



## **TDS-1-DMH**

### **CTCSS & DCS Encoder & Decoder**

**Manual Revision: 2009-02-03**

**Covers Software Revisions:**

**TDS-1-DMH: 2.2 and higher**

**Covers Hardware Revisions:**

**TDS-1-DMH: 242D**

## SPECIFICATIONS

|                        |                                   |
|------------------------|-----------------------------------|
| Operating Voltage      | 10 - 15 VDC                       |
| Operating Current      | 20 mA                             |
| Operating Temperature  | -30 to +60°C                      |
| Input Level            | 25 - 500 mV RMS                   |
| Input Impedance        | 100K $\Omega$                     |
| Dynamic Range          | 25 dB                             |
| Frequency Range        | 12-270 Hz                         |
| Sinad Ratio            | <8 dB                             |
| Band Width for CTCSS   | $\pm 1.5\%$                       |
| Momentary Output       | 100 mA                            |
| PTT Output Current     | 100 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 $\Omega$ /27K $\Omega$        |
| Dimensions             | 3.0" L x 4.1" W x 1.25" H         |

## GENERAL INFORMATION

The TDS-1-DMH 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 reverse burst for CTCSS and the invert & shut-off code for DCS are also supported.

The TDS-1 can be programmed for up to 64 different CTCSS/DCS tones. Using the rotary switch, 16 tones can be selected. Using the Bank switch and the Monitor switch 48 more tones can be selected using the rotary switch (see the table in the Operation section).

## 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-DMH 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 Blue 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 this product, as the TDS-1 is non-readable.

Ground the PTT Input (White Wire); turn on power, and within 5 seconds click "Program Unit" in the menu bar to send the file to the product. **Note:** The Monitor button must be in the Out position during programming.

## HARDWARE INSTALLATION

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

### P1 Connector

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

**P1-1: Black** – Ground – Connect to the nearest ground point.

**P1-2: Violet** – Alert Tone/Speaker Audio Output – Connect to high side of the speaker. This provides Time-Out Timer, Penalty, and Go Ahead tones. When using 20-40 Ohm speakers, the onboard resistor in series with Q7 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.

**P1-3: Gray** – COR Input – Connect to point in the squelch or CTCSS circuit that changes logic level when carrier is received.

**P1-4: Green** – Mic Mute – 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. To access this feature, install JU4.

**P1-5: Light Brown** – 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. Do not allow the Monitor/Squelch Output to conflict with the COR Input.

**P1-6: White** – PTT Input – 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.

**P1-7: Dark Brown** – PTT Output – Connect to the other side of the open PTT path as referred to in the above step. The UED now has control of the PTT for Time Out Timer (TOT) and penalty timer. The PTT transistor, Q6, is rated at 100 mA continuous.

**P1-8: Yellow** – 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.

**P1-9: Red** - +5.5-18 VDC – Connect to switched B+ in the radio.

**P1-10: Pink** – RX Hipass 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.

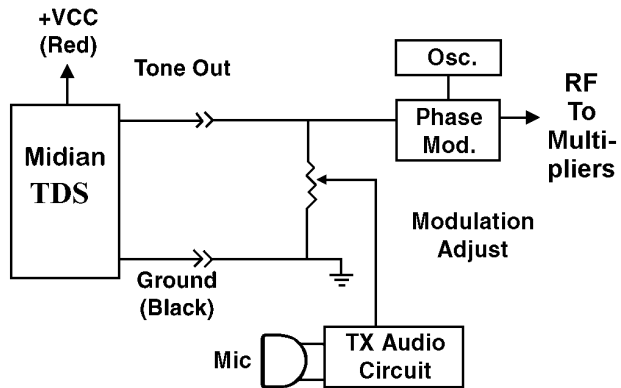
**P1-11: Orange** – RX Tone Input – Connect to an unsquelched audio point in the receiver, usually the high side of the volume control or discriminator output.

**P1-12: Blue** – Hook/Monitor/Program In – For Program In, this lead is connected to the Green lead from the KL-3 programmer. Connect to the mic hang-up button, monitor button, or squelch pot switch.

