



# Operating Instructions

Model ST-110 Encoder  
Model ST-111 Notch Filter  
Model ST-112 Bandpass Filter

## BURST TONE PRODUCTS

Manual Number: M501-3320

JULY 26, 1996

Revision (960726-1)

### GENERAL:

Selectone's Burst Tone products all incorporate state-of-the-art "state variable" active filters. When considering the requirements for this product line, it became obvious that the three products had almost identical design requirements. Therefore, in order to minimize design and production costs, it was decided to produce a single p.c. board which could be adapted to all three circuits. To fill the particular requirement of each individual product, critical parts and jumpers are factory loaded as indicated on the option and jumper charts.

Because of our comprehensive warranty policy, field repair should not be necessary. If repair is unavoidable, all parts are clearly labeled on the diagram, and should be available through local component distributors.

Interface diagrams are available or can be developed for most applications. Please call us if you would like details for a specific application. Together, we may be able to save you some time and money.

### OPERATION

#### Model ST-110 Encoder

The ST-110 is a highly stable, tunable oscillator providing a sine wave output. There are two possible application hookups:

1. The oscillator will run continuously until the PTT lead (YELLOW) is connected to system negative (-) ground (BLACK). Oscillation will stop 300 mS, 500 mS, or 1 Sec. later. Since the oscillator runs continuously, set up is easily accomplished.

2. With the PTT and the system negative (-) leads tied together, the oscillator will run for the selected burst duration following application of power. Since the oscillator does not run continuously, set up requires temporary disconnection of PTT lead from system (-) while power is applied. This application has the advantage that supply current is zero until power is applied.

#### Model ST-111 Notch Filter

The ST-111 is a frequency tunable narrow bandwidth notch filter. It is intended for placement in series with audio paths to eliminate operator annoyance from burst signalling systems. Because of its narrow bandwidth, only minor changes in passed audio will occur.

#### Model ST-112 Bandpass Filter

The ST-112 is a frequency tunable narrow bandwidth bandpass filter. It can be useful to pre-filter audio to a single tone decoder when voice or other signalling is present simultaneously during single tone signalling.

### OPERATING SPECIFICATIONS

#### General Specifications - all models

Frequency Range:	Continuously tunable 800 to 3000 Hz
Frequency Stability:	±.25%
Temperature Range:	-30°C to +70°C
Supply Voltage:	5 to 30 Vdc (regulator active above 10.5 Vdc; regulator removed and jumpered 5 to 10 Vdc)
Interface:	18 in. Flying leads
Mounting:	Double-sided adhesive foam tape
Size:	1"W x 1.25"L x .38"H (2.54cm x 3.18cm x .97cm)

#### Specifications - Model ST-110 Burst Tone Encoder

Supply Current:	<15 mA (capable of 0 mA standby)
Output Impedance:	<1K (Step-up bridging resistors supplied)
Output Level:	Adjustable to 2 Vrms with operating voltage >>10 Vdc
Tone Purity:	<3% THD Distortion
Burst Duration:	Field Selectable 300 mS, 500 mS, 1 Sec., or continuous

#### Specifications - Model ST-111 Notch Filter

Supply Current:	<15 mA
Input Impedance:	50 K unbalanced
Output Impedance:	<1 K
Input Level:	<4.4 V peak to peak (operating voltage >10 Vdc)
Output Level:	= Input Level ±2 dB
Notch Depth:	30 dB; Typically >40 dB
3 dB Bandwidth:	±8% of center frequency

#### Specifications - Model ST-112 Bandpass Filter

Supply Current:	<15 mA
Input Impedance:	50 K unbalanced
Output Impedance:	<1 K
Input Level:	<4.4 V peak to peak (operating voltage >10 Vdc)
Output Level:	Adjustable to input level +6 dB at Fo
3 dB Bandwidth:	±3% of center frequency

### INSTALLATION - All Models

**POSITIVE (+) SUPPLY (RED):** Connect to system (+) supply 10.5 to 30 Vdc. For operation below 10.5 Vdc remove VR1 and jumper (cut the center lead off near the P.C. board, bend the remaining two leads together and solder).

