



# ***BTE-3 DMH***

## **DASHMOUNT BURST TONE ENCODER WITH OPTIONAL CTCSS/DCS ENCODE & DECODE**

### **INSTRUCTION MANUAL**

#### **Programmable Features**

- Programmable Encoder/Decoder compatible with Motorola Private Line/Digital Private Line, GE Ericsson Channel Guard/Digital Channel Guard, and EF Johnson Call Guard/Digital Call Guard Feature
- Encodes and decodes 38 Standard EIA, CTCSS tones, and 13 split tones
- Programmable reverse burst squelch tail eliminator
- Encodes and decodes standard 83 DCS codes with 134Hz shutoff code (requires a true FM radio)
- User can program his own custom CTCSS frequencies and DCS codes, in addition to standard frequencies and codes
- Encodes Burst Tone with programmable frequency and timing (1 Hz to 3500 Hz; 0.0-7.6 secs)
- 64 memory register locations for selecting CTCSS, DCS, Burst Tones, with ANI enable, using six line binary address or 1 of 8 from channel selector. Each location may have a different CTCSS or DCS for encode or decode.
- Programmable decoder drop time prevents re-muting during fading
- Busy Channel Lockout with Busy Tone
- Time Out Timer with Warning Tone
- Penalty Timer
- Field selectable positive or negative squelch output with mute or un-mute during Busy/TOT tones

- High pass filter for removing tones from receive audio signal
- PTT and Microphone hang up control inputs
- Programmable via KL-3 keyloader (requires IBM compatible PC)
- Available in a DMH dash mount box

#### **Programmable ANI Formats**

- Five Tone: EEA, CCIR, ZVEI, DZVEI, DDZVEI, NATEL, EIA, & MODAT
- Touch Tone® (DTMF)
- Burst Tone Encoder

#### **Programmable ANI Features**

- Front Porch Key-Up Delay Timer before ANI for repeater access
- Man Down Sensor Input Delay Timer (0-9 seconds)
- Accidental Man Down Warning Timer (0-9 seconds)
- Emergency ANI with Programmable Repeat (0-9 times)
- 0-8 Digit Leading and/or Trailing ANI
- ANI Repeat Delay Timer so ANI is not sent with every PTT
- Emergency ANIs with Repeat Delay Timer (0-99 seconds between ANIs)
- CTCSS/DCS can be held off before and during ANI
- CTCSS/DCS modulation is programmable relative to ANI
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## SPECIFICATIONS

### VOLTAGE/CURRENT

Operating Voltage ..... 10 - 15 VDC  
Operating Current..... 20 mA

### INPUTS

Input Level .....25 - 500 mVRMS  
Input Impedance..... 100K $\Omega$   
Dynamic Range..... 25 dB  
Frequency Range .....12-270 Hz  
Sinad Ratio..... <8 dB  
Band Width for CTCSS ..... $\pm 1.5\%$

### OUTPUTS

Output Tones..... Busy and TOT  
Momentary Output..... 200 mA  
Disable Output (not used)..... 200 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 $\Omega$ /22K $\Omega$

### TIMING

Key-Up Delay (Front Porch).....00-99 seconds  
Time Out Timer ..... 00-99 seconds

Penalty Timer ..... 00-99 seconds  
Momentary Output ..... 0-9 seconds  
Queuing Signal Delay ..... 0-9 seconds  
Burst Tone Timing ..... 0.0-7.6 seconds  
ANI Tone Timing.....0.001-9.999 seconds  
Emergency ANI Repeat Delay..... 00-99 seconds  
Emergency Input Debounce ..... 0-9 seconds  
Number of Emergency ANI Repeats ..... 0-9  
Emergency ANI Warning Timer ..... 0-9 seconds  
Min. Recommended Encode Tone Time (ANI) . 20 msec

### ANI

ANI ..... 0-8 digits  
Secondary/Emergency ANI ..... 0-8 digits  
Formats .....Five Tone: EEA, CCIR, ZVEI, DZVEI,  
DDZVEI, NATEL, EIA & MODAT;  
DTMF & BURST TONE

