

# MODEL CS-16 TOUCH TONE™ DECODER

## INTRODUCTION

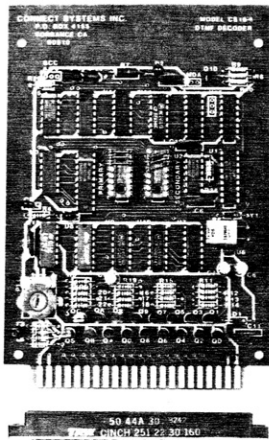
The Model CS-16 Touch Tone™ Decoder/Logic Board permits the economical and reliable control of remotely located devices such as amateur and business band repeaters.

The CS-16 has security features never before offered in a signaling product. These user selectable and user programmable features permit:

- Operation with or without use of passwords.
- Operation with one three digit password.
- Hierarchy control utilizing separate 3 digit primary and secondary passwords.
- A special primary password command permits enabling/disabling access by secondary password users.

Also, the data strobe output can be used to gate repeater audio so that tones are not re-transmitted. This would eliminate the possibility of tape recording control codes for future use. In addition, you would never be annoyed by "buttonpushers."

Reliability is important to us. The glass, silk screened and solder masked board with plated holes is reflow soldered and machine trimmed. The edge connector is gold plated to guarantee an intermittent free connection with the mating connector. (connector supplied)



SUPPLIED AS SHOWN

## FEATURES

### • 16 Latched Functions

With the CS-16 you can remotely control up to 16 on/off functions. If password control is not selected, simply send ★6 to turn on function No. 6, or #9 to turn off function No. 9. ★ and # are used to describe whether the named function is to be turned on or off.

### • Primary and Secondary Passwords

Two independently user programmable three digit passwords allow hierarchy control. All 16 functions are available when the primary password is used. Only 8 of these functions are available to those using the secondary password.

### • Secondary Password Override

A board strap allows the option of assigning one of the exclusive primary functions as a secondary password on/off control. This permits a control operator to enable or disable all access by secondary password users.

### • Password Programming

The passwords are programmed by arranging three jumper wires on a removable 16 pin dip header plug. New codes can be made up at the shop in advance and simply plugged into the CS-16 when you arrive at the repeater site.

### • Open Collector and Logic Outputs

Each of the 16 latched output functions has both an open collector driver suitable for operating relays etc. and a 5 volt CMOS logic output to interface directly with external logic.

### • Data Strobe

This output is made available in both open collector and 5 volt CMOS logic formats. This signal can be used to gate repeater audio so that control commands are not re-transmitted.

### • Audio Preamp

An audio preamp with level control is provided which allows a generous 10 mv to 2 v input range.

### • Strobe LED

The strobe LED illuminates whenever a valid digit is decoded. This light is useful for setting the preamp level control and for test purposes.

### • Power up Reset

In the event of power interruption, the CS-16 comes up with all functions in the off state after power is reapplied.

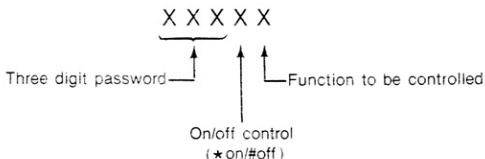
### • Limited Six Month Warranty

The CS-16 carries a full six month factory warranty. However, output devices used for energizing customer loads are excluded.

## SPECIFICATIONS

|                         |  |
|-------------------------|--|
| Tone decoder chip       | SSI-202 (XTAL controlled)                    |
| Decode rate             | Up to 15 digits/second                       |
| Maximum interdigit time | 2.34 seconds                                 |
| Input tone level        | 10 MV. to 2 volts                            |
| Power supply voltage    | 10 VDC to 25 VDC. Reverse polarity protected |
| Power supply current    | <20 MA.                                      |
| Output collectors       | 30 V MAX 200 MA. MAX.                        |
| Output logic fanout     | 1 LS TTL or 50 CMOS                          |
| Size                    | 4½"W x 6½"L                                  |
| Connector               | 44 pin edge — gold plated                    |
| Board material          | G12 Glass                                    |

## PASSWORD/CONTROL FORMAT



Example: A password has been programmed as 8A3 and it is desired to turn function 6 on.  
Simply send 8A3\*6  
(Simply send \*6 if password control has not been selected)

## HEIRARCHY FUNCTION FORMAT

Function: D 1 2 3 4 5 6 7 8 9 0 \* # A B C

The secondary password can only operate this group of eight functions.

