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# MODEL NC102 TUNABLE CTCSS ENCODER/DECODER INSTRUCTION MANUAL

## INTRODUCTION

The Model NC102 is a high stability sub-miniature (CTCSS) Encoder/Decoder engineered for tone squelch applications. The NC102 features small size, continuously field-tunable over entire frequency range, input/output mode selections, low current drain and uses a convenient mounting technique for quick field installations.

## GENERAL

The Model NC102 has been engineered for maximum reliability. However, should you require technical assistance or detailed information, please contact our Customer Service Department at: (530) 477-8400.

## SPECIFICATIONS

- FREQUENCY** . . . . . CONTINUOUSLY TUNABLE FROM 67 TO 250 HERTZ
- FREQUENCY STABILITY** . . . . . EXCEEDS EIA SPECIFICATIONS  $\pm 0.5\%$
- BANDWIDTH** . . . . .  $\pm 1.5\%$  NOMINAL
- OPERATING TEMPERATURE** . . . -20°C TO +80°C
- OPERATING VOLTAGE** . . . . . 5.5VDC TO 24VDC
- OPERATING CURRENT** . . . . . 3.5mADC
- ENCODER OUTPUT** . . . . . ADJUSTABLE 0 TO 650mVRMS (NO LOAD)
- SINE WAVE DISTORTION** . . . . . LESS THAN 1% (THD)
- INPUT SENSITIVITY** . . . . . 10mVrms TO 2Vrms
- INPUT IMPEDANCE** . . . . . GREATER THAN 50K Ohms
- DETECT/DROPOUT TIME** . . . . . 195ms/200ms NOMINALLY @135 HERTZ
- CONTROLLED OUTPUTS** . . . . . A) SINK=80mA @ 40VDC (OPEN COLLECTOR)  
B) SOURCE=4.0VDC THRU SERIES 5.6K Ohm RESISTOR AND STEERING DIODE.
- CONTROLLED INPUTS** . . . . . A) ENCODER ENABLE  
B) DECODER DISABLE
- HIGH PASS FILTER** . . . . . FOR ELIMINATION OF CTCSS TONE FROM RECEIVER AUDIO
- SIZE** . . . . . 0.8" W x 1.5" L x 0.2" H
- INTERFACE** . . . . . MICRO-MINIATURE HEADER AND 12" COLOR CODED CABLE ASSEMBLY.
- MOUNTING** . . . . . DOUBLE SIDED ADHESIVE TAPE

--SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE--

# INTERFACING

- RED (+) ..... Connect to +5.5VDC TO +24VDC
- BLACK (-) ..... Connect to system ground
- GREEN [AUDIO INPUT] ..... Connect to receiver discriminator or high side of volume control.  
**NOTE:** Breaking the audio path at either of these locations is ideal for insertion of the high-pass filter.  
(Refer to violet lead)
- YELLOW [ENCODER OUTPUT] . Connect to transmitter CTCSS input or at a point following all pre-emphasis, clipping or limiting circuitry. A series resistor may be necessary to eliminate input circuit leading due to the low output impedance of the encoder.
- GRAY [ENCODE ENABLE] ..... The encode enable lead is factory jumpered to provide an encode output signal and activate the decoder's output circuitry when "HIGH" (Above ground). This lead is commonly connected to the microphone hang-up switch or hang-up button on back of microphone. If used in portable radio (Handheld) applications, then connect this lead to transmitter keyed "HIGH" circuitry.  
**NOTE:** To reverse this function, remove solder bridge jumper from JU4 pads.
- BROWN [MONITOR ENABLE] . . . The Monitor Enable lead is factory jumpered to activate the decoder,s output circuitry when "HIGH" (Above ground). This lead is commonly connected to the monitor switch on the desk microphone of a base station or the tone/squelch switch of a portable radio to allow monitoring of the channel. If this lead is not used, it must be grounded or remove solder bridge jumper from JU5 pads B & C. **NOTE:** To reverse this function, remove solder bridge jumper from JU5 pads B & C and solder bridge jumper JU5 pads A & B.
- ORANGE [SQUELCH CONTROL] The squelch control is factory jumpered to provide an output "LOW" (To ground) when the brown and gray leads are "LOW" (To ground). Upon detection of a valid decode tone, the output will go "HIGH" (Above ground) and enable the receiver's squelch circuitry. **NOTE:** (1) To reverse this function, remove solder bridge jumper from JU3 pads. (2) To source output, remove solder bridge from jumper JU2 pads.
- VIOLET [HIGH-PASS FILTER . . . . Solder bridge jumper JU1 pads and remove "violet" lead when filter is to be connected in series with discriminates INPUT] or high side of volume control. **NOTE:** For receivers with separate provisions for use of high-pass filter, remove solder bridge jumper from JU1 pads and use the "HPF" (violet) lead for input and "HPF" (white) lead for output to receiver audio circuitry. This method provides an independent high-pass filter circuit for applications other than in series with detector output and decoder input. This filter is not intended for use in high level audio stages, such as speaker output.
- WHITE [HIGH-PASS FILTER . . . . This output contains buffered audio with CTCSS tone frequencies removed. Connect this lead to remaining side of OUTPUT] broken audio path.

