



Operating Instructions

MODEL ST-146 Micro-Miniature CTCSS Encoder/Decoder

Manual Number: M501-2855

April 19, 1996

Revision (960419-1)

GENERAL:

The ST-146 is a miniature surface-mount version of our popular ST-104 CTCSS Encoder/Decoder it features a universal design for easy interface to most radio squelch circuits, and is small enough to be mounted in a mobile or portable radio where space is limited.

Like the ST-104, the ST-146 is fully compatible with all major CTCSS systems, including Motorola "Private Line", General Electric "Channel Guard", and E.F.Johnson "Call Guard".

Due to surface-mount construction and our comprehensive warranty policy, field repair is usually not cost effective. Complete technical documentation is available through our applications department for customers with special requirements.

Application information is available or can be developed for most radio models. If you would like application details for a specific radio, please call us TOLL FREE at (800) 227-0376.

ADJUSTMENTS

Frequency:

The ST-146 is CONTINUOUSLY tuneable over the standard CTCSS frequency range from 67 to 250.3 Hz. To set the frequency, apply power, set R33 fully clockwise and connect the Tone Output lead (WHT/GRN) to your frequency measuring equipment Adjust R10 for the desired CTCSS frequency. You may find the use of a lissajous figure with a known on-frequency reference the quickest set-up procedure, or as an alternate if a frequency counter is not available.

Output Level:

The Tone Output level is adjusted with R33. Adjust R33 for approximately ± 750 Hz deviation.

INSTALLATION

Mounting:

Use of a double-sided adhesive pad eliminates hardware requirements. Mount the ST-146 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. The

ST-146 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 minimise RF problems, twist the RED and BLACK leads together and maintain all leads at minimum length.

Radio Interface:

The interface between the ST-146 board and the radio is by 13 wire leads on a miniature low profile connector. Most applications will not require the use of all leads. Unused leads should be removed from the connector by carefully lifting the small tab near each connection pin and pulling the wire from the connector. We recommend this method (rather than cutting wires) because it allows reusing pins if an error is made.

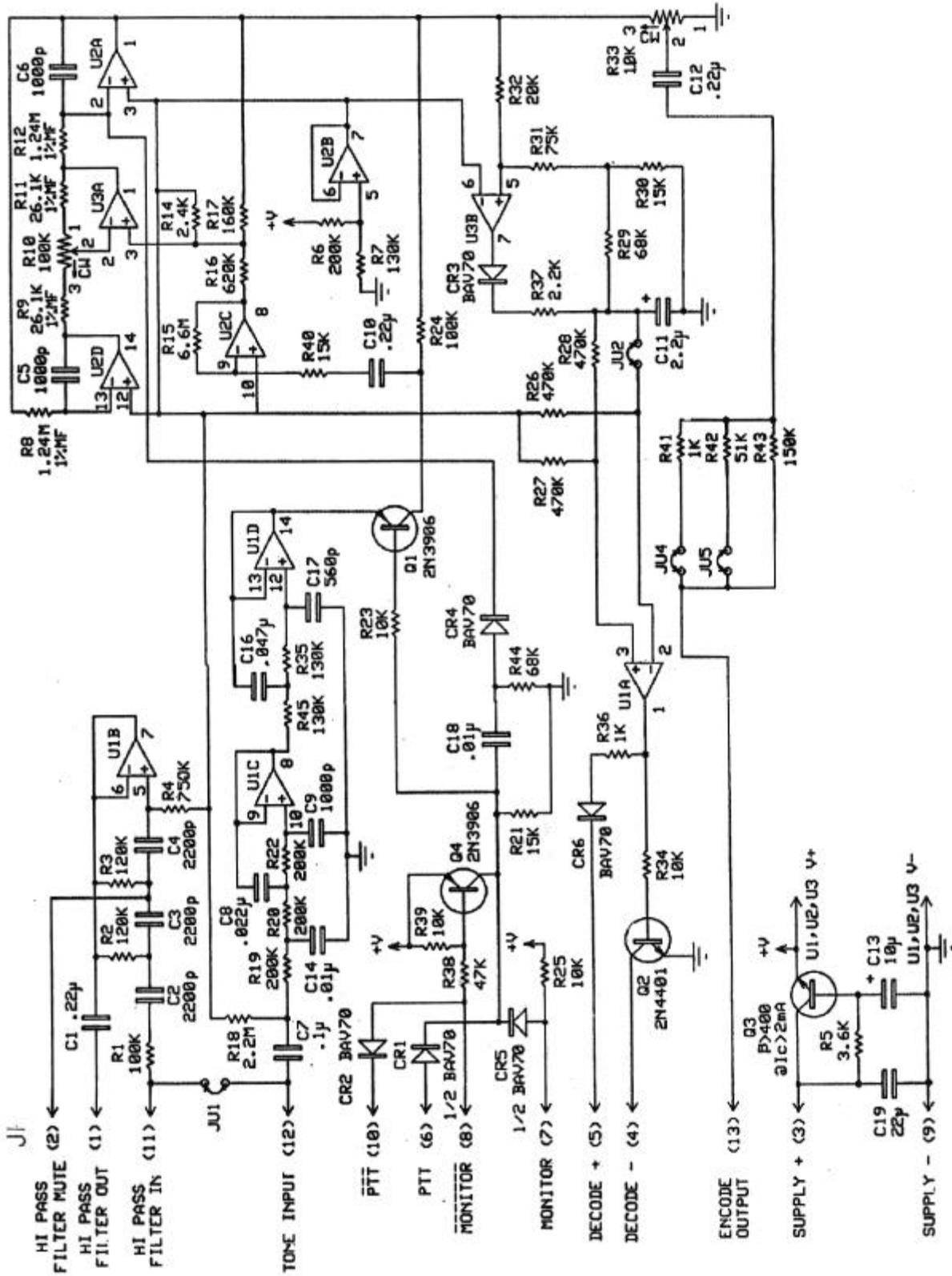
[9] Negative (-) Supply (BLACK): Connect to System (-) (Ground)

