENT LOCATOR

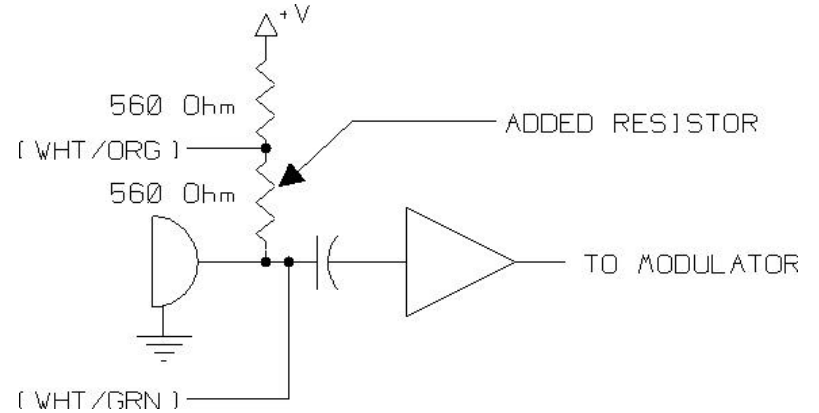


MICROPHONE AUDIO MUTING

EXISTING MICROPHONE CIRCUIT



MODIFIED MICROPHONE CIRCUIT



SOLDER JUMPERS

Due to the small size of these boards, application characterization is accomplished by small solder jumper pads. Jumpers should be installed only when power is off. Use a fine tip solder iron (600°-700°F) with a grounded tip to place a small dab of solder on the pad. A clean tip on the same iron will easily remove a jumper.

JUMPER OPTION TABLE

POWER SUPPLY VOLTAGE >+5.2 Vdc	JU1 - SHORT JU2 - OPEN JU3 - SHORT
POWER SUPPLY VOLTAGE =+4.8 TO 5.2 Vdc	JU1 - OPEN JU2 - SHORT JU3 - OPEN
ENI REPETITION SENT REPETITIVELY UNTIL RESET SENT ONLY ONCE	JU5 - OPEN JU5 - SHORT

Table #1

ADJUSTMENTS

Set R22 to produce ± 3.0 KHz of modulation during the transmission of a DTMF sequence.

PROGRAMMING

Field programming is accomplished with either the ST-907 PC Based Programmer or the ST-905 Keypad Programmer.

The ST-907 PC Based Programmer uses the DOS program *ST-CONFIG*. All necessary hookup and programming information is provided on screen when the program is executed.

The ST-905 Keypad Programmer is used to program a number of Selectone products. All programming information required to use the ST-905 to program the ST-803 is contained in THIS MANUAL.

ST-905 HOOKUP and PROGRAMMING

- At the 13 pin connector, disconnect the ST-803 from its radio application connection cable.
- Connect the Red and Black lead of the Keypad programmer (ST-905) to a 6 to 18Vdc power source, Red to (+), Black to (-) (a 9Vdc Transistor Radio Battery is a usable power source).
- On the ST-905 press each of the keys 1,2,3,4,5,6,7, 8,9,0,*,#,A,B,C,D. This sequence will initialize the ST-905 and MUST be done once each time the ST-905 is powered-up for use with the ST-803.
- Connect the Programming Cable supplied with the ST-905 Keypad Programmer to the ST-905 then to the ST-803. Power is supplied to the ST-803 via the programming cable.
- The ST-803 is now ready to program.

Programmable Feature Descriptions

The PROGRAMMING TABLE summarizes the features that can be field programmed. The table lists the EEPROM storage register, the programmable feature, the value that is programmed as a factory default, and the minimum and maximum values permitted for programming. During programming, any character on the ST-905 Keypad Programmer (1 2 3 4 5 6 7 8 9 0 * # A B C D) may be used. Enter your sequence then press [*#] (*and # **simultaneously**) followed by the EEPROM storage number. The LED on the top ST-905 will activate immediately on the first key press. It will deactivate after about three seconds of no key presses or immediately following the release of the EEPROM storage register key. This LED is a keypad activity indicator and entries made while it is active may be stored in EEPROM.

