Installation Information
for
ST-20B or ST-25B Series interfaced to
Kenwood TK-780/880

General Information:

ST-20B: This application applies to the Selectone ST-20B simple frequency domain inversion scrambler operating with Kenwood TK-780/880. The cipher process inverts speech frequencies in reference to one of eight possible inversion carriers. The scrambled speech is unintelligible to the casual listener, but the recovered audio is very clear. Operation is virtually transparent to the user. The Clear/Cipher input, used to enable or disable the cipher mode, is the only user control. Applications include commercial shared repeaters and other business and marine radio systems where protection is desired from co-channel users and casual eavesdroppers. The ST-20B does not require a license for export.

ST-25B: This application applies to the Selectone ST-25B Rolling Code Voice Encryption unit operating with the Kenwood TK-780/880. The ST-25B Rolling Code Encryption Module is a miniature, high security voice encryption device with up to four user programmable code keys, each selected from over four billion possible keys. The ST-25B may be used to communicate in a secure mode with up to four different groups on the same radio channel. To insure security, code keys are stored in a non-volatile EEPROM and are never transmitted over the air.

The Clear/Cipher select line is the only user control. Receive mode is automatic, clear speech or encrypted speech with the proper code key will be received regardless of the mode selected. Programming is accomplished via the ST-954B programmer which plugs into a computer serial port. All software is available free at www.selectone.com.

Technical Information:

General:

The installation will require solder point connections of 12 flying leads to designated junction points in the Kenwood TK-780/880 mobile radio. The radio will require modification of the RX and TX audio path.

ST-25B only, optional (white/orange) wire if transmit alert tone is required. The transmit alert tone is required when a long transmit delay is need to gain access to a system such as (LTR). This will alert the user with a beep that the delay time has expired and is ready for the user to go ahead and talk.

Operation:

This application uses the programmable OPT key to enable clear/cipher mode by a single push. On the display will appear the (OPT) indicator as well as an audible single beep in the speaker, this is an indication that you are now in the ciphered mode. Press it again the displayed (OPT) indication will disappear and you will hear two audible beeps, you are now in the clear mode. Press and hold the (OPT) key to enter the code setting mode. Codes 1 to 16 will be displayed. Set a code by pushing the [Up/Down] buttons. When the OPT key is pressed again, the code setting mode terminates.

Installation Requirements:

- Experienced technician with radio and encryption experience.
- Radio service manual.
- Radio Service Monitor.
- Soldering Iron and required hand tools.
- ST-954B programmer and ST-25BPM software. **(ST-25B ONLY)**
- Kenwood TK-780/880 programming software (KPG49D version 1.00 or latter) and adapter (KPG-46).
- PC compatible computer.

ST-25B Configuration:

See below (ST-25B Programming Parameters)

Installation Information:

Refer to the Wiring Connection Chart & NOTES and Radio Programming.

Modification Instruction for TK-780/880:

Remove R529 and R571on the control unit.

Modification Instructions for ST-20B and ST-25B series:(See ST-20B/25B manual for resister locations)