[3] Positive (+) Supply (RED): Connect to (+) Supply (5.5Vdc to 16Vdc)

[13] Encode Output (WHT/GRN): Most F.M. two-way radios make provisions for CTCSS modulation. This point is generally after the speech modulation limiter, and near the voice deviation control. The impedance at this point varies from radio to radio. Three parallel resistors (1K, 51K, & 150K) are in series with the ST-146 output circuit, and the 1K and 51K resistors may be eliminated from the circuit by removal of JU4 and or JU5. Remove JU4 or JU4 and JU5 to provide a correct tone level without loading the radio modulator circuit and reducing voice modulation. A CTCSS deviation level of ± 750 Hz is recommended.

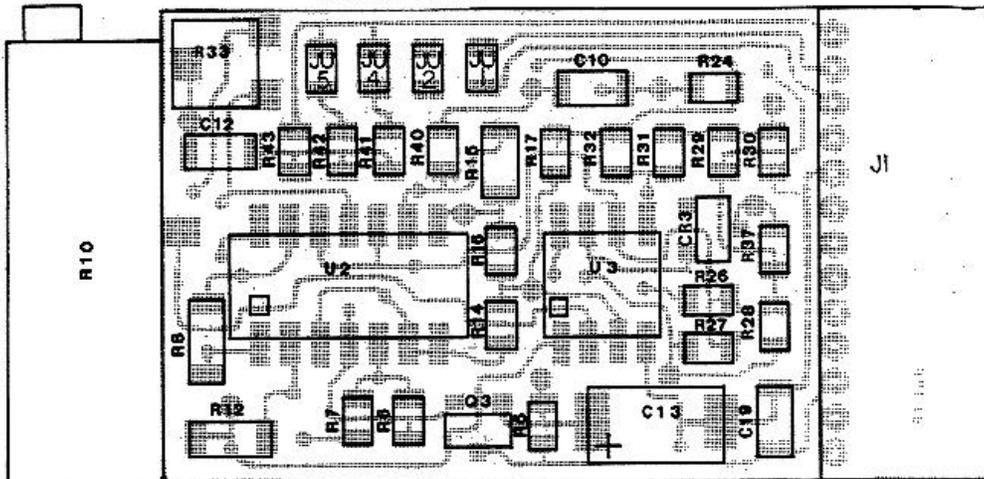
[12] Tone Input (GREEN): Jumpered to Hi-Pass Filter input by JU1. Connect directly to the FM receiver detector audio output. Breaking the audio path at this point will allow insertion of the Hi-Pass Filter. If it is not practical to break the audio path at this point, refer to Hi-Pass Filter input (BLUE).

[11] Hi-Pass Filter input (BLUE): Use only when Tone input (Green) cannot be used for Hi-Pass Filter input. Remove JU1 for applications where breaking the audio path at the FM receiver detector is not practical Hi-Pass Filter input audio should be taken at the most convenient point