The primary password has control of all 16 functions, all of the time. Even if the command has been issued which denies secondary password access.



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## PASSWORD PROGRAMMING

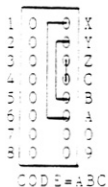
The primary and secondary three digit passwords are programmed by the arrangement of three jumper wires on separate removable dip header plugs.

The letters "XYZ" refer to the digit positions of the password code. Simply connect X to the number you wish for the first digit, Y to the number you wish for the second digit and Z to the number you wish for the third digit.

The three illustrated examples below should make the programming method clear.

The CS-16 is supplied with the primary password programmed "123" and the secondary password "234". The CS-16 will respond to these codes until they are user reprogrammed.

**CAUTION:** Never apply power to the CS-16 with password plugs removed.



### EXAMPLES OF PASSWORD PROGRAMMING

## MODE SELECTION

The status of the "MDA" (multi-digit access) and the "SCC" (secondary code control) Board straps determine four user definable modes of operation.

- MODE 1.** Operation without password control:  
MDA - no strap (cutout factory installed strap)  
SCC - Strap A to B
- MODE 2.** Primary password control, Secondary password disabled:  
MDA - strap (leave in factory installed strap)  
SCC - strap A to B
- MODE 3.** Hierarchy dual password control. Both passwords always enabled:  
MDA - strap  
SCC - no strap required
- MODE 4.** Hierarchy dual password control with secondary password override. Primary password can disable and enable secondary password control by turning function No. 8 on/off.  
MDA - strap  
SCC - strap B to C

## OPERATION

**MODE 1.** Without password Control: \* or # are first sent to indicate whether the function No. sent next is to be turned on or off. For example, it is desired to turn function No. 6 on and No. 9 off. Simply send \*6 #9.

**MODES 2-4.** With Password Control: The procedure is similar to MODE 1, except that the two digit instruction must be prefaced with the correct user programmed three digit password. Example: The factory installed primary password (123) has not yet been changed and you wish to turn function No. 6 on and No. 9 off. Simply send 123\*6 123#9.

**MODES 3 and 4.** Hierarchy Control: The primary password can always control all 16 functions. However the secondary password can only access the bottom 8 functions (D1234567). This two level control can be put to very advantageous use.

**Secondary Password Override:** If mode 4 has been selected, function No. 8 determines whether the secondary password can be used or not. Turning on function No. 8 (123\*8 with factory installed primary password code) Disables the secondary password. Turning function No. 8 off (123#8) restores secondary password control.

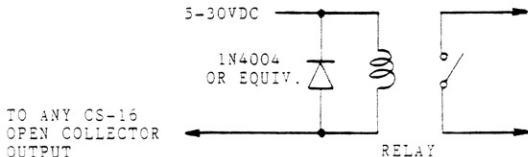
**NOTE:** If mode 4 has been selected, it must be understood that the function No. 8 open collector output may not be used for any other control purpose.

**DO NOT CONNECT ANY LOAD TO CS-16 PIN 12 IF "SCC" B-C IS STRAPPED.**

### OUTPUT LOAD RULES

**Open Collector Outputs:** CS-16 pins 4-20 may be used to energize positive current sinking loads such as 12 VDC relays. The off voltage must not exceed 30 VDC. The on current must not exceed 200 MADC.

**Note:** It is absolutely essential that a diode (1N4004 or equivalent) be installed across inductive loads. Otherwise the output transistors may be damaged. (The output transistors are NOT covered by warranty.)

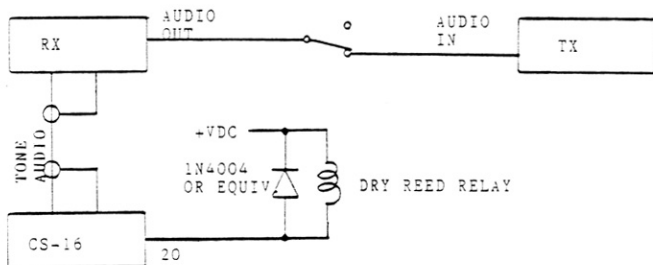


BE SURE TO ADD DIODE  
ACROSS INDUCTIVE LOAD!

**CMOS LOGIC OUTPUTS:** CS-16 pins D - X are 5 volt CMOS logic levels. These outputs will drive over 50 external CMOS loads. Or one LS TTL load can be driven.