### DECODING

CTCSS ..... 38 EIA & 13 Split Tones  
DCS ..... 83 Codes

### MECHANICAL

Standard Dim. .... 3.0" x 4.1" x 1.25"  
Operating Temperature..... -30 to +60°C

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## WARRANTY

Midian Electronics, Inc., warrants this product to be free from defects in material and workmanship for two years from date of shipment. If such malfunction occurs, it will be repaired or replaced (at our option) without charge for materials or labor if returned to the factory. This warranty does not apply to any parts damaged due to improper use--including accident, neglect, unreasonable use, and improper installation--or to unauthorized alterations or modifications of the equipment. It does not extend to damage incurred by natural causes such as lightning, fire, floods, or other such catastrophes, nor to damage caused by environmental extremes, such as power surges and/or transients. It does not extend to microprocessors, if it is determined that the failure of a micro is due to static damage, application of improper voltages to the unit, or other problems not related to circuit design. In such case or in the case of a desire to update the micro to a different version of software, such request must be specified in writing, and there will be a charge agreed upon by both parties.

This product is warranted to meet published specifications and to operate as specified only when properly installed in radio equipment which complies with U.S. FCC specifications and the applicable radio manufacturer's specifications. Midian Electronics is not responsible for any operational problems caused by system design, outside interference, or improper installation.

Equipment for repair can be returned to the factory without prior written authorization. A brief letter describing the nature of the defect should be included with the merchandise. Repair by other than Midian Electronics, Inc., will void this warranty. In-warranty merchandise must be shipped, freight prepaid, to Midian Electronics. Midian Electronics will return, freight prepaid via UPS ground, the repaired or replaced equipment to purchaser, within the United States. Out-of-warranty repairs will be billed at the rate of \$60 per hour, plus replacement parts.

This warranty applies to the original purchaser of the equipment only. Midian Electronics is not liable under this warranty, or any implied warranty, for loss of use or for other consequential loss or damage experienced by the purchaser. Some states do not permit the exclusion or limitation of implied warranties or consequential damages. This warranty provides special legal rights, and the purchaser may have other rights that vary from state to state.

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## BTE-3 DMH PROGRAMMING WORKSHEET

## SCHEMATIC

## PICTORIAL

# Installation Instructions

Installation Note: Midian products utilize CMOS integrated circuits, which are susceptible to damage from high static charges. Be sure to follow standard antistatic procedures when handling, including using grounded workstations and soldering irons and wearing grounding bracelets. Please be careful when selecting wire colors. It is sometimes difficult to distinguish between the grey, black, and brown wire colors under fluorescent lighting. We suggest using Color-Bright/Color-Corrected or incandescent lighting. If in doubt, compare wire positions on board layout for correct color code.