PROGRAMMING TABLE

REG. #	FEATURE	DEFAULT	MINIMUM	MAXIMUM
1	PREFIX ANI CODE	UNPROGRAMMED	NONE	15
2	ENI CODE	UNPROGRAMMED	NONE	15
3	TRANSMIT DELAY TIME	150 ms	0 mS	9999 mS
4	TONE-ON TIME	35 mS	35 mS	999 mS
5	TONE-OFF TIME	15 mS	15 mS	999 mS
6	ENI RE-TRANSMIT DELAY TIME	30 Sec.	1 Sec.	300 Sec.
7	ENI TALK WINDOW TIME	0 Sec.	0 Sec.	100 Sec.
8	ANI HOLD-OFF TIME	0 Sec.	0 Sec.	300 Sec.
9	ANI HOLD-OFF COUNT	5 Transmissions	0	16
0	TRANSMIT LIMIT TIME	120 Sec.	0 Sec.	600 Sec.
*	SUFFIX ANI CODE	NONE	NONE	15

Table #2

The following paragraphs describe the programmable features. After each feature is programmed by the keypad programmer, the new programming information will be stored in the non-volatile EEPROM. At the end of the programming session, disconnect the ST-803 from the programming cable and reconnect to the radio application cable.

Restoration Of Default Parameters

If, in the process of learning how to program the ST-803, either you or the ST-803 become hopelessly confused, it is possible to return the ST-803 to its factory default settings by pressing [*] then [#] then [*] then [#] and then [*#] together. The keypad active indicator will turn OFF immediately on release of the [*#] combination.

REGISTER 1 - PREFIX ANI CODE

This memory register stores the PREFIX ANI CODE that will be sent at the beginning of each transmission. Once triggered, the ST-803 will hold the transmitter keyed long enough to send the entire ANI sequence even if the activation of the PTT input was only momentary. *For this register, if no entry is made before the [*#][1] sequence is entered, the register location will be cleared.*

REGISTER 2 - ENI CODE

Sent upon activation of the ENI input. The ENI CODE will be sent repeatedly until reset by a high to low voltage transition on either the PTT or ENI RESET inputs to the ST-803. *For this register, if no entry is made before the [*#][2] sequence is entered, the register will be cleared*

REGISTER * - SUFFIX ANI CODE

Sent at the "END" of each transmission. This code is programmed in the same way as the PREFIX ANI CODE and may be used together with, or instead of, the PREFIX ANI CODE. It can be the same code or a different code according to the preference of the user.

For this register, if no entry is made before the [#][*] sequence is entered, the register location will be cleared.*

IMPORTANT! *If you are using a Selectone ST-822 Desktop ANI/ENI Decoder, you must add an ANI PREFIX DIGIT or ANI ALARM PREFIX (ENI) to the beginning of the ANI code. The ST-822 uses the PREFIX DIGIT, both for validation and to determine the nature of the code sequence, whether ANI or ENI. For the ST-803 and ST-822 to work properly together, the ST-803 must be programmed to encode the same PREFIX DIGIT as the ST-822 is expecting to receive. For example; if you chose * as your PREFIX DIGIT to represent a normal ANI condition for the ST-822, and the required ANI code was 1 2 3 4, you would enter [*][1][2][3][4][*#][1].*

REGISTER 3 - TRANSMIT DELAY TIME

This is the duration in milliseconds of the silent delay from activation of the PTT input until the ST-803 begins encoding the ANI or ENI sequence. This time is used to accommodate delays inherent to a particular system (repeater attack time, CTCSS decode time).

REGISTER 4 - TONE-ON TIME

TONE-ON TIME in milli-seconds of each digit to be encoded. One divided by the duration of TONE-ON plus the duration of TONE-OFF [$1 / (T-ON + T-OFF) = \text{SIGNALLING RATE}$] equals the signalling rate in digits per second. The programmed signalling rate of the ST-803 must not exceed the maximum signalling rate of the decoder that is to be used.

REGISTER 5 - TONE-OFF TIME

TONE-OFF TIME in milli-seconds of each digit to be encoded. One divided by the duration of TONE-ON plus the duration of TONE-OFF [$1 / (T-ON + T-OFF) = \text{SIGNALLING RATE}$] equals the signalling rate in digits per second. The programmed signalling rate must not exceed the maximum signalling rate of the decoder that is to be used.