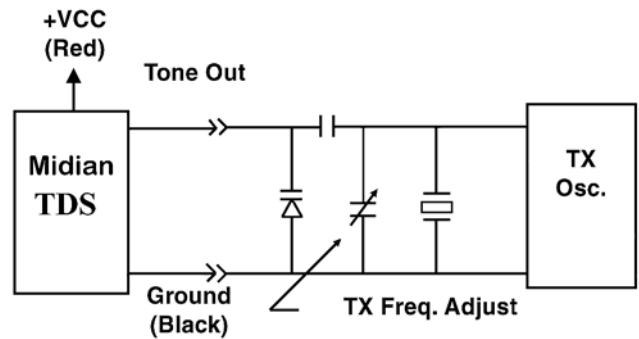
## Installation Diagrams:

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.

### Phase Modulation



### Direct FM 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 R79 so that Pin 14 of U2 there is approximately 2.25 VPP or 750 RMS. Additionally Pin 1 of U3 (TP1) should show a clean and symmetrical square wave.

**TX Audio Output:** Adjust R-43 so that per EIA specifications CTCSS is 750 Hz to 1 KHz modulation. In Low-Z mic circuits, it may be necessary to close JU2 and/or increase C36.

**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-18, R-19, & R-20

## RADIO PROGRAMMING

The TDS-1-DMH can be wired to many radios, repeaters or test equipment. 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.

**Tone Selection:** The 16 position rotary switch on the front of the unit selects the tones according to the position of the push button switches and the table below. Note: In order to use the Mute/MON Switch remove JU-7 on the board and install a jumper from SW1 Pad 1 to SW1 Pad B.

| Tone Select | Bank Switch | Mute/MON Switch |
|-------------|-------------|-----------------|
| 1-16        | Out         | Out             |
| 17-32       | In          | Out             |
| 33-48       | Out         | In              |
| 49-64       | In          | In              |