| P1 Wire          | Function                  | Instructions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Black</b>     | Ground                    | Connect to nearest ground point.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Red</b>       | 10 - 15 VDC               | Connect to switched B+ in radio.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Gray</b>      | COR/COS                   | Connect to point in Squelch circuit that changes logic level when carrier is received. Program desired COR active polarity. A radio whose squelch circuit provides a logic low or logic high can readily turn the COR transistor on and off. If the point that this lead is hooked to only makes a minute change in voltage, it will be necessary to adjust the values of R18 and R20 to cause Q1 to change states. Note: BTE-3 DMH will not decode unless COR is present. This prevents popping on squelch, particularly when programming short CTCSS decode times.                                                                                                                                                                                                                                        |
| <b>Orange</b>    | RX Tone Input             | Connect to an unsquelched audio point in the receiver, usually the high side of the volume control or discriminator output. <b>Not used if only sending Burst Tone.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Lt. Brown</b> | Monitor/Squelch Output    | Connect to point in squelch circuit that normally changes logic level with carrier. The squelch polarity is set by programming register R71B and by changing the polarity of D5. R67 can be changed to provide more or less current as needed. Do not conflict with COR lead.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Pink</b>      | High Pass Filter Output   | Break the discriminator or volume high audio. Connect this lead to the side closest to the speaker. The High Pass Filter prevents CTCSS and DCS from being heard in the speaker (see Orange Wire above). <b>Not used if only sending Burst Tone.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Yellow</b>    | Tx Tone Out               | Connect to modulator circuit. When generating CTCSS, use CTCSS point in modulator. Use high impedance point in radio. Low-Z will cause low frequency rolloff across C36 and R42. In Low-Z mic circuits, it may be necessary to short this resistor and/or increase C36. Per EIA specifications, set CTCSS to 750 Hz - 1 kHz; set ANI to 3.3 kHz modulation. See Table 3, CTCSS/DCS Attenuation Table. Set Mod Pot R43 to 3.3 kHz with ANI. Following Table 3, program CTCSS/DCS to 1 kHz.                                                                                                                                                                                                                                                                                                                   |
| <b>Green</b>     | Optional Mic Mute         | If desired, connect to mic element bias point or to some other point in the modulator audio amp to crowbar mic audio during ANI to prevent voice interference.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Violet</b>    | Alert Speaker Audio       | Connect to high side of speaker. This provides busy tone and TOT warning tone. (Speaker completes ground path for speaker emitter-follower transistor, Q7.) CAUTION: When attaching this lead to a 4 or 8 Ohm speaker, add a 100 Ohm resistor in series with this blue lead to limit current. When using 20-40 Ohm speakers, the onboard resistor in series with Q7 should be sufficient.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>White</b>     | PTT In                    | Requires a logic low from PTT switch. Remove wire from PTT and connect this lead to the switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Dk. Brown</b> | PTT Out                   | Connect to the wire that was removed from PTT switch in above step. Micro now has control of PTT for time out timer and busy lockout. NOTE: If neither Busy Channel Lockout, Time Out Timer or Penalty Timer are programmed, the PTT In and PTT Out leads can be tied together and tied directly across the radio's PTT switch. If Busy Channel Lockout, Time Out Timer and/or Penalty Timer are desired, it will be necessary to perform the instructions given and properly program the unit, so that the micro has control of PTT. The surface mount PTT transistor (Q6) is rated at 100 mA continuous. Use caution when connecting to relays with heavy coil currents; install a diode in parallel to the relay coil to eliminate counter EMF or serious damage may result to Q6 and void the warranty. |
| <b>Blue</b>      | Monitor/Hook              | Connect to microphone hang-up button, monitor button, or squelch pot switch.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>RJ11</b>      | Auxiliary/Emergency input | When taken to Ground, this input can send an emergency ANI. Connect to a customer-installed switch such as a hidden foot pedal or mercury tilt switch for emergency ANI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## 1.0 OPERATION

The BTE-3 DMH is really a TDS-1 DMH with a monitor button relabeled and reconnected to be a send button. When a register is set up to send Burst Tone it cannot encode CTCSS.

### 1.1 Controls and Indicators

The BTE-3 DMH is controlled by the PTT &/or Send button, Mic Hang-up monitor line and COR input. The PTT transmits Burst Tone or CTCSS/DCS with ANI, and keys the transmitter during a conversation.

There is also a latching push button on the right side of the DMH box that can select an extra bank of 16 codes by grounding the 5<sup>th</sup> line of the 6<sup>th</sup> line binary input. The first four lines are used by the 16 position binary switch.

The momentary Send button is internally jumpered to the PTT line and is used to send the Burst Tone in lieu of using the microphone's PTT. If the Send button is not needed, it could be used as an additional 16 code bank selector by jumpering its line over to the 6<sup>th</sup> binary position. This will allow you to go from 32 codes to 64 codes.

The first bank switch allows you to go from 16 codes to 32 codes. The second bank switch (Send) allows you to go to 48 codes. Using both bank switches allows you to use all 64 codes. **NOTE: The momentary send button can be connected to latched with the enclosed pin.**

Normally the Mic Hang-up input allows the user to monitor the channel to see if other users are transmitting. This feature is not necessary because the BTE-3 DMH can detect a busy channel by monitoring the radio's COR circuit to determine if the channel is busy. If busy and the user keys the radio, it will generate a busy tone thus preventing the user from keying the transmitter. There is also a queuing feature that will give the user a tone indicating the channel is no longer busy.

The unit employs a Time Out Timer that turns off the Push To Talk and generates a warning tone if the user has talked too long or if the mic button is stuck. A penalty timer is activated when the Time Out Timer exceeds its programmed time. This penalizes the user for talking too long and denies him access to the channel for the amount of time programmed in the penalty timer location. There is a speaker output which provides the timeout timer and busy tones.