## CS-16 INTERFACE DATA

**Control Code Muting:** The data strobe output can be used to eliminate the retransmission of control code sequences in a repeater. Decoding is so fast that only a very slight "chirp" will be heard on the output.



REPEATER CONTROL CODE MUTING

**CS-16 Audio Take Off:** The 10mV to 2 volt input range of the CS-16 will allow many choices of audio take off points in a receiver. Connection to the top of the volume control is the favored take off point in most receivers. Be certain that audio is taken after de-emphasis.

Be sure to use shielded wire when making the audio interface connection.

Refer to the CS-16 pin assignment list and/or schematic diagram for pin outs.

**PRE-AMP AUDIO LEVEL ADJUSTMENT:** LED D2 will light when any valid touch tone digit is being decoded. Set the level control P1 to a setting that simultaneously permits both very low and very high level tones to be decoded.

**OUTPUT POLARITY:** When a given function is turned on, the corresponding open collector output is in the on (conducting) state. The corresponding CMOS output is in the high state. Opposite states occur when the function is turned off.

The data strobe open collector output is on (conducting) when any of the sixteen buttons on a pad are pressed. The corresponding CMOS output is in the high state. The open collector output goes off and the CMOS output goes low when decoding ceases.

## CS-16 PIN ASSIGNMENTS

| Function    | Open Collector | Logic |
|-------------|----------------|-------|
| D           | PIN 4          | PIN D |
| 1           | 5              | E     |
| 2           | 6              | F     |
| 3           | 7              | H     |
| 4           | 8              | J     |
| 5           | 9              | K     |
| 6           | 10             | L     |
| 7           | 11             | M     |
| 8           | 12             | N     |
| 9           | 13             | P     |
| 0           | 14             | R     |
| *           | 15             | S     |
| #           | 16             | T     |
| A           | 17             | U     |
| B           | 18             | V     |
| C           | 19             | W     |
| DATA STROBE | 20             | X     |

Power (+10 to +25 VDC): Pins 2 and B  
 GND: Pins 1 and A

Audio in: Pins 21 and Y  
 Audio return: Pins 22 and Z

### LIMITED WARRANTY

Connect Systems Inc. guarantees your CS-16 to be free of defects in material and workmanship for a period of six months from invoice date.

Service to be performed at the CSI Torrance, Ca. facility. The owner is responsible for transportation costs.

Warranty only valid to original purchaser.

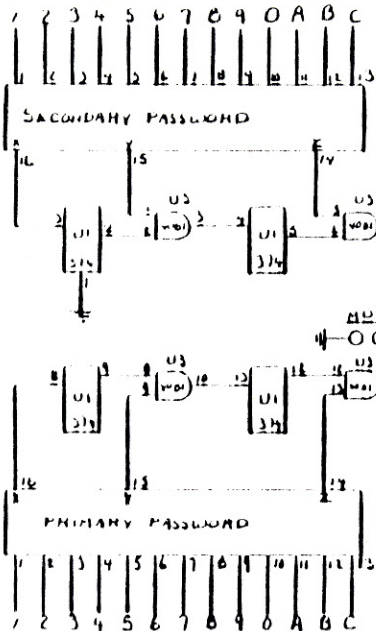
Warranty void if serial number is defaced, altered or missing.

Warranty void if there are any signs of misuse, modification or tampering.

