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- ANI Systems
- Voice Encryption Modules
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- Tone Signaling Boards

Manual # 600-1701

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USER'S GUIDE FOR INSTALLATION AND OPERATION

MODEL ST-025BGP

Mobilecall® Voice Encryption Module

For use in Motorola GP300, GP88, P110, and
P110-5T (European Version) Transceiver

TABLE OF CONTENTS

GENERAL	2
SPECIFICATIONS	2
OPERATION	2
DOUBLE CLICK MODE	2
TRANSMIT DELAY	2
USER CODE KEYS	3
INSTALLION	3
FIGURE 1	3
GP300, P110, **(GP88, P110-5T) FIGURE 2A (UHF)	4
GP300, P110, **(GP88, P110-5T) FIGURE 2B (VHF)	4
FIGURE 3* -	5
GP300, P110, **(GP88, P110-5T)	5
FIGURE 4A (UHF).....	5
GP300, P110, **(GP88, P110-5T) FIGURE 4B (VHF).....	6
ADJUSTMENTS	6
GENERAL:	6
SETTING THE SYNCHRONIZATION LEVEL:	6
WIRE SIGNAL DESCRIPTIONS	6
SCHEMATIC	7
COMPONENT LOCATOR	8
DISCLAIMER	8
WARRANTY POLICY	ERROR! BOOKMARK NOT DEFINED.

GENERAL

The ST-025BGP is an ST-025B voice encryption device with additional application components and instructions for use with the Motorola Radius Model GP300 Transceivers. It is used to secure two way radio communication systems. The cipher process uses a proprietary microprocessor controlled digital scrambling algorithm. Each unit can be programmed with four User Code Keys, with over 4 billion code keys to choose from. Special factory set master code key groups are reserved to provide extra security for special services. Each master code key group has over 268 million possible code keys. To maintain security, code keys are never transmitted. Audio processing filters provide high quality low distortion recovered audio.

☞ **Note:** This manual is intended for use in place of the manual provided with the ST-025B.

☞ **Note:** The ST-025BGP cannot be used in a radio with a DTMF keypad option.

SPECIFICATIONS

Specification	Detail
Encryption:	32 bit algorithm
Operating Voltage:	5.2 Vdc to 16.3 Vdc
Operating Current:	< 8mA _{dc}
User Code Keys:	Greater Than 10 ¹² or 1
Cipher Algorithm:	Real Time Frequency
Synchronization:	Initial and Maintenance
Usable Audio Level	25 mV p-p to 2.0 V p-p
Input to Output	< ± 1 dB
Frequency	300 Hz to 2600 Hz
Temp: Range:	0° C to 70° C
Interface:	18" flying leads terminated in a 13 pin connector.
Size:	0.90" W X 1.50" L X 0.18" H 22.8mm X 38.1mm X 4.6mm

Specifications are subject to change without notice.

☞ **Note:** Operation of radio equipment with encrypted speech capability may be government regulated. You are responsible for compliance with applicable radio regulations regarding operation of this equipment.

OPERATION

Operation is almost transparent to the user. The user may select any one of 4 previously programmed code keys. The user then enables or disables the transmit cipher mode. Once enabled all subsequent transmissions will be ciphered using the selected

code key. Ciphered reception is automatic; other units transmitting with the selected code key will be automatically deciphered. Clear transmissions will also be received automatically.

DOUBLE CLICK MODE

The ST-025B must be programmed for this mode. This mode of operation is enabled during programming. The Clear/Ciphered line is connected to the option 2 switch. The user can toggle between Clear/Ciphered by operating the switch two times in rapid succession (Double Clicking). The ST-025B will then provide a tone output to the radio speaker. A high frequency beep or series of beeps indicate subsequent transmissions will be Ciphered. A low frequency tone for .5 Sec. indicates subsequent transmissions will be in the Clear (NOT Ciphered).

