



TDS-1

CTCSS & DCS Encoder/Decoder

Manual Revision: 2009-08-18

Covers Software Revisions:
UED-1: 4.0 and higher

Covers Hardware Revisions:
TDS-1: 283B

SPECIFICATIONS

Operating Voltage	5.5 - 15 VDC
Operating Current	<7 mA
Operating Temperature	-30 to +60°C
Input Level	25 - 500 mV RMS
Input Impedance	100K Ω
Dynamic Range	25 dB
Frequency Range	12-270 Hz
Sinad Ratio	<8 dB
Band Width for CTCSS	\pm 1.5%
Momentary Output	200 mA
Disable Output (not used)	100 mA
PTT Output Current	200 mA
Audio Output Level	1V RMS
CTCSS Output Codes	0-51
CTCSS Output Level	0 to -18 dB relative to ANI tones
Audio Output Impedance	10K Ω /27K Ω
Dimensions	1.8" L x .84" W x .22" H

GENERAL INFORMATION

The TDS-1 encodes and decodes the 38 standard CTCSS tones, 13 split tones and custom CTCSS tones, as well as any of the 512 (85 recommended) DCS codes (000-777). The TDS-1 can be programmed for up to 64 different CTCSS/DCS tones using 6-line binary. The reverse burst for CTCSS and the invert & shut-off code for DCS are also supported.

PRODUCT PROGRAMMING

Midian's TDS-1 is programmed using the KL-3. Please reference the KL-3 manual for setup instructions of the KL-3 software and hardware. From the product selection screen on the KL-3 software, select the TDS-1 from the list and click OK.

Set the parameters of the product to fit the application. If any clarifications on a feature are required, move the mouse cursor over the feature name until the question mark appears and right click, a definition of the feature will be shown.

After entering the parameters, save the file by going to File - Save As. Enter the file name in the File Name block and click Save. Saving the file will allow for quick and easy reprogramming of units.

Connect the Orange/White wire to the Green KL-3 lead and the Black wire to a common ground with the KL-3's Black lead. The Yellow clip lead is not used with these products, as the TDS-1 is non-readable.

Ground the PTT Input (Gray Wire); turn on power, and within 5 seconds click "Program Unit" in the menu bar to send the file to the product.

HARDWARE INSTALLATION

Be certain to follow standard anti-static procedures when handling any of Midian's products.

P1 Connector

P1-4 – Black – Ground – Connect to the nearest ground point.

P1-2 – Red - +5.5 – 15 VDC – Connect to switched B+ in the radio.

P1-3 – Brown – COR Input – Connect to point in the squelch or CTCSS circuit that changes logic level when carrier is received. **Note:** The TDS-1 will not decode unless COR is present.

P1-6 – Orange – RX Tone Input – Connect to an un-squelched audio point in the receiver, usually the high side of the volume control or discriminator output. **Note:** DCS has a 12 Hz low frequency component which will not pass through small coupling caps.

P1-7 – Yellow – Monitor/Squelch Out – Connect to a point in the squelch circuit that normally changes logic level with carrier. The squelch polarity is set in the KL-3 software and by selecting the polarity of D-5 by inserting either JU5 or JU6. R-47 can be changed to provide more or less current as needed. Do not allow the Monitor/Squelch Output to conflict with the COR Input.

P1-10 – Gray/White – High Pass Filter Output – If used, this wire should be used in conjunction with the RX Tone Input. Break the discriminator or volume high audio and connect this wire to the side closest to the speaker. If this lead is used the RX Tone Input would be connected to the other side of the break.

P1-1 – Green – TX Tone Out – Connect to the modulator circuit. Use high impedance point in the radio. If generating CTCSS, use the CTCSS point in the modulator.

P1-8 – Green/White – Mic Mute – If desired, connect to mic element bias point or to some other point in the audio amp to crowbar mic audio to ground during ANI to prevent voice interference.

P1-5 – Blue – Alert Tone/Speaker Audio – Connect to high side of the speaker. This provides Time-Out Timer and busy tones. When using 20-40 Ohm speakers, the onboard resistor in series with Q3 should be sufficient. When attaching this lead to a 4-8 Ohm speaker, add a 100-Ohm resistor in series with the lead to limit current.

P1-11 – Gray – PTT In – Requires a logic low from the radio's PTT switch. If TOT is not needed, the PTT In & Out wires can be tied together and connected directly across the radio's PTT switch. For non-common PTT, open the PTT path and connect the gray wire to the switch.