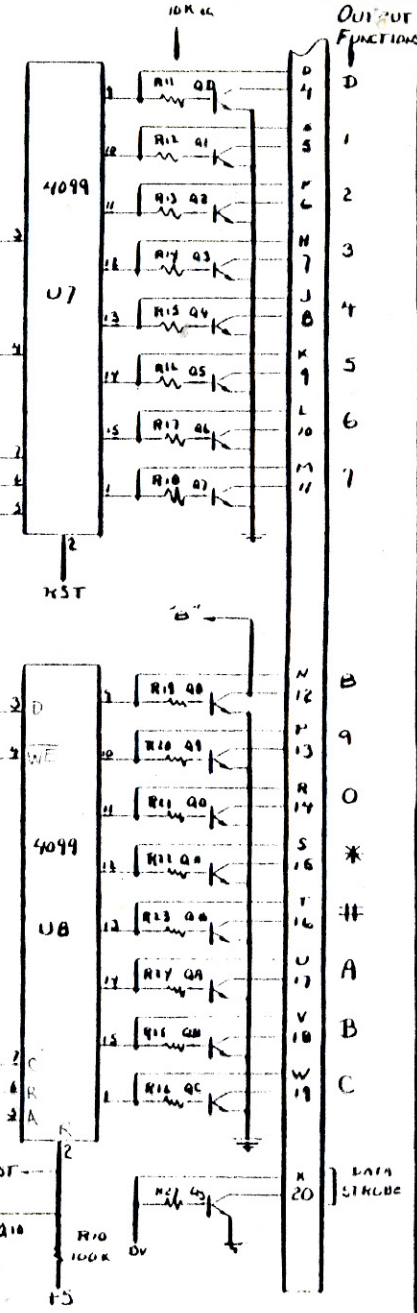
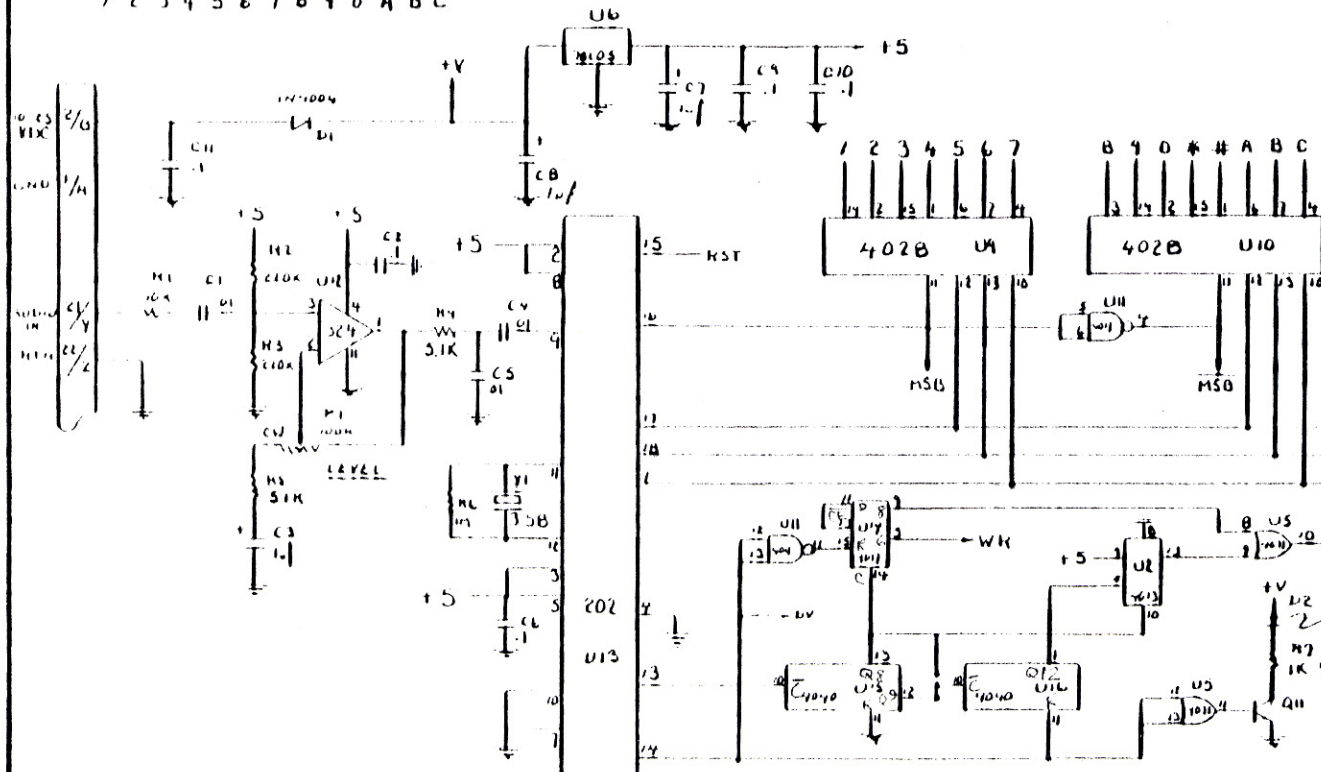
Warranty does not cover damage caused by input over voltage, plugging the board in backwards or any act of GOD such as lightning.

**EXCLUSION:** All output devices used for energizing customer loads are specifically excluded from warranty.

| REV | AUTHORITY | DATE | DESCRIPTION | DATE | APPROVED |
|-----|-----------|------|-------------|------|----------|
|     |           |      |             |      |          |



Q10 and Q11 are PN2222  
All other transistors are MPS-A13



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DWG NO CS-16  
SHEET