User Code Keys are selected by operating the same switch [option 2] four times in rapid succession (Quad Clicking). Quad Clicking permits switching between User Code Keys when in the transmit Cipher Mode (Double Click selection). Each Quad Click transaction advances the selected User Code Key one step around a loop of possible selections (Primary, Alt #1, Alt #2, Alt #3, Primary...). Following a Quad Click sequence the ST-025B responds with speaker beeps to indicate the selection position (Primary: 1 Beep, First Alt: 2 Beeps, Second Alt: 3 Beeps, Third Alt: 4 beeps). When returning to cipher mode from clear mode, the last used User Code Key will be selected and indicated with speaker beeps. Following power-up Cipher operation will select the Primary User Code Key.

Transmit DELAY

All radio systems have an operating delay. This is the time between PTT activation at a transmitter and speaker audio being available at the receiving point. This time may vary considerably from system to system or even from transmission to transmission. For reliable cipher operation the ST-025B must wait for this time period before signaling the beginning of a ciphered transmission. System delays must be evaluated and accommodated for with the INITIAL SYNCHRONIZATION DELAY parameter.

For many radio operators it is difficult to reliably know how long to wait before speaking in ciphered mode. This can cause loss of the beginning of a message. The ST-025B can be programmed to accommodate this problem. For cipher transmissions the ST-025B will provide all the necessary timing and beep the speaker as a "GO AHEAD" and speak indication.

USER CODE KEYS

Of the more than 268 million available code keys, four may be selected and easily accessed as User system (officers, sergeants, lieutenants, captains).

Setup and Programming

Other than level setting, all customization is accomplished with Selectone Product Manager a Microsoft Windows based program. During installation all units MUST be connected to the Selectone Program Manager. The Microsoft Windows based program is fully documented with an on line manual, accessed through the help menu. The online manual provides advantages in that corrections and upgrades can be immediately

Code Keys for each unit. These may be used to provide different levels of security within a particular radio

accessed via the Selectone Web page on the Internet at www.selectone.com.

The ST-25 Product manager is launched from the Select.one directory as ST25.exe. As a default, com port #1 is used. To select com port #2 use ST25.exe /2 as the launching command.

Note: The security of your system depends on the secrecy of your code keys. For secure operation we recommend changing your code keys often.

INSTALLATION

1. Program the following for the ST-025B
 - Tx Alert on
 - Operating mode - double click
 - 4 cipher codes - your secret codes
 - Install a 33K resistor at R4, R21, R28, & R35
2. Open the transceiver.
3. Remove the foam rubber pad from the inside of the front cover.
4. Use the supplied double-stick foam adhesive tape to mount the ST-025B with the cable assembly onto the metal case as shown in FIGURE 1.