**NEGATIVE (-) SUPPLY (BLACK):** Connect to system (-).

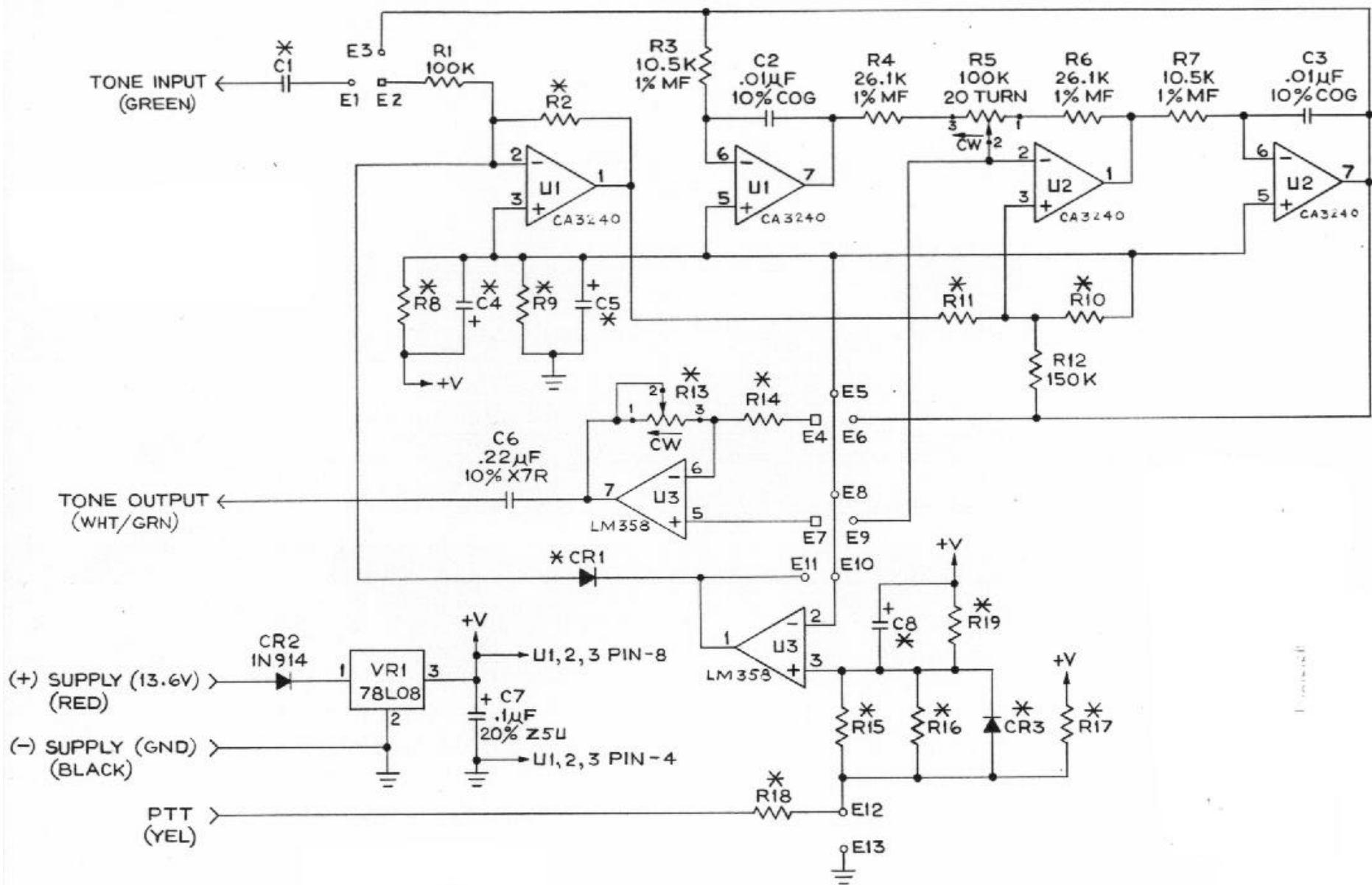
**PTT (YELLOW):** (ST-110 only) connect to radio PTT.

**TONE OUTPUT (WHT/GRN):** Encode output and output for filtered audio. Unbalanced audio. Bridging step up resistors supplied.

