Selectone
PRODUCT GROUP

OPERATING INSTRUCTIONS
Model ST-139
Miniature CTCSS Encoder/Decoder

Manual # 600-0401
Rev. A - 99036

June 18, 1999

GENERAL

The ST-139 is a digitally programmable version of Selectone's popular CTCSS Encoder/Decoders. 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 all previous Selectone CTCSS products, the ST-139 is fully compatible with all major CTCSS systems, including Motorola "Private Line", Ericsson/GE "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. In most cases existing ST-146 Application Notes will serve ST-139 requirements. Documentation on ALL current products and many of our application notes are available for instant access on our web site **www.selectone.com** If you would like application details for a specific radio, please call us at (510) 887-1950 or request assistance via E-mail at techsupport@selectone.com

OPERATING SPECIFICATIONS

Operating Voltage: ..... 5.5Vdc to 24Vdc
Operating Current: ..... Less than 5mAdc
Frequency Range: ..... 67 to 254.1Hz
Number of Frequencies: 47
Temperature Range: ..... -30°C to +60°C
Frequency Stability: ..... Exceeds EIA RS-220A (crystal controlled)
Encode Output Level: ..... Adjustable 0 to 1.8V P-P
Encode Distortion: ..... Less than 2%THD
Decoder Input Level: ..... 30mVrms to 1Vrms
Decoder Input Z: ..... Greater than 50K
Hi-Pass Filter: ..... May be muted by decode output
Decoder Activate: ..... Field selectable (+) or (-) logic
Decoder Output: ..... Open collector sink to (-) Supply or source (+) voltage. Four possible output conditions or Hi-Pass filter muting.
Size: ..... 1.6" L x 0.85" W x 0.14" (40.64mm x 21.6mm x 3.56mm)

ADJUSTMENTS

OUTPUT LEVEL

The Tone Output level is adjusted with R4. Adjust R4 for approximately ±750 Hz deviation.

FREQUENCY

The ST-139 is set to internationally accepted EIA standard CTCSS frequencies with small solder jumpers at FJ0 - FJ5.

CTCSS PROGRAMMING TABLE
0=Shorted, 1=Open

Nominal Freq. (Hz)	FJ0	FJ1	FJ2	FJ3	JJ4	FJ5	Nominal Freq. (Hz)	FJ0	FJ1	FJ2	FJ3	FJ4	FJ5
67.0	1	1	1	1	1	1	151.4	1	1	1	0	0	0
69.3	1	0	0	1	1	1	156.7	0	1	1	0	1	0
71.9	1	1	1	1	1	0	159.8	1	0	0	0	1	1
74.4	0	1	1	1	1	1	162.2	0	1	1	0	0	0
77.0	1	1	1	1	0	0	167.9	1	0	1	0	1	0
79.7	1	0	1	1	1	1	173.8	1	0	1	0	0	0
82.5	0	1	1	1	1	0	179.9	0	0	1	0	1	0
85.4	0	0	1	1	1	1	183.5	0	1	0	0	1	1
88.5	0	1	1	1	0	0	186.2	0	0	1	0	0	0
91.5	1	1	0	1	1	1	189.9	1	1	0	0	1	1
94.8	1	0	1	1	1	0	192.8	1	1	0	0	1	0
97.4	0	1	0	1	1	1	193.6	0	0	1	0	1	1
100.0	1	0	1	1	0	0	199.5	1	0	1	0	1	1
103.5	0	0	1	1	1	0	203.5	1	1	0	0	0	0
107.2	0	0	1	1	0	0	206.5	0	1	1	0	1	1
110.9	1	1	0	1	1	0	210.7	0	1	0	0	1	0
114.8	1	1	0	1	0	0	218.1	0	1	0	0	0	0
118.8	0	1	0	1	1	0	225.7	1	0	0	0	1	0
123.0	0	1	0	1	0	0	229.11	1	1	1	0	1	1
127.3	1	0	0	1	1	0	233.6	1	0	0	0	0	0
131.8	1	0	0	1	0	0	241.8	0	0	0	0	1	0
136.5	0	0	0	1	1	0	250.3	0	0	0	0	0	0
141.3	0	0	0	1	0	0	254.1	0	0	0	1	1	1
146.2	1	1	1	0	1	0							

INSTALLATION

MOUNTING

Use of a double-sided adhesive pad eliminates hardware requirements. Mount the ST-139 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-139 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 RED and BLACK leads together and maintain all leads at minimum length.

ELECTRICAL INTERFACE

The interface between the ST-139 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 24Vdc)

[13] Encode Output (WHT/GRN): Most FM 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-139 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 Finer 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.