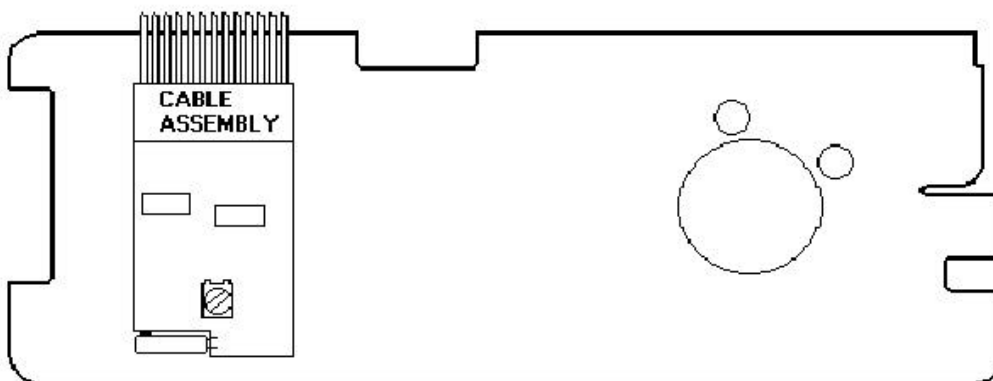
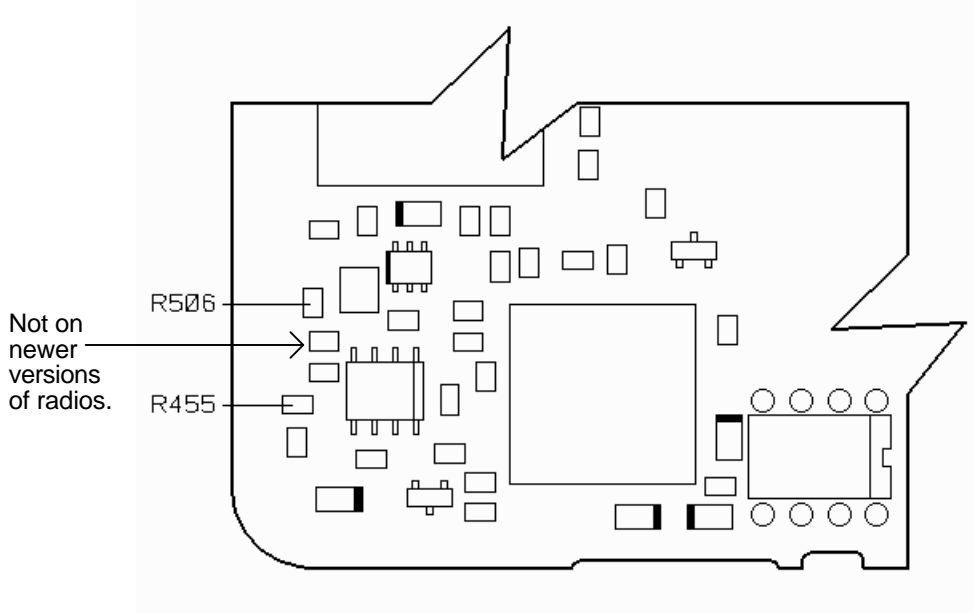


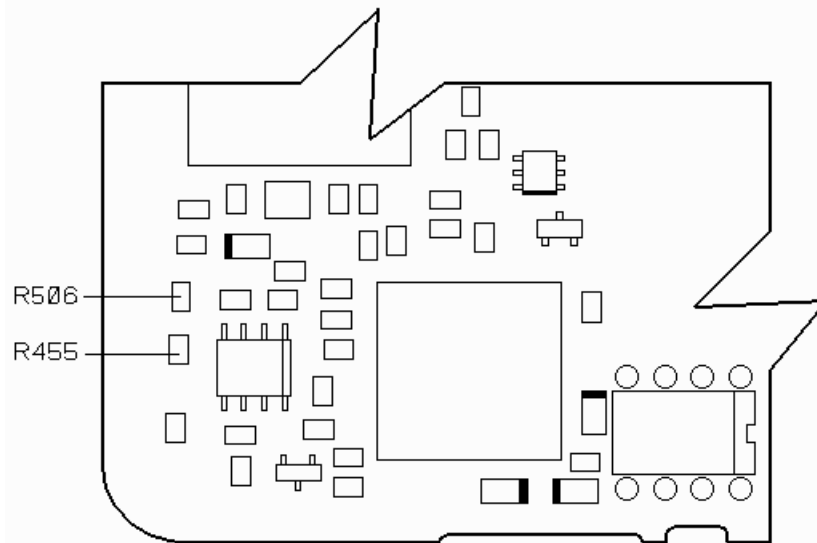
FIGURE 1

5. Remove the metal case from the transceiver main board by unclipping the four spring clips.
6. On the back side of the transceiver main board (the side towards the battery pack), remove R455 and R506, see FIGURES 2a and 2b.