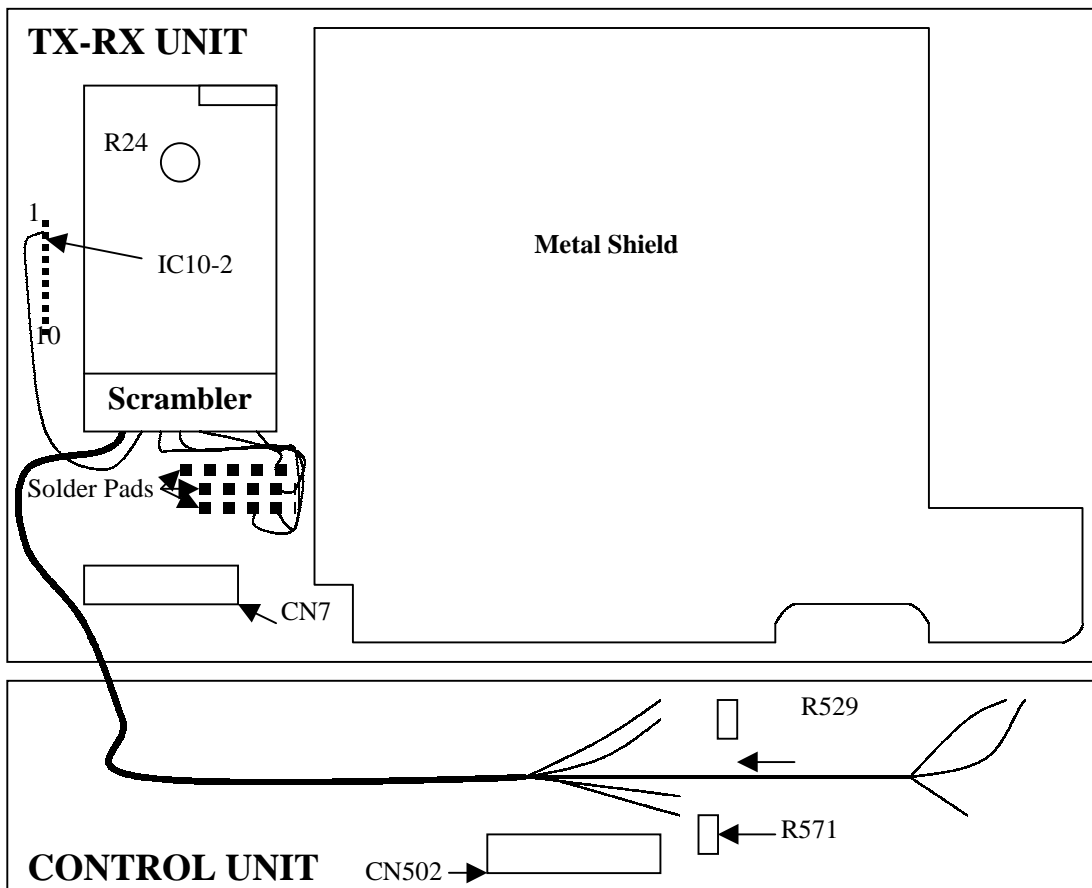Install a 33K ohm resister into R4 and R21 customer select locations.
Install a 1.1K ohm resister into R28 and R35 customer select locations.

ST-25B Programming Parameters

Placement

Position the Scrambler in the TX-RX unit as shown below.

<h1 style="text-align:center">Wiring Connection Chart & NOTES
for the ST-25B to
Kenwood TK-780/880</h1>

INSTALLATION:

Remove the upper and lower halves of the transceiver case, then remove the faceplate and unscrew the control unit.

NOTES:

Radio modification:

1. Remove R529 and R571 on the control unit.

ST-20B or ST-25B gain select resisters:

2. Install a 33K ohm resister into R4 and R21 customer select locations. Install a 1.1K ohm resister into R28 and R35 customer select locations.
3. Add a .1µf capacitor in series with WHITE/GREEN. **Or** replace R44 on the encryption unit with a surface mount .1µf capacitor.

ST-25B only:

4. OPTIONAL, this connection should only be used when a long transmit delay is needed. Transmit alert tone is a courtesy beep to indicate go ahead and talk. Add a 1.2m ohm resister in series with the WHITE/ORANGE lead to IC10-2 on the TX-RX unit.

- **The chart below is a guide to assist in locating the solder point connections required for this installation.**