[1] Hi-Pass 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 the solder jumper at JU2A and place a solder jumper at JU2B 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 the solder jumper at JU2A and place a solder jumper at JU2B 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.

[7] Monitor (BROWN): PRIMARY CONTROL of Decode functions. Connect to (-) Supply through Monitor/hook switch to enable Decode and mute radio. Open from (-) Supply to cause Monitor (Unmute radio). Must be connected to (-) Supply to mute 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 (BLK/BRN) to the Monitor hook switch.

[10] PTT (BLK/YEL): For applications with PTT closure to Negative (-) Supply (Ground) during transmit Connect to PTT in the radio.

[6] PTT (YELLOW): For applications where a keyed Positive (+) is available during transmit.

WARRANTY POLICY

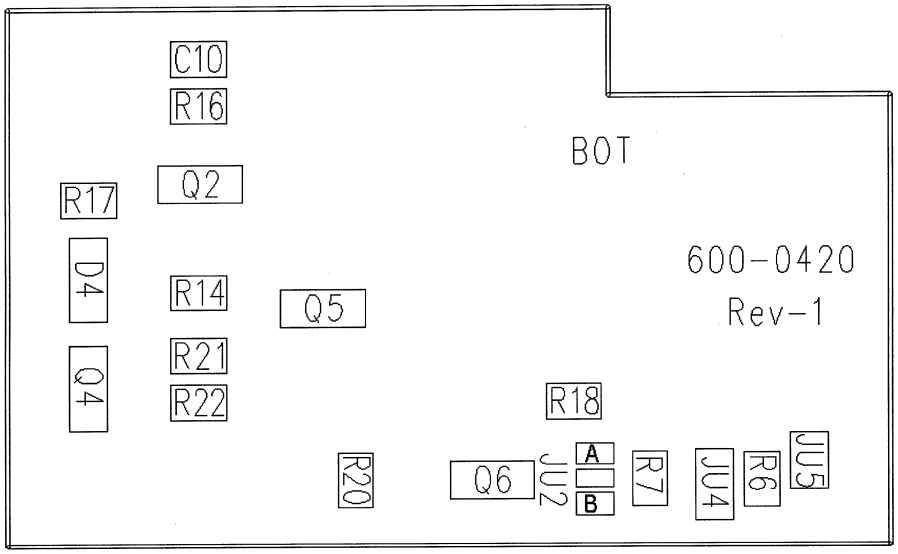
All Selectone products are guaranteed to meet or exceed published performance specifications and are warranted against defects in material and workmanship for a period of two (2) years from date of purchase. Third party equipment such as radios, power supplies, antennas, etc., carry the factory warranty of their respective manufacturers.

All warranty repairs must be performed at the SmarTrunk factory in Hayward, California, or other factory authorized repair depot. Any unauthorized repair attempted by the customer, 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, 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. Repairs must be shipped freight prepaid and will be returned freight prepaid. Shipments should be directed to:

SmarTrunk Systems, Inc.
Attn: Repair Department
23278 Bernhardt Street
Hayward CA 94545, U.S.A.

JUMPER OPTION CHART		
TONE INPUT/H.P. FILTER	**JU1**	
Common	Short	
Separate	Open	
OUTPUT ACTIVE	**JU2A**	**JU2B**
Before Decode	Short	Open
After Decode	Open	Short
ENCODE Z	**JU4**	**JU5**
3K	Short	Short
50K	Open	Short
150K	Open	Open



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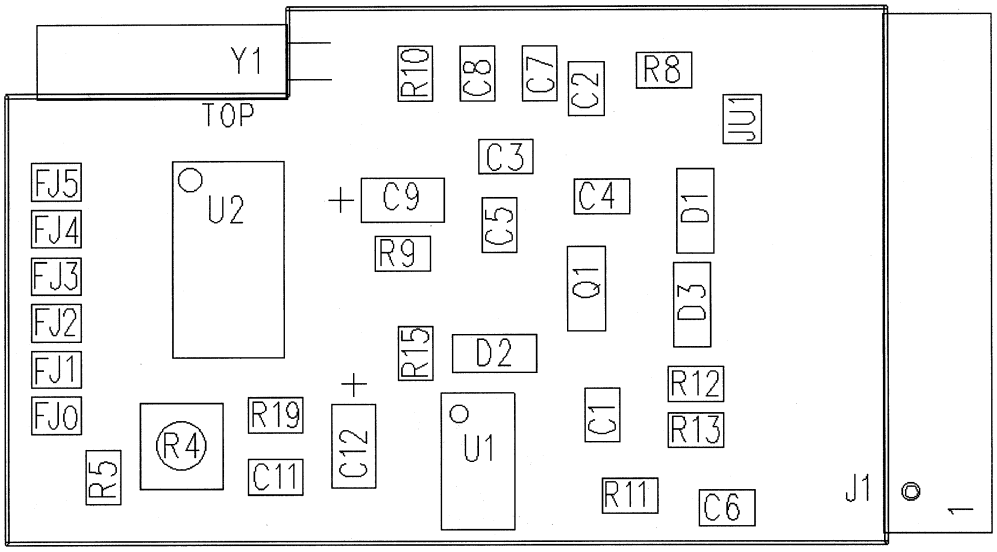