## 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.

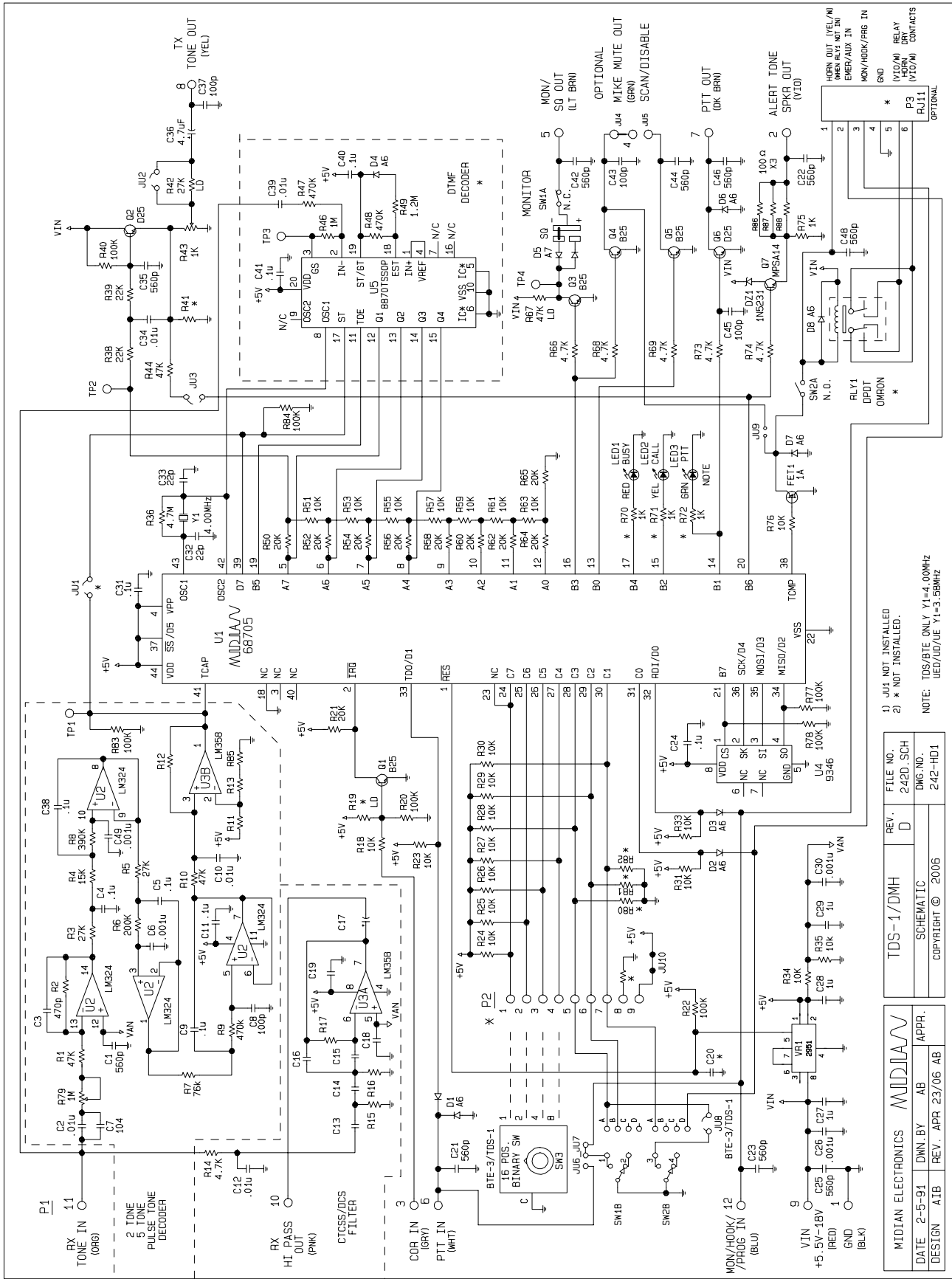
## TECHNICAL NOTES

**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

**Midian Electronics Inc.**  
2302 East 22<sup>nd</sup> Street  
Tucson, Arizona 85713 USA

**Orders:** 1-800-MIDIANS  
**Phone:** 520-884-7981  
**Fax:** 520-884-0422  
**E-mail:** [sales@midians.com](mailto:sales@midians.com)  
**Web:** <http://www.midians.com/>