SPECIAL NOTE: Unless modified, the NC102 is factory jumpered as indicated above.

# TUNING PROCEDURE

1. Tuning procedure must be made with Tone Board installed in the radio and with a dummy load connected in place of antenna.

## METHOD A

Connect a frequency counter with 0.1Hz resolution to yellow lead on the tone board. Key transmitter and carefully adjust R32 multi-turn potentiometer to desired frequency.

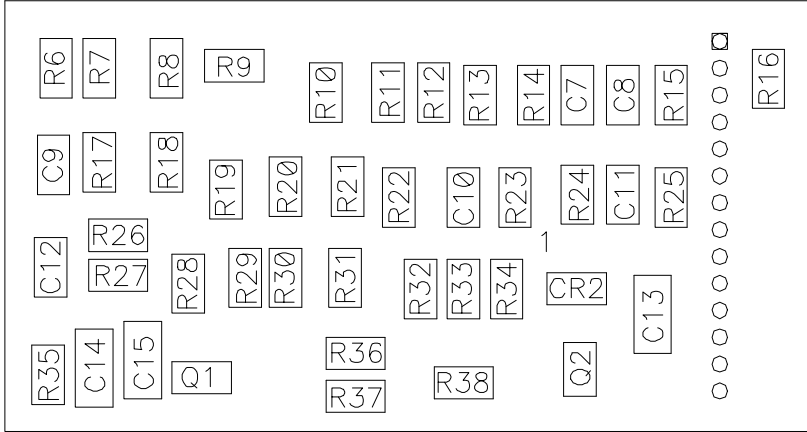
## METHOD B

Use a tone generator and an oscilloscope with an X-Y input to obtain a lissajois pattern on the scope. The tone generator must have a 0.1Hz resolution of the desired CTCSS tone frequency, i.e., if tone frequency desired is 100Hz, the tone generator should be set to 100.0Hz. Set the tone generator to the desired frequency and connect to the horizontal input of the scope then connect yellow lead on the tone board to the vertical input on the scope. Key transmitter and carefully adjust R32 multi-turn potentiometer to obtain a lissajois pattern.

2. Key transmitter and adjust R31 for approximately  $\pm 750$ Hz deviation as viewed on monitor scope or deviation meter.

# FREQUENCY ADJUSTMENT AND

## BOTTOM SIDE



### MOUNTING:

The Model NC102 is supplied with a piece of double sided

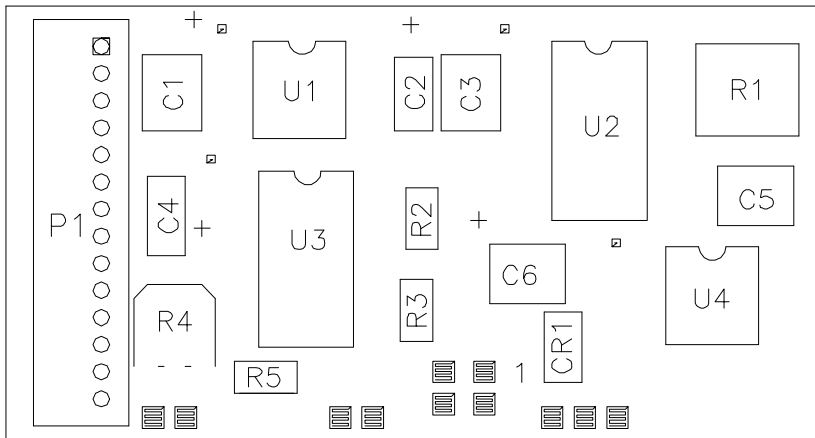
Remove the protective covering from one side of tape and attach to bottom side of P.C. board. Now remove

unit to desired location, making sure that mounting surface is clean and dry to insure positive mounting. For maximum

from intensive R.F. fields and all leads be kept to minimum lengths.