<table>
<tr><td colspan="3" align="center">ST-20/25B Interface Cable</td></tr>
<tr><td>J1   ST-20/25B
PIN #   COLOR</td><td align="center">ST-20/25B
FUNCTION</td><td align="center">TK780/880
DESIGNATION   LOCATION</td></tr>
<tr><td>1.   WHITE/BLUE</td><td>RECEIVE AUDIO   OUTPUT</td><td>RXAO   ON THE CONTROL UNIT</td></tr>
<tr><td>2   VIOLET</td><td>CODE SELECT 1   INPUT</td><td>C1   ON THE TX-RX UNIT</td></tr>
<tr><td>3.   RED</td><td>POSITIVE (+) SUPPLY</td><td>SB   ON THE CONTROL UNIT</td></tr>
<tr><td>4.   WHITE/ORANGE</td><td>SPEAKER BEEP   OUTPUT</td><td align="center">Optional for ST-25B ONLY
(see notes # 4)</td></tr>
<tr><td>5.   BLACK/ORANGE</td><td>CODE SELECT 2   INPUT</td><td>C2   ON THE TX-RX UNIT</td></tr>
<tr><td>6.   YELLOW</td><td>PTT IN   INPUT</td><td>PTT   ON THE CONTROL UNIT</td></tr>
<tr><td>7.   BROWN</td><td>CLEAR/CIPHERED   INPUT</td><td>OP   ON THE TX-RX UNIT</td></tr>
<tr><td>8.   BLACK/BROWN</td><td>AMP ENABLE (NOT USED) OUTPUT</td><td>N/A</td></tr>
<tr><td>9.   BLACK</td><td>NEGATIVE (-) SUPPLY</td><td>GND   ON THE CONTROL UNIT</td></tr>
<tr><td>10   BLACK/YELLOW</td><td>CODE SELECT 3   INPUT</td><td>C3   ON THE TX-RX UNIT
(REQUIRED FOR THE ST-20B ONLY)</td></tr>
<tr><td>11. BLUE</td><td>RECEIVE AUDIO   INPUT</td><td>RXAI   ON THE CONTROL UNIT</td></tr>
<tr><td>12.   GREEN</td><td>TRANSMIT AUDIO   INPUT</td><td>TXAI   ON THE CONTROL UNIT</td></tr>
<tr><td>13. WHITE/GREEN</td><td>TRANSMIT AUDIO   OUTPUT</td><td>TXAO   ON THE CONTROL UNIT
(see notes # 3)</td></tr>
</table>

Final Assembly

Use the supplied shrink sleeve to insulate the scrambler, then secure it with the supplied double-sided tape to the radios TX-RX UNIT as described previously under **Placement**.

- ST-25B only: Go to Radio Programming then return.
- ST-25B only: Transmit in ciphered mode and adjust Sync to half system deviation.

Reassemble radio.

Required Radio Programming
for
TK-780/880 Mobile Radio

Scrambler Feature Enable:

To enable the Scramble feature on your radio, you must first set it up through the initial radio setup. To do this run the radio programming software, go to **Model**, set all your features. When you come to Option Board choose **Voice Scrambler.**
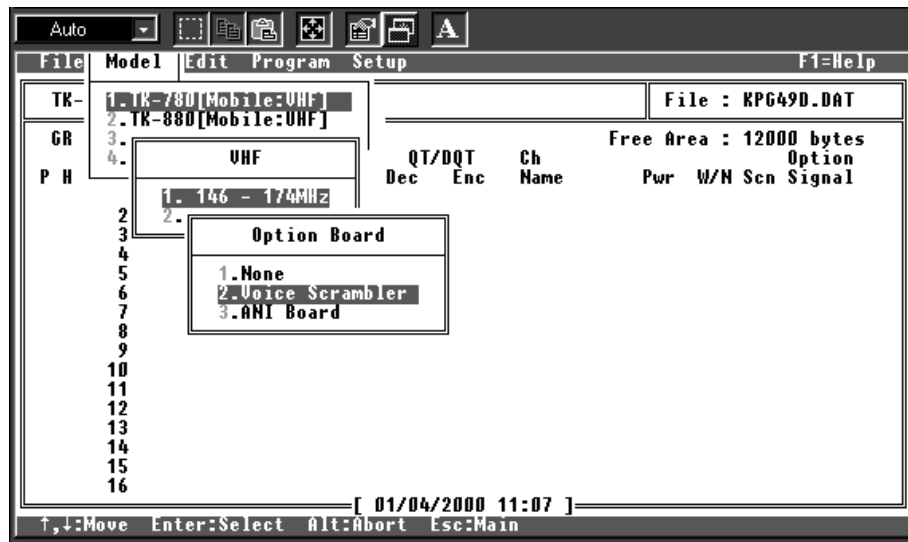
Scrambler Enable and Disable Key Assignment:

Go to **Edit**, then **Key Assignment.** Select a button to provide the scrambler enable and disable function and assign it to the **Scrambler** function.

```
 Auto      ▼   ▦ ▣▣ ▦ ▣▦ A
 File  Model  Edit  Program  Setup                            F1=Help
 TK-780   V  Optional features                    File : KPG49D.DAT
  GR                        Key Assignment                    00 bytes
                                                              Option
 P H    SCN Switch    : [None                             ]   Signal
        A Switch      : [Scrambler                        ]
        B Switch      : [None                             ]
        C Switch      : [Channel Down                     ]
        D Switch      : [Channel Up                       ]
        Monitor Switch : [Monitor A [Monitor Unmute(Momentary)] ]
        Volume Up     : [Volume Up                        ]
        Volume Down   : [Volume Down                      ]
        Group Up      : [Group Up                         ]
        Group Down    : [Group Down                       ]
        Foot Switch   : [None                             ]
        DTMF Keypad   : [No ]

        14
        15
        16
                         [ 01/04/2000 11 12 ]
  ↑,↓:Move  Space:Select  F2:List  Alt:Abort  Esc:Main
```
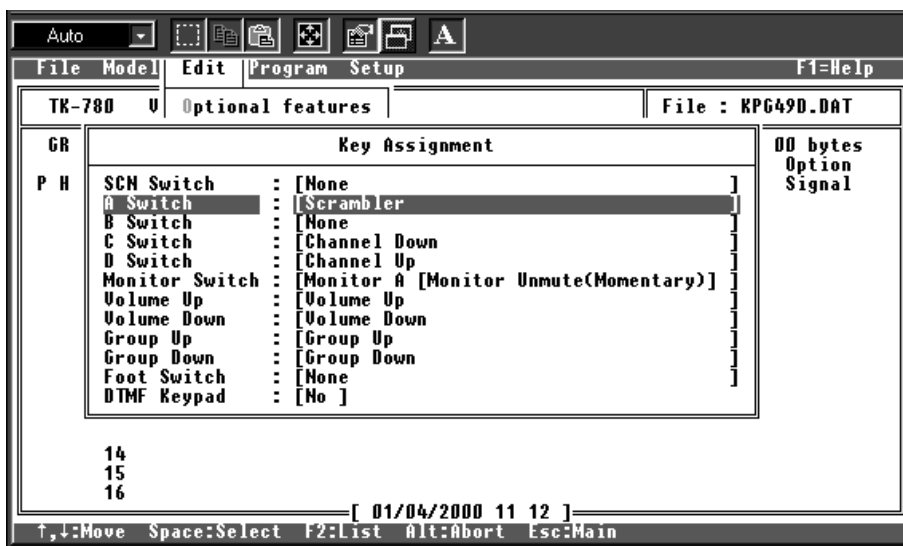
Channel power up Code Select Assignment:

At the main menu press **F10** to edit channel. In the **Voice Scrambler** location you must assign each channel you wish to scramble with a power-up code select number.

```
 Auto      ▼   ▦ ▣▣ ▦ ▣▦ A
 File  Model  Edit  Program  Setup                            F1=Help
 TK-780   VHF : 146 - 174MHz                                  .DAT
  GR : 1                      Channel Data   1                ytes
      Ch       Frequency    Receive Frequency  : [150.00000]MHz  ion
 P H  No. Receive    Transmi Transmit Frequency : [150.00000]MHz  nal
      1  150.00000  150.000  QT/DQT Decode      : [        ]      e
      2                      QT/DQT Encode      : [        ]
      3                      Channel Name       : [  CH  1  ]
      4                      Option Signalling  : [None   ]
      5                      Busy Channel Lockout : [No ]
      6                      Beat Shift         : [No ]
      7                      TX Power           : [High]
      8                      Wide/Narrow        : [Wide  ]
      9                      Scan Delete/Add    : [Add]
      10                     Priority Channel   : [***]
      11                     Home Channel       : [***]
      12                     Compander          : [***]
      13                     Scrambler          : [ 1 ]
      14                     PTT ID             : [Off]
      15                     Data               : [No ]
      16
                         [
  ↑,↓:Move  Enter:Input  Space,F2:Select  F7:Next  F8:Prev  Alt:Abort  Esc:Main
```