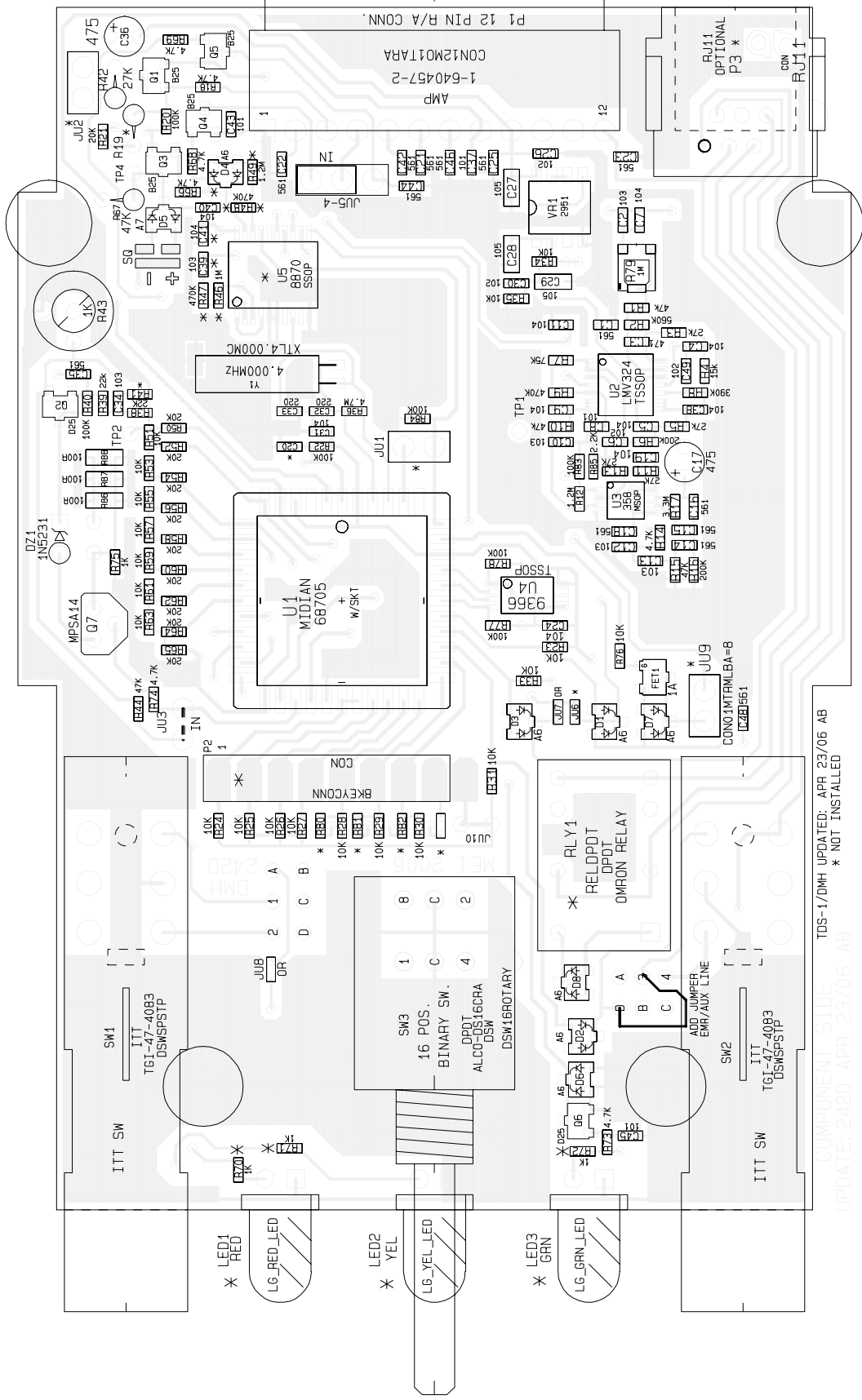
1) JU1 NOT INSTALLED  
2) \* NOT INSTALLED.

NOTE: TDS/BTE ONLY Y1=4.00MHz  
UED/UD/UE Y1=3.58MHz

|                  |      |          |
|------------------|------|----------|
| TDS-1/DWH        | REV. | FILE NO. |
| SCHEMATIC        | D    | 2420.SCH |
| COPYRIGHT © 2005 |      | DWG. NO. |
|                  |      | 242-HD1  |

|                    |           |       |              |
|--------------------|-----------|-------|--------------|
| MIDIAN ELECTRONICS | MIDIAN    | REV.  | APR 23/06 AB |
| DATE 2-5-91        | DWN BY AB | APPR. |              |
| DESIGN AIB         | REV.      |       |              |