P1-9 – White – PTT Out – Connect to the other side of the open PTT path as referred to in the above step. The TDS now has control of the PTT for Time Out Timer (TOT). The PTT transistor, Q6, is rated at 200 mA continuous.

P1-12 – Orange/White – Monitor/Program In – For Program In, this lead is connected to the Green lead from the KL-3 programmer. For Monitor taking this input high or low (depending on programming) will reset the monitor/squelch output.

P2 Connector

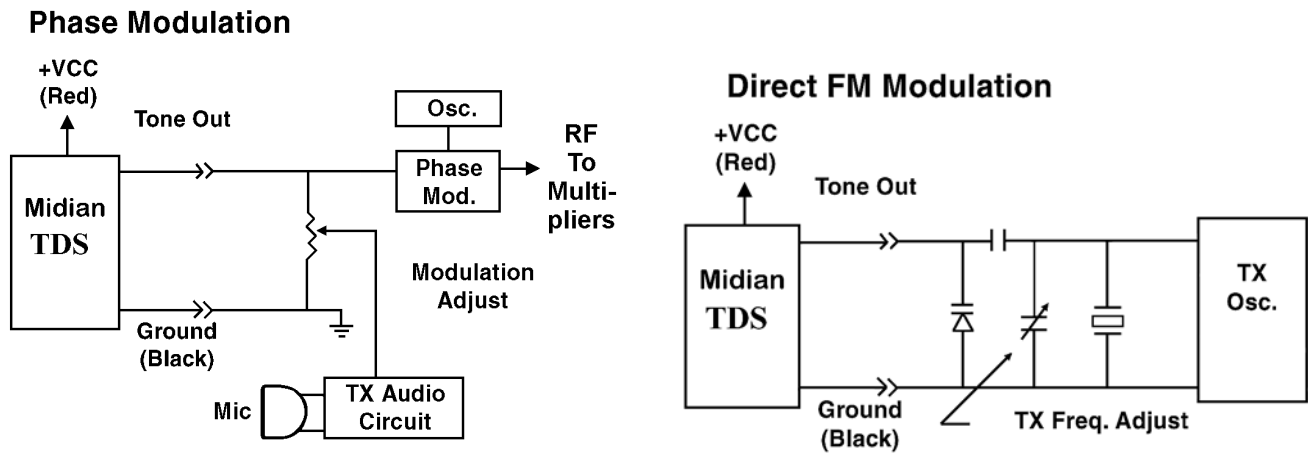
P2-10 – Gray/White – Momentary Speaker Ground – Provides a momentary ground through Q7 (200 mA). This output will produce a momentary ground during sidetone audio. This can be used in some radios with push/pull outputs to complete the ground during TOT, busy, beep.

The following P2 connections are for the channel selection:

P2 Wire	Binary Mode	BCD Mode	Discrete Mode
P2-1 – Green	Bit 0	Bit 0	Select 1
P2-2 – Red	Bit 1	Bit 1	Select 2
P2-3 – Brown	Bit 2	Bit 2	Select 3
P2-4 – Black	Bit 3	Bit 3	Select 4
P2-5 – Blue	Bit 4		Select 5
P2-6 – Orange	Bit 5		Select 6
P2-7 – Yellow			Select 7
P2-8 – Green/White	Ground	Ground	Ground

Installation Diagrams:

The following installation diagrams are provided to give an idea of how the audio wire can be connected. When using DPL, the radio must be a true FM as shown in the Direct FM Modulation diagram below. In fact, a varactor diode could be added to the oscillator circuit in radios employing phase modulation.



HARDWARE ALIGNMENT

RX Audio Input: Apply the desired CTCSS tone at 1 KHz of modulation from a signal generator to the receiver. For best SINAD performance, adjust R65 so that Pin 14 of U2 (TP1) there is approximately 2.25 VPP or 750 RMS. If less level is needed remove R63 by opening JU1. Additionally Pin 8 of U2 (TP2) should show a clean and symmetrical square wave.

TX Audio Output: Adjust R-22 so that per EIA specifications CTCSS is 750 Hz to 1 KHz modulation. In Low-Z mic circuits, it may be necessary to short R23 and/or increase C20.

COR/COS: If the radio only makes a minute change, it may be necessary to adjust the following values to cause Q1 to change states:

R-6, R-69, & R-4

RADIO PROGRAMMING

The TDS-1 is a generic module that wire into most radios. Any radio specific programming, if available, would be found on any Application Notes available for those radios. You may visit our website or call us for application notes.

OPERATION

Decode: When the TDS-1 is inactive (not encoding or decoding) the Monitor/Squelch Output and the Mic Mute Outputs are active (high or low depending on programming). When CTCSS or DCS is decoded the outputs unlatch to the opposite state to open the squelch of the radio.