GP300, P110, *(GP88, P110-5T)

FIGURE 2a (UHF)



GP300, P110, *(GP88, P110-5T)

FIGURE 2b (VHF)

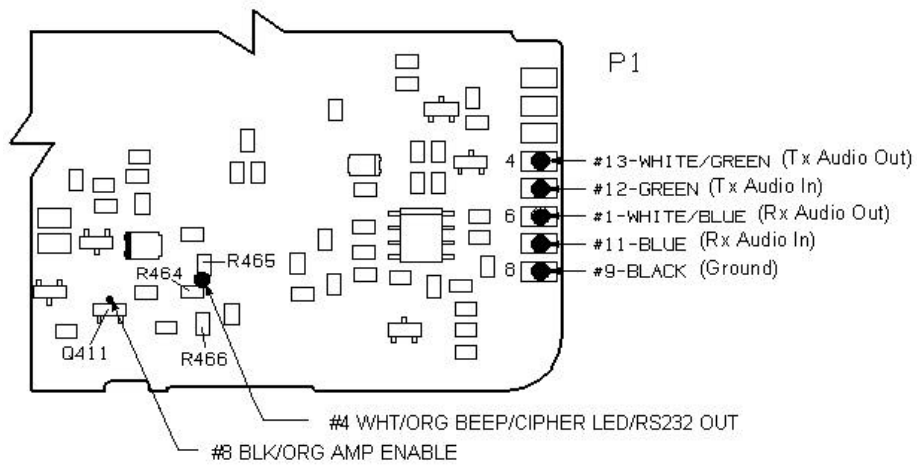
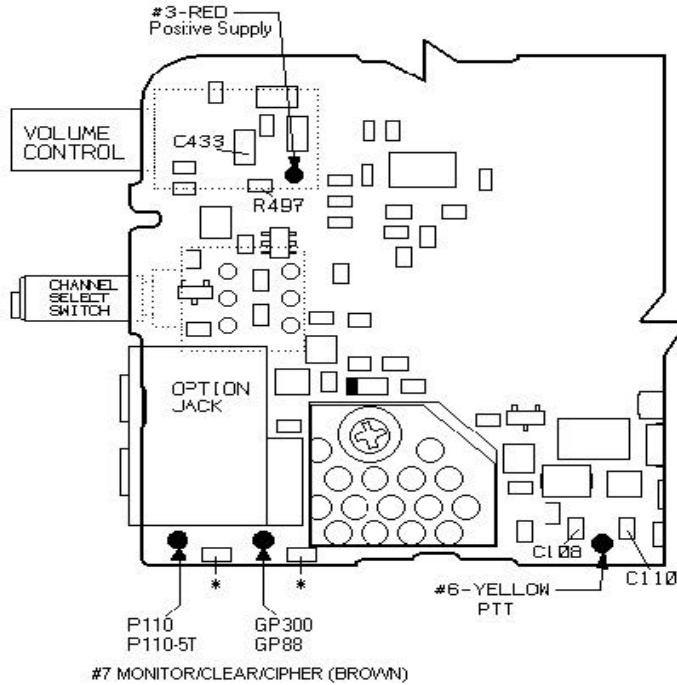
** May vary slightly

7. Five wires wrap around the end of the metal case and go to points that are normally covered by the metal case. Wrap the five wires around the end of the metal case and attach them to the transceiver main board as shown in FIGURES 3, 4a, and 4b. The wires should pass through the notch of the case.

- Red
- Black/Brown
- Yellow
- White/Orange (add the supplied 1.2M resistor in series with this lead).
- Brown

FIGURE 3* -

Capacitors may not be on older version boards, may vary slightly.



GP300, P110, *(GP88, P110-5T)

FIGURE 4a (UHF)

**GP300, P110, *(GP88, P110-5T)
FIGURE 4b (VHF)**

** May vary slightly

8. Reattach the metal cover to the transceiver main board.
9. Attach the remaining five wires to P1 as shown in FIGURE 4. The wires should be as short as possible to prevent them from binding as the radio is reassembled.
 - White/Green (add the supplied 24K resistor in series with this lead)
 - Green
 - White/Blue (add the supplied 30K resistor in series with this lead)
 - Blue
 - Black

ADJUSTMENTS

General:

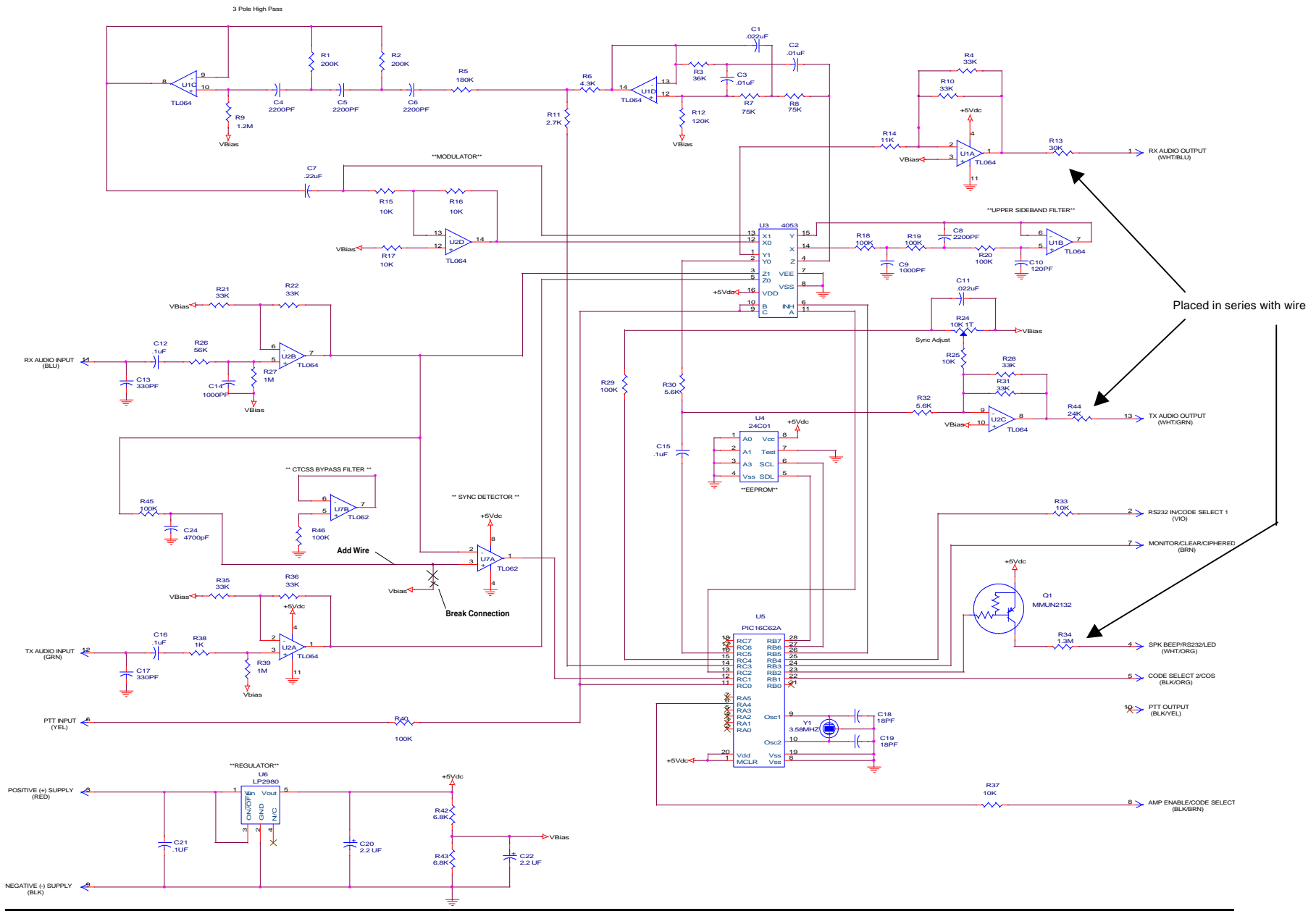
During cipher transmissions the ST-025B transmits synchronization information approximately twice per second. This signal carries no coding information but is necessary for proper operation. The level is set at the factory but should be verified in the radio.