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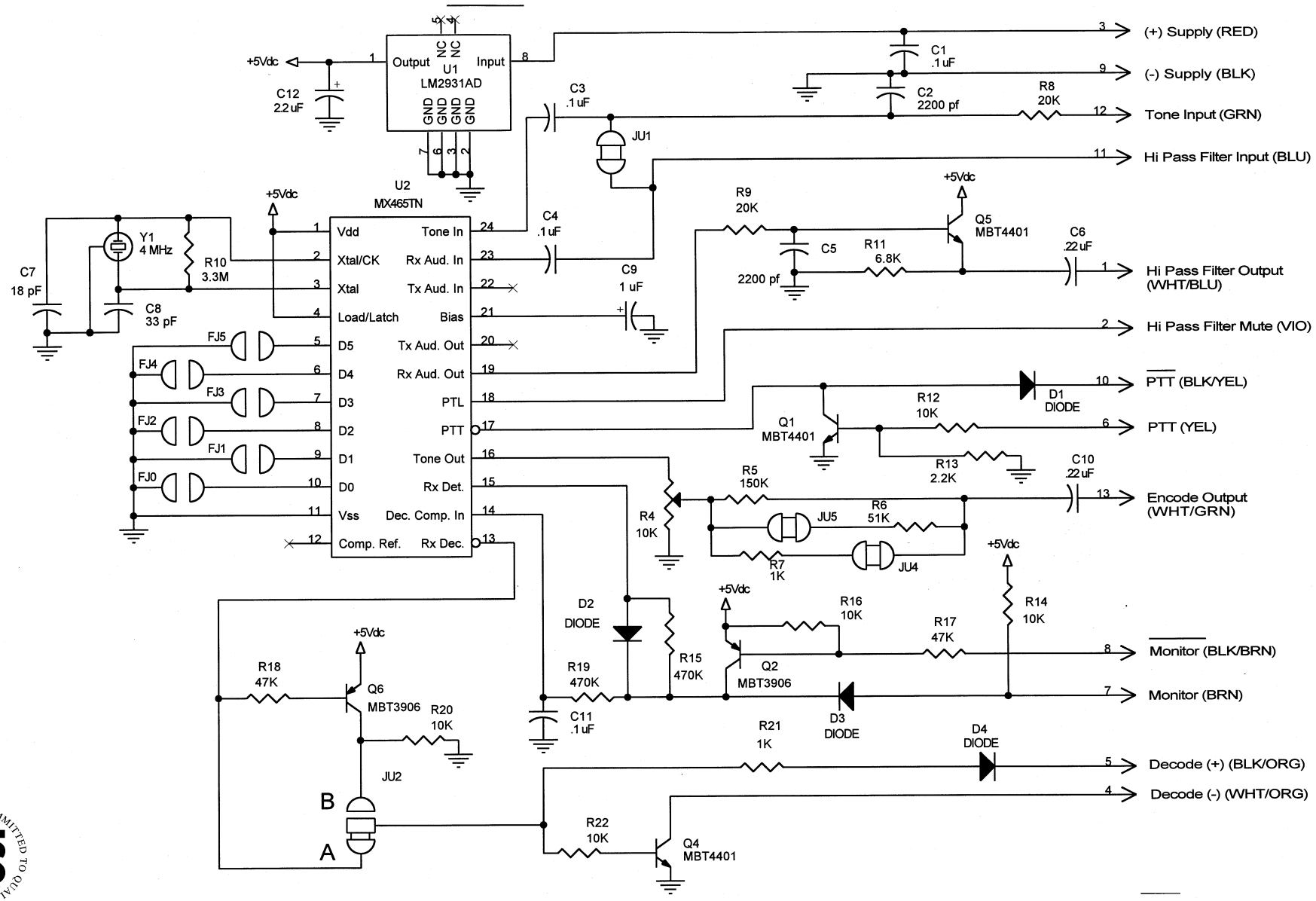
ST-139 Component Locator



ST-139 Schematic Diagram

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