Resetting of Outputs: The outputs will reset upon loss CTCSS/DCS. The programming field CTCSS Tone Loss Detect Time sets the length in time after the tone goes away that the TDS will reset the outputs.

Monitor: Taking the monitor input high or low (depending on programming) will cause the Monitor/Squelch and Mic Mute outputs to release as long as the monitor input is active.

Encode: Grounding the PTT Input will cause the TDS to assert the PTT Output to key the radio. The CTCSS/DCS tone will be generated out the TX Audio Output line.

COR Input: This input controls the busy channel lockout function. If COR is active and the unit tries to encode with busy lockout enabled, the unit will be prevented from keying up. Additionally COR must be active for the TDS-1 to decode.

PROGRAMMABLE FEATURES

Turn Off Format (Squelch Tail Eliminator): This field can be set for “None” which turns off the squelch tail eliminator function, “Tone” which causes the TDS-1 to generate a turn off tone when unkeyed, or “Phase Shift” which causes the TDS-1 to generate a reverse burst when unkeyed.

Turn Off Tone Frequency/Phase Shift: This programs the frequency of the turn off tone if enabled (000.0 – 999.9 Hz), or the phase of the reverse burst if enabled (0000-0359).

Turn Off Tone Time (seconds): If the using the turn off tone, this sets the time of the tone from .00 - .99 seconds. Midian recommends using approximately .25 seconds.

Burst Tone Duration (seconds) (format 0.0): If generating burst tone to open a repeater instead of CTCSS/DCS this field sets the length of the burst tone from 0.0 seconds to 9.9 seconds.

CTCSS Decode Detect Time (seconds): Programs how fast in milliseconds, that the decoder will decode a CTCSS tone. This does not apply to DCS. EIA specs stipulate that at 100 Hz, a decoder should detect in 250 msec. Lower frequencies will take longer, and higher frequencies will take less time. The TDS-1 can be programmed to decode any tone in 100 msec. At 67 Hz the microprocessor will count 6.7 cycles in 100 msec. At 250 Hz, the microprocessor will count 25 cycles in 100 msec. Going below 100 msec is possible, but not recommended because the unit will tend to false off. We would generally recommend using approximately 200 msec., especially below 100 cycles, to increase the number of counts, and thus diminishing the possibility of falsing.

Turn Off Code Detect Time (seconds): Works in the same fashion as CTCSS Decode Detect Time above. If using a shut off tone above the CTCSS 254.1, you can use a shorter detect time. If using a shut off tone below 67 Hz, use a longer detect time. If using a shut off code of 500 to 999.9 Hz as a go ahead tone, pick a time that is audibly pleasant. We would recommend 100 msec. Turn Off Tone Time should be lower than Turn Off Code Detect Time. **Note:** The TDS-1 Decoder will not reset when a CTCSS phase shift occurs.

CTCSS Tone Loss Detect Time: Set this field for 0.00 to 0.99 seconds. This sets the time the TDS-1 waits to reset the outputs after loss of CTCSS or DCS. It is recommended to set this time to at least 0.20 so the radio does not mute during short fades. Note that the Tone Turn Off Time should be set longer than this time to prevent hearing part of the squelch tail.