## COMPONENT LAYOUT

## TOP SIDE



(JU1)  
HIGH-PASS  
FILTER

(JU2)  
DECODE  
SINK/  
SOURCE

A B C  
(JU5) MONITOR POLARITY  
(JU4) ENC. ENABLE POL.  
(JU3) DECODE POLARITY

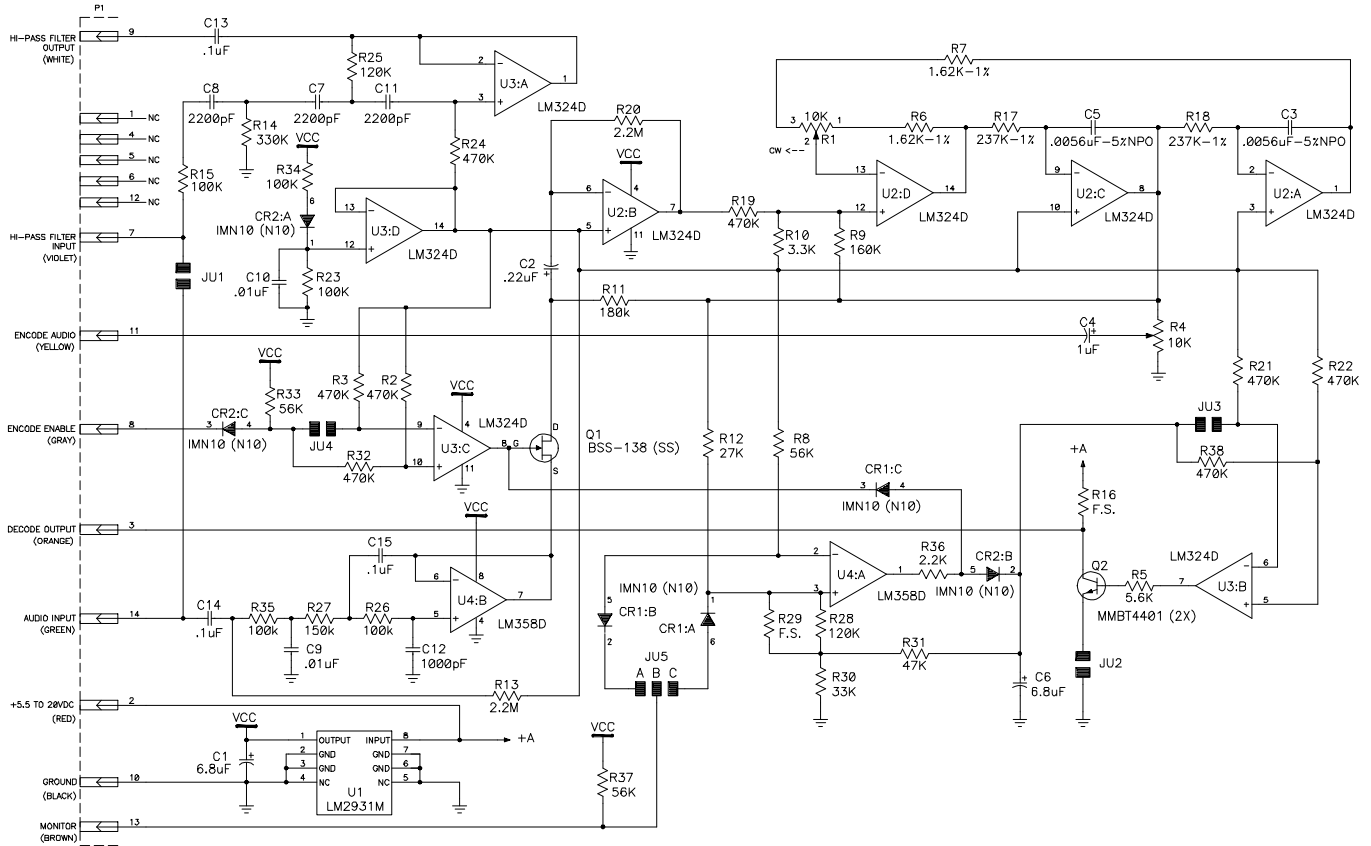
### FREQUENCY/DEVIATION

Frequency adjustment is easily performed by operating the unit as an encoder. With JU4 jumpered, unground the

with a frequency counter. Adjust R1 for desired tone frequency. Key transmitter and adjust R4 for

scope or deviation meter.

# SCHEMATIC LAYOUT



NorComm products are unconditionally guaranteed for two (2) years on materials and labor from date of purchase.

All Warranty repairs must be performed at NorComm's Customer Service Department in Grass Valley, CA. Units under warranty can be returned for repair or

Purchaser's authorization for NorComm to repair or replace equipment and to invoice Purchaser for any and all reasonable costs of repair labor, parts and freight.

limited to, catastrophe, power failure, or transients, environmental extremes, improper use and maintenance or interfacing applications. NorComm further assumes no liability for any incidental or consequential damages which may result from the applications of its products by the Purchaser or any other party.