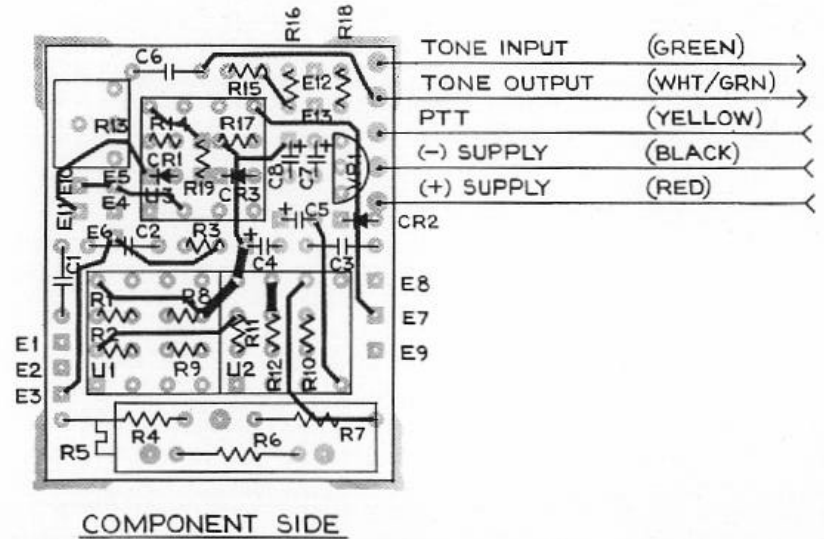
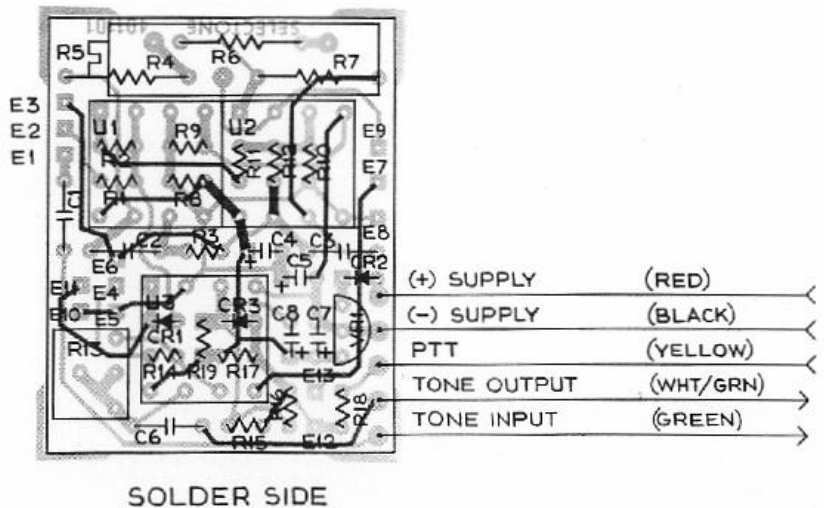
**TONE INPUT (GREEN):** (ST-111 and ST-112 only) unbalanced audio input.

SELECTONE INC. • 3501 BREAKWATER AVE • HAYWARD, CA. 94545-3610

(510) 781-0376 • NATIONWIDE TOLL FREE (800) 227-0376 • FAX: (510) 781-5454 E-MAIL admin@selectone.com



**NOTE:** UNLESS OTHERWISE INDICATED:  
 1. ALL RESISTORS ARE 1/8W ±5%



OPTION CHART			
✳	BURST	NOTCH	BP
R2	NA	51K	51K
R8	13K	NA	NA
R9	10K	NA	NA
R10	4.3K	10K	4.3K
R11	620K	330K	150K
R13	10K POT	680K	10K POT
R14	3.6K	10K	2.2K
R15	470K	NA	NA
R16	270K	430K	430K
R17	10K	NA	NA
R18	1K	NA	NA
R19	1N914 <small>CATH. TOFF</small>	560K	560K
C1	NA	.22µF <small>10% X7R</small>	.22µF <small>10% X7R</small>
C4	2.2µF <small>20% TA</small>	NA	NA
C5	2.2µF <small>20% TA</small>	NA	NA
C8	2.2µF <small>20% TA</small>	NA	NA
CR1	1N914	NA	NA
CR3	1N914	NA	NA
MODEL No.	ST-110	ST-111	ST-112

JUMPER CHART	
BURST	E2/E3, E4/E6, E7/E8
NOTCH	E1/E2, E4/E5, E7/E9, E10/E11, E12/E13
BP	E1/E2, E4/E6, E7/E8, E10/E11, E12/E13

## ADJUSTMENTS

### Model ST-110 Encoder

To adjust frequency, apply power and observe oscillation on the tone output lead (WHT/GRN) with a frequency counter or scope set for lissajous figure with a standard tone generator. Adjust R5 for the required frequency. Adjust R13 for the desired output amplitude. **NOTE: If the PTT and system (-) leads are tied together, the PTT lead must be temporarily disconnected in order to adjust frequency.**