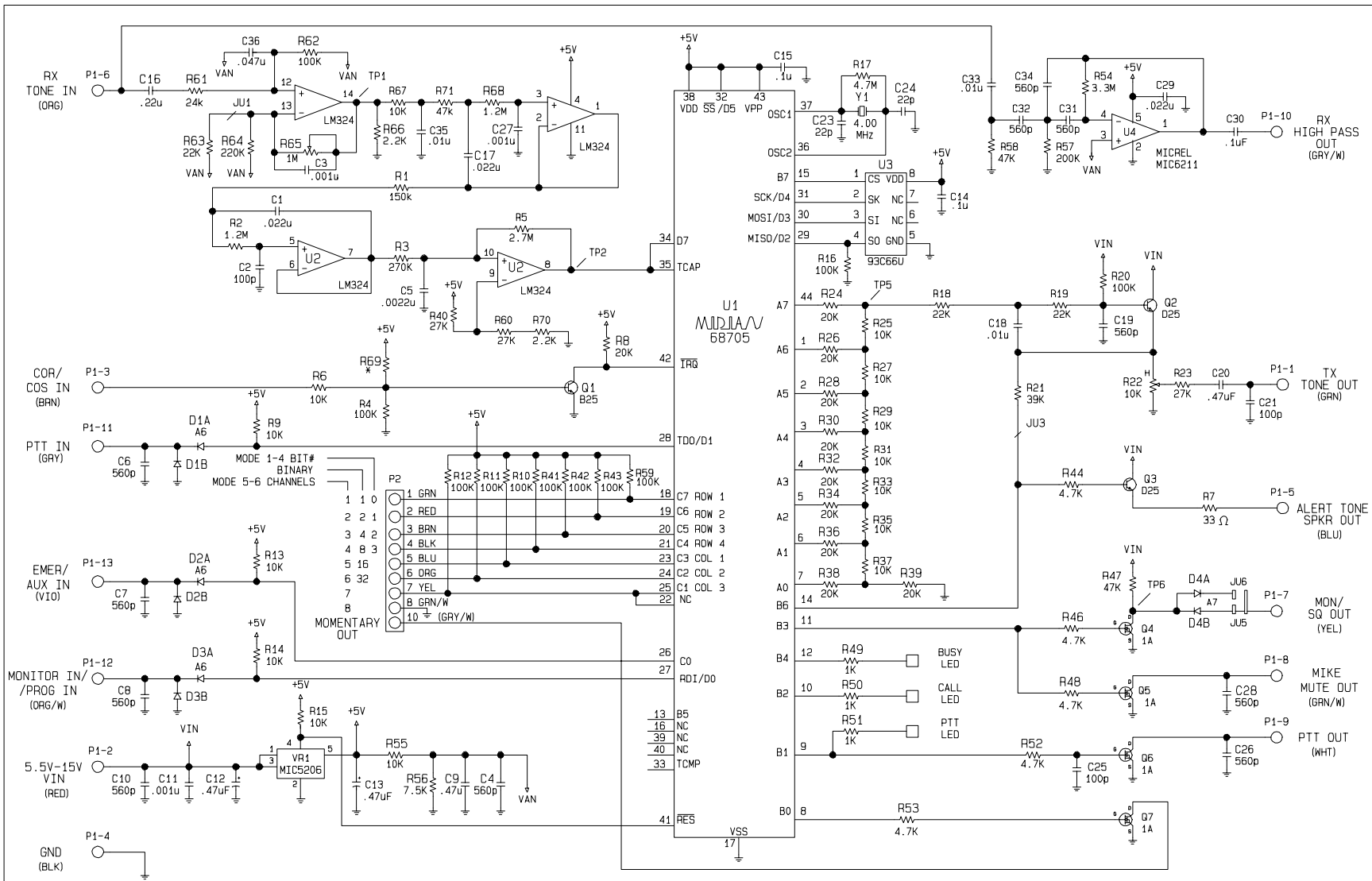
TECHNICAL NOTES

CTCSS Decode Detect Time: This time must be programmed to at least 0.20 seconds. If not the output of the TDS-1 on decode of DCS will chatter on and off.

MIDIAN CONTACT INFORMATION

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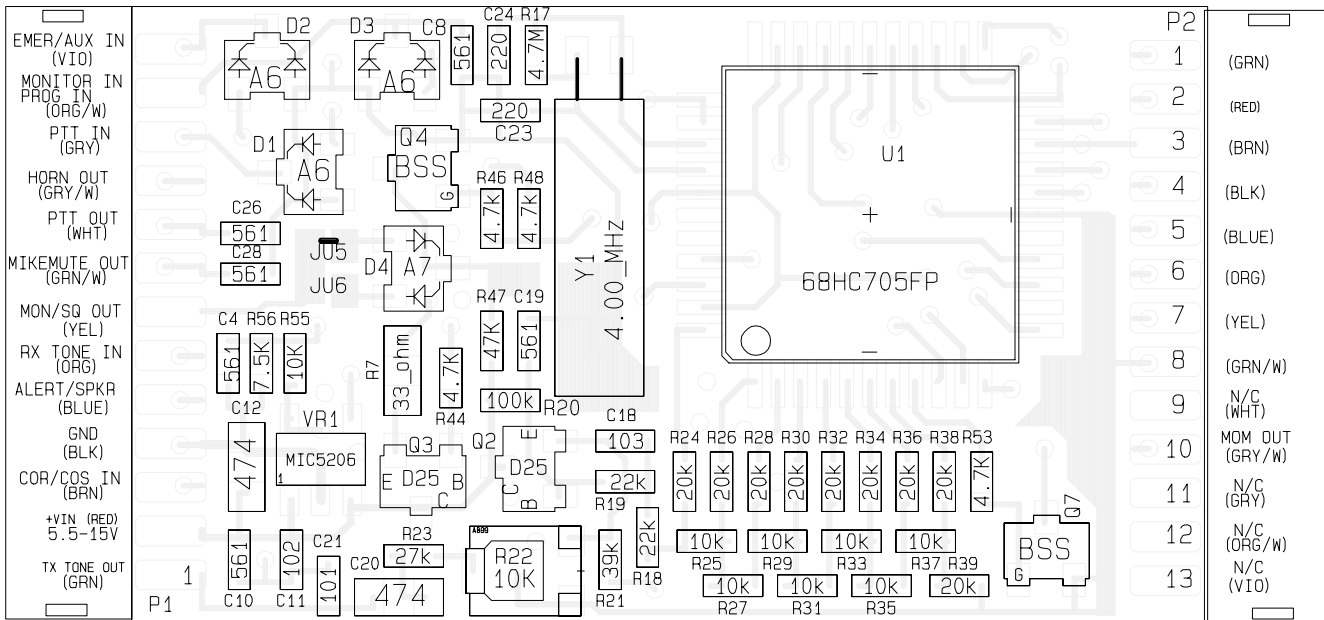
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Web: <http://www.midians.com/>