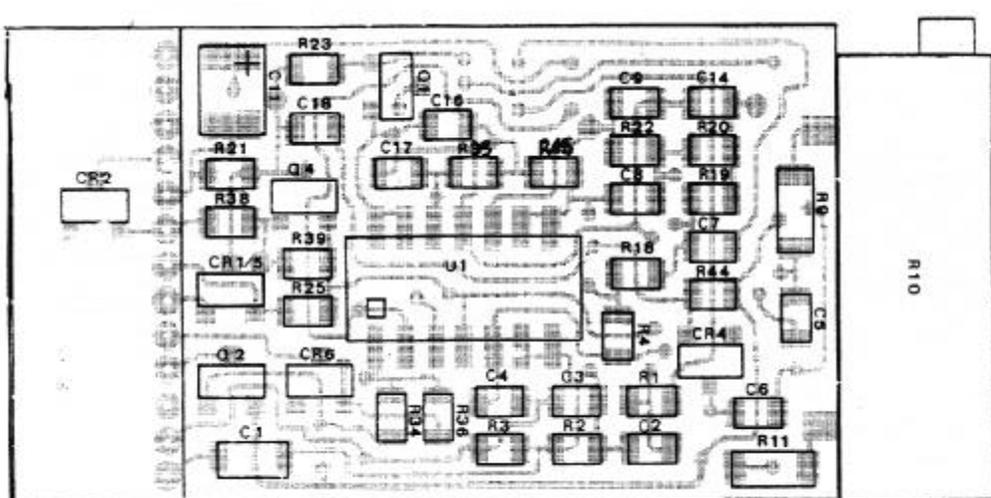


JUMPER OPTION CHART		
INPUT/H.P. FILTER	JU1	
Common	Short	
Seperate	Open	
OUTPUT ACTIVE	JU2	
Before Decode	Short	
After Decode	Open	
ENCODE Z	JU4	JU5
3K	Short	Short
50K	Open	Short
150K	Open	Open

JUMPERS



TOP SIDE



BOTTOM SIDE

[1] **HiPass Filter Output (WHT/BLU):** Connect to place the Hi-Pass Filter in series with receiver audio path.

NOTE: The Hi-Pass Filter will not work in high level audio stages such as speaker leads.

[4] **Decode (-) (WHT/ORG):** For applications where the radio mute point must be held at Negative (-) Supply (Ground) during mute Remove JU2 for applications requiring (-) Supply (Ground) during decode.

[5] **Decode (+) (BLK/ORG):** For applications where the radio mute point must be held Positive (+) during mute. Remove JU2 for applications requiring Positive (+) during decode.

[2] **Hi-Pass Filter Mute (VIOLET):** Connect to Decode (-) (WHT/ORG) if none of the above mute conditions apply.

[1] **Monitor (BROWN):** PRIMARY CONTROL of Encode/Decode functions. Connect to (-) Supply through Monitor/hook switch to enable Decode and mute radio. Open from (-) Supply to cause Encode and Monitor (Unmute radio).

[8] **Monitor (BLK/BRN):** If your monitor switch closes to Negative (-) Supply (Ground) to monitor, then MONITOR (Brown) must be connected to Negative (-) Supply. Connect this lead (BRN/BLK) to your Monitor hook switch.

[10] **PTT (BLK/YEL):** For applications with PTT closure to Negative (-) Supply (Ground) during transmit Connect to PTT in the radio. Required only if you must Encode without Monitor.

[6] **PTT (YELLOW):** For applications where a keyed Positive (+) is available during transmit. Required only if you must Encode without Monitor.

OPERATING SPECIFICATIONS

Operating Voltage: 5.5Vdcto 16Vdc
Operating Current: Less than 5mAdc
Frequency Range: 67 to 250.3Hz, continuously tuneable
Temperature Range: 30°C to +60°C
Frequency Stability: Exceeds EIA RS-220A

(less than ±1.5%, typically less than ±0.2%)

Encode Output Level: Adjustable 0 to greater than 1Vrms with 8Vdc to 18Vdc supply

Encode Distortion: Less than 1% THD

Decoder Input Level: 10mVrms to 2Vrms (supply dependent)

Decoder Input Z: Greater than 100K

Hi-Pass Filter: May be muted by decode output

Decoder Activate: Field seledable (+) or (-) logic

Decoder Output: Open collector sink to (-) Supply or source (+) voltage. Four possible output conditions or Hi-Pass filter muting.

Interface: 18" flying leads terminated at

miniature

low profile connector.

Size: 1.68" L X 0.80" W X .25" H

4.27cm X 2.03cm X .64cm

NOTICE

If you are using a Selectone Application Note intended for the ST-104 please note the following: If the YELLOW wire of the ST-104 is shown plugged into pin 3 of the tone board use the BLACK/YELLOW wire on the ST-146 for this connection. If the WHITE/ORANGE wire of the ST-104 is shown plugged into pin 5 use the BLACK/ORANGE wire on the ST-146 for this connection. If the modification instructions advise cutting R25 on the ST-104, ground the Brown wire on the ST-146. R41 and R42 are equivalent to JU4 and JU5. All other application information contained in Application Notes intended for the ST-104 is transferable to the ST-146.

ST-104

ST-146

YELLOW (pin 3) = BLACK/YELLOW
WHITE/ORANGE (pin 5) = BLACK/ORANGE
Cut R25 = Ground BROWN
R41 = JU4
R42 = JU5

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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 of 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.

Selectone

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