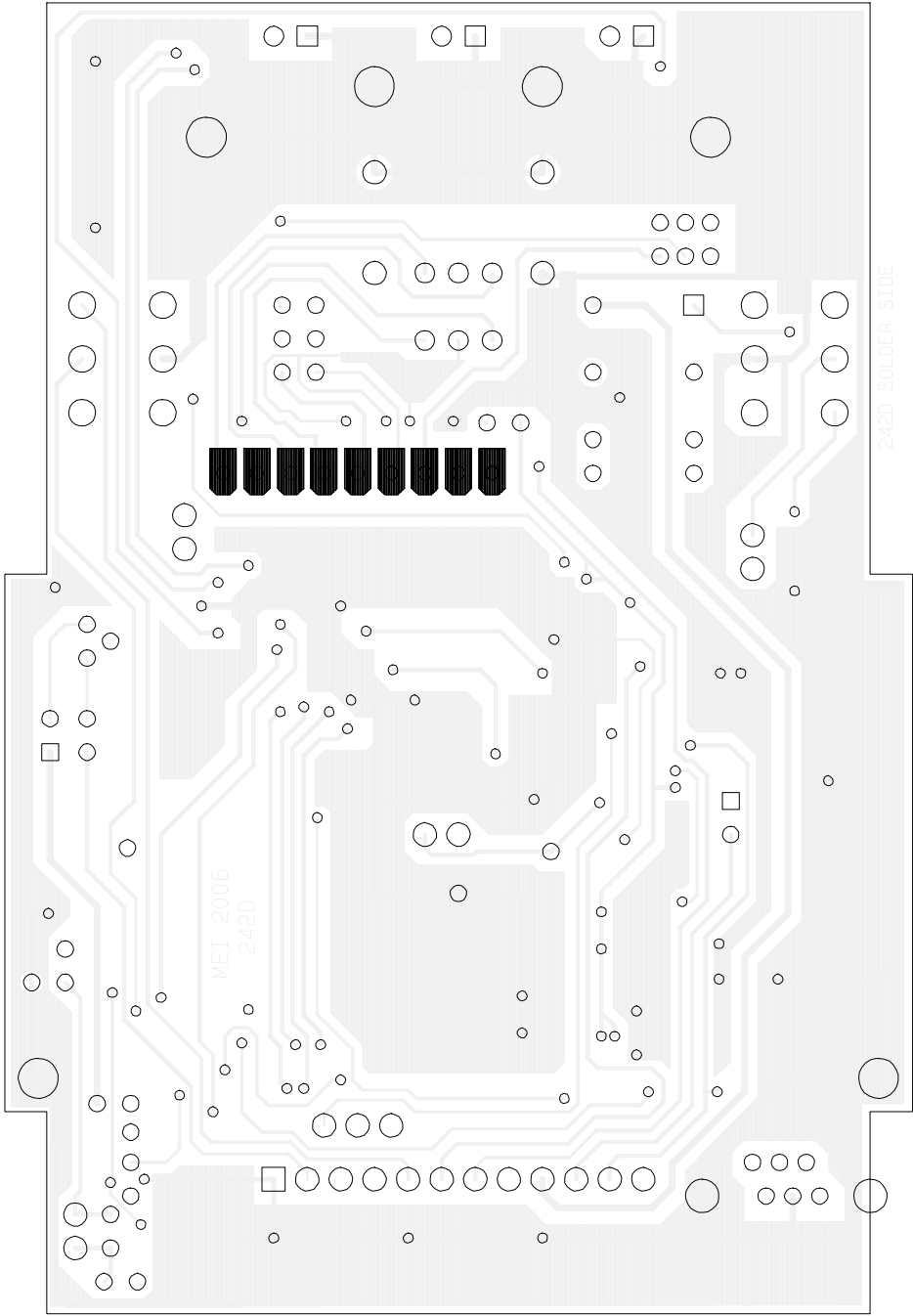
*- This page intentionally left blank -*



COMPONENT SIDE  
 TDS-1/DNH UPDATED: APR 23/06 AB  
 UPDATE: 242D APR 23/06 AB

|                    |                   |
|--------------------|-------------------|
| MIDIAN ELECTRONICS | MIDIAN            |
| DATE 2-5-91        | DNW.BY AB         |
| DESIGN AIB         | REV. APR 23/06 AB |
| APPR.              |                   |

|                  |       |          |
|------------------|-------|----------|
| TDS-1/DNH        | REV.  | FILE NO. |
| PICTORIAL        | D     | 242DTS   |
| COPYRIGHT © 2006 | SHEET | DMG.NO.  |
|                  |       | 242HCP   |



|                    |                   |                  |       |                 |
|--------------------|-------------------|------------------|-------|-----------------|
| MIDIAN ELECTRONICS |                   | MIDIAN           | REV.  | FILE NO.        |
| DATE 2-5-91        | DNW. BY AB        | APPR.            | D     | 242DTS          |
| DESIGN AIB         | REV. APR 23/06 AB |                  | SHEET | DMG. NO. 242HCP |
|                    |                   | COPYRIGHT © 2006 |       |                 |