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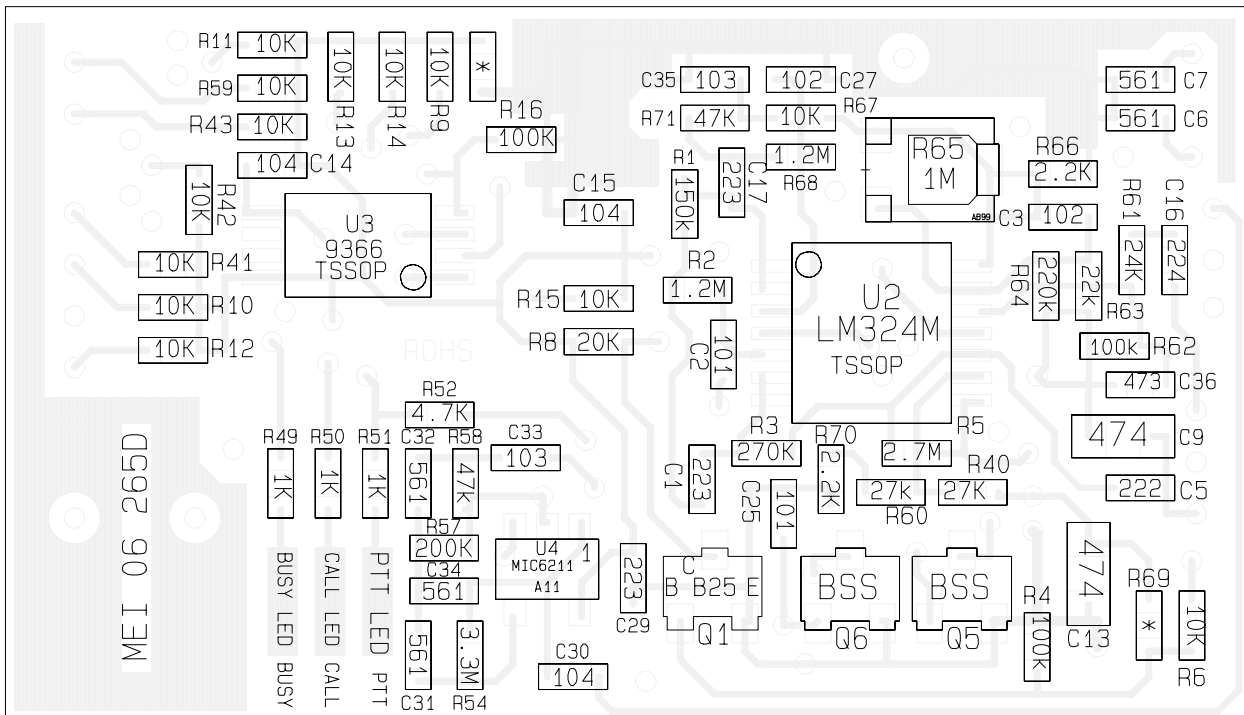
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SCHEMATIC	SHEET	DWG. NO. 2650-HCD
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NOTES:
 * NOT INSTALLED
 TO USE JU1, REMOVE R63
 TO USE JU3, REMOVE R21



* NOT INSTALLED 265C.PCB

265DUGBR



JUNE 12/07 265D.PCB

265DSGBR

MIDIAN ELECTRONICS		MIDIAN		TDS-1	REV. D	FILE NO. 265D.PCB
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