NOTE: *The factory default settings for tone-on and tone-off time will produce a signalling rate of 16 digits per second.*

REGISTER 6 - ENI RE-TRANSMIT DELAY TIME

Delay between each ENI transmission attempt. After sending the initial ENI sequence, the ST-803 will wait for the duration of the RE-TRANSMIT DELAY before attempting to transmit ENI again. To avoid transmission collisions of two units in emergency status, the ST-803 will randomly delay for an additional time period equal to one ENI transmission sequence. If the ST-803 determines that the radio channel is busy (based on the condition of the C.O.S. SIGNAL INPUT), when the ENI RE-TRANSMIT DELAY TIME has expired it will wait until the channel is clear before transmitting the ENI sequence possibly randomly delayed to avoid a collision.

REGISTER 7 - ENI TALK WINDOW TIME

Duration in seconds of "open microphone" time following the transmission of the first ENI transmission. This feature allows a dispatcher to listen momentarily to the sounds at the site of the emergency and possibly gain some inkling of what is wrong without the help of the party in distress.

NOTE: *Microphone wiring may need modification to insure open Mic when PTT operates.*

REGISTER 8 - ANI HOLD-OFF TIME

Time in seconds that will elapse after activation of PTT causing an ANI sequence before PTT will cause another ANI sequence. This feature is used together with ANI HOLD-OFF COUNT to minimize the amount of air time lost to ANI if it is not absolutely necessary to send ANI with every transmission. If a transmission runs longer than the hold-off timer setting, ANI will be sent at the beginning of the next transmission if PREFIX ANI is used and at the end of the current transmission if SUFFIX ANI is used. If all transmissions are short, the ANI HOLD-OFF COUNT will likely elapse before the ANI HOLD-OFF TIME causing a normal suffix or prefix ANI data burst to be sent.

REGISTER 9 - ANI HOLD-OFF COUNT

Maximum number of transmissions to be made before ANI data is again transmitted. This feature is used together with ANI HOLD-OFF TIME to minimize the amount of air time lost to ANI if it is not absolutely necessary to send ANI with every transmission. If a transmission runs longer than the hold-off timer setting, ANI will be sent at the beginning of the next transmission if PREFIX ANI is used and at the end of the current transmission if SUFFIX ANI is used. If all transmissions are short, the ANI HOLD-OFF COUNT will likely elapse before the ANI HOLD-OFF TIME causing a normal suffix or prefix ANI data burst to be sent.

REGISTER 0 - TRANSMIT LIMIT TIME

Duration in seconds the ST-803 will permit for any single transmission. If a microphone gets stuck or the radio system is subject to abuse from long winded users, the ST-803 terminate any transmission that exceeds the duration of this timer. After the transmission ceases, the ST-803 will encode a warning from the TIME-OUT TIMER ALARM OUTPUT to signal the user that his transmission has ceased. Release of the PTT signal will reset the timer and permit another transmission.

In applications where the transmit limit timer may not be applicable, PTT input & output are generally tied together. This allows the ST-803 to hold the transmitter keyed for the duration of the ANI sequence even if the PTT INPUT is of short duration. To eliminate continuous keying of the transmitter by the output of the limit timer circuit, program the transmit limit time to 0 Sec. this will disable the timer.

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 one year from date of purchase. Special configurations and nonstandard systems are also 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 postpaid via airmail or UPS Blue Label (air), and will issue full credit, including freight, upon the return of defective unit(s). For special warranty replacement service, call the Selectone Customer Service Department TOLL FREE at 1-800-227-0376. C.O.D. customers must return defective equipment prior to exchange or will receive the replacement C.O.D. with credit issued only on return of the defective equipment.

After 90 days, this warranty is specifically limited to correction of the defects by factory repair 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 alteration or modification of the equipment, damage by external sources, or removal or alteration of the serial number label or date code, will void the warranty. Specifically excluded from this warranty 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 authorization; however, a note must be sent with the packing list briefly describing the nature of the defect.

Selectone

Selectone Corporation 3501 Breakwater Ave.

Hayward, Ca. 94545 (510) 781-0376

NATIONWIDE TOLL FREE: (800) 227-0376

FAX: (510) 781-5454 Email admin@selectone.com