Burst duration may be selected by clipping resistors R15 or R16. Factory standard is 300 mS (both R15 and R16 in circuit). For 500 mS, remove R15; for 1 Sec., remove R16. **NOTE: Clip only one resistor from the circuit.**

### Models ST-111 Notch Filter and ST-112 Bandpass Filter

To adjust frequency, apply power (RED & BLACK) and an input signal on the frequency to be notched or passed. Observe the output signal on tone output (WHT/GRN) with a scope or AC voltmeter. Adjust R13 on the ST-112 for mid range. Tune R5 for a dip (ST-111), or a peak (ST-112). The output level on the ST-112 may be finally adjusted for the desired output level with R13.

## MOUNTING

Use of a double-sided adhesive pad eliminates hardware requirements. Mount the P.C. board on a clean, dry surface oriented to allow future adjustments should they be necessary. Press firmly after mounting to insure good contact of adhesive. Do not touch the adhesive or attempt to reposition the unit after mounting.

The Selectone Burst Tone circuits have been designed for maximum immunity to RF interference; however, an effort should be made to locate the units as far as possible from the radio's RF power stages. To further minimize RF problems, twist the power leads together and maintain all leads at a minimum length.

Manual #: M501-3320

Revision: 960726-1

Last Edit Date: 7/26/96

Edited By: RTS

# Selectone

3501 Breakwater Ave. Hayward, CA. 94545-3610

(510) 781-0376 (800) 227-0376

Fax: (510) 781-5454

E-MAIL admin@selectone.com

## PARTS LIST

**NOTE: Key to schematic reference suffix**

**B = Burst Tone Encoder (ST-110)**

**N = Notch Filter (ST-111)**

**P = Bandpass Filter (ST-112)**

Sch. Ref	Part #	Description
C1N,C1P	026-2203	Capacitor .22UF X7R 50V 10%
C2-3	033-1002	Capacitor .01UF COG 100V 10%
C4B,C5B	034-0001	Capacitor 2.2UF TANT 16V 20%
C6	026-2203	Capacitor .22UF X7R 50V 10%
C7	026-1003	Capacitor .1UF X7R 50V 10%
C8B	034-0001	Capacitor 2.2UF Tant 16V 20%
CR1B		
CR2,CR3B	066-0000	Diode 1N914 Silicon
R1	146-1003	Resistor 100K 1/8W 5% C.F.
R2N,R2P	146-5102	Resistor 51K 1/8W 5% C.F.
R3	147-1052	Resistor 10.5K RN55 1% M.F.
R4	147-2612	Resistor 26.1K RN55 1% M.F.
R5	112-0004	Potentiometer 100K 20-Turn
R6	147-2612	Resistor 26.1K RN55 1% M.F.
R7	147-1052	Resistor 10.5K RN55 1% M.F.
R8B	146-1302	Resistor 13K 1/8W 5% C.F.
R9B	146-1002	Resistor 10K 1/8W 5% C.F.
R10B,R10P	146-4301	Resistor 4.3K 1/8W 5% C.F.
R10N	146-1002	Resistor 10K 1/8W 5% C.F.
R11B	146-6203	Resistor 620K 1/8W 5% C.F.
R11N	146-3303	Resistor 330K 1/8W 5% C.F.
R11P,R12	146-1503	Resistor 150K 1/8W 5% C.F.
R13B,R13P	111-0002	Potentiometer 10K 1-Turn
R13N	146-6803	Resistor 680K 1/8W 5% C.F.
R14B	146-3601	Resistor 3.6K 1/8W 5% C.F.
R14N	146-1002	Resistor 10K 1/8W 5% C.F.
R14P	146-2201	Resistor 2.2K 1/8W 5% C.F.
R15B	146-4703	Resistor 470K 1/8W 5% C.F.
R16B	146-2703	Resistor 270K 1/8W 5% C.F.
R16N,R16P	146-4303	Resistor 430K 1/8W 5% C.F.
R17B	146-1002	Resistor 10K 1/8W 5% C.F.
R18B	146-1001	Resistor 1K 1/8W 5% C.F.
R19B	066-0000	Diode 1N914 Silicon
R19N,R19P	146-5603	Resistor 560K 1/8W 5% C.F.
U1-2	085-0004	IC CA 3240 CMOS Dual Op Amp
U3	085-0003	IC LM358 Dual Op Amp
VR1	086-0006	IC 78L08 Voltage Reg 8V

## 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.