Setting the synchronization level:

1. Attach a fully charged battery to the transceiver assembly.
2. Power on the radio, you should hear a long beep indicating clear mode.
3. Double click the option 2 Control button, you should hear a short beep to indicate cipher mode.
4. Using a service monitor with an oscilloscope display, press PTT and adjust R10 on the ST-025B for ½ system deviation (Readings made with a deviation meter may not accurately measure the intermittent synchronization burst signal).
5. Note: Keep the length of transmission as short as possible because there is no antenna.
6. Remove the battery from the transceiver assembly.
7. Close the transceiver covers. Be careful that no wires are pinched as the transceiver assembly is pushed into the case.

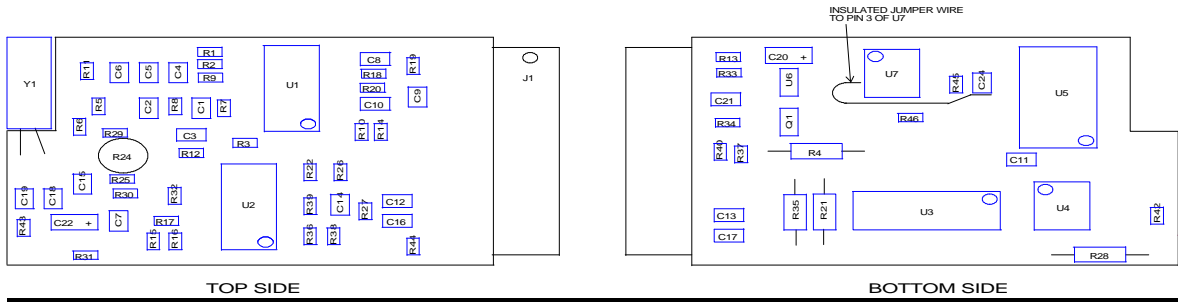
WIRE SIGNAL DESCRIPTIONS

Pin #	Signal Name	Wire Color	Signal Description
11	Rx Audio In	Blue	no RF, noise ~1 Vpp
1	Rx Audio Out	White/Blue	no RF, noise ~0.5 Vpp
12	Tx Audio In	Green	Mic audio, ~0.2 Vpp (PTT pressed)
13	Tx Audio Out	White/Green	Mic audio, ~0.2 Vpp (PTT pressed)
6	PTT	Yellow	+5Vdc, PTT released 0Vdc, PTT pressed
3	Positive Supply	Red	Vcc, ~7.5 volts
9	Negative Supply	Black	Ground, 0Vdc
8	Audio Amp Enable	Black/Brown	normally +7Vdc, 0Vdc during alert tone
4	Alert Tone	White/Orange	normally ground +5 volt square wave during alert tone
7	Clear/Cipher Input	Brown	+5Vdc with Control button opt 2 released 0Vdc with Control button opt 2 pressed



SCHEMATIC

COMPONENT LOCATOR



NOTE: Export of this product is under the jurisdiction of the U.S. Department of Commerce. An Export License is Require.

Disclaimer

This is the installation procedure for Selectone equipment based on the best information available to us at the time of publication. Selectone assumes no responsibility for the accuracy of the information or the damage to equipment resulting from the use of this procedure.

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 out a replacement unit and will issue full credit, including freight, upon the return of the defective unit(s). All prepay/C.O.D. customers must return the defective equipment prior to exchange, otherwise the customer will be required to prepay for the new unit(s) 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 caused 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, fuses, lamps, and damage caused by lightning, power surges, or mechanical abuse.

For equipment to be returned to the factory for repair, you must first call and get an RMA# from Customer Service. The RMA# must be written on the outside of the package, otherwise receiving will reject the shipment. In addition, a note must be sent with the packing list briefly describing the nature of the defect.

For special warranty replacement service, if any other assistance is required, contact Selectone Customer Service Department at (800) 227-0376, FAX (510) 781-5454, E-Mail techsupport@selectone.com, or on the WEB at www.selectone.com.

All repairs and returns are to be sent to:
Selectone
 23210 Bernhardt St
 Hayward, CA 94545
 Attn: Customer Service