### 1.2 CTCSS

The BTE-3 DMH is normally configured to encode Burst Tone. There are 16-64 registers depending on the number of bank switches mentioned in 1.1 above. These registers can be programmed to encode either Burst Tone or CTCSS. The decode register only decodes CTCSS and DCS not Burst Tone.

The BTE-3 DMH may be programmed to open repeaters, base stations, or mobile units via one of 51 different subaudible CTCSS codes (38 standard codes plus 13 split codes) or 83 DCS codes. The user may also program custom CTCSS frequencies above, below and in between the normal codes. All CTCSS codes are entered as a specific frequency.

The user may also program custom DCS codes, these are entered as 3 digit codes from 000-777, however, using non standard frequencies or codes may cause falsing problems; use caution when doing so. The BTE-3 DMH has a unique feature allowing the CTCSS/DCS to be delayed for a programmed period, to delay opening the repeater until after the unit's ANI is sent. Thus, the ANI is only received at a remote console connected to the repeater, preventing all other system radios from having to listen to ANIs.

### 1.3 Time Out Timer (TOT)

In order to prevent one party from tying up a channel, or in the event of a stuck microphone, many systems require a time out timer. This feature allows a radio transmitter to stay on the air for a programmed period of time. Then, it automatically shuts the transmitter off. After shutting off, the BTE-3 DMH generates a warning tone to alert the user that he has talked too long or his mic button is stuck.

### 1.4 Penalty Timer

If the user has talked beyond his allotted time, the unit will time out by unkeying the transmitter and emitting a warning tone. The user is prevented from immediately keying up again for 00-99 seconds as programmed in the Penalty Timer location.

### 1.5 Busy Channel Lockout

Government regulations require radio users to open tone squelch and monitor a channel before transmitting. If they do not, they may interfere with co-users already on the channel. Busy Channel Lockout automatically checks the channel, and if busy will not allow the transmitter to key-up or the receiver to unsquelch--preventing a user from monitoring another person's call. If the channel is busy, the BTE-3 DMH generates a busy tone. The BTE-3 DMH may also be programmed to continue to check the channel (channel queuing) and provide the user with two beep tones to indicate that the channel is free and thus available for the call to be tried again.

### 1.6 Sending ANI

The BTE-3 DMH is capable of transmitting Five-Tone and DTMF ANI. See Table 5, ANI Formats. If sending Burst Tone instead of CTCSS or DCS, the ANI will immediately follow the Burst Tone and may not be seen by a ANI display decoder if the repeater Burst Tone decoder does not open quick enough. Therefore,

we recommend using trailing ANI when programming Burst Tone in any one of the 64 registers. If using CTCSS or DCS in any of the 64 registers the ANI can be leading, trailing, or both.

The ANI is sent when the PTT is first pressed (leading ANI) and/or when it is released (trailing ANI). There is a front porch keyup delay--programmable from .00 to .99 seconds, which allows for a front porch lead-in delay time to open a repeater's CTCSS decoder before any ANI is transmitted.

To compute the front porch delay time, EIA specs state that a CTCSS decoder should open in 250 msec at 100 Hz. The time increases as CTCSS frequencies decrease. Therefore, from the high-end frequencies to the low frequency, the time could run 100 to 500 msec. In addition, transmitter synthesizer lock time can also be a consideration and may run from a few milliseconds to 100 msec. Also, E & M lead on microwave systems that may be tied to the repeater can add a 50 to 100 msec delay. Satellite voting systems can also introduce additional delays.

The BTE-3 DMH also has an ANI repeat window timer, programmable from 00 to 99 seconds. This prevents the ANI from being sent every time the PTT is pressed to prevent irritating and repetitive ANIs during short conversations. For example, if this location is set to 10 seconds, the unit will not transmit ANI if PTT is pressed again within 10 seconds.

### 1.7 Emergency ANI

The emergency input can be used to control the Emergency ANI. An emergency ANI may be sent by a manual switch or by a mercury "man down" tilt switch. The unit can be programmed to have a delay on the input so that if someone bends over momentarily, it does not send the emergency ANI right away. Additionally, there is a warning timer to indicate the unit is about to send the emergency ANI, giving the user time to right the unit. This is not used in the DMH version of the BTE-3.

### 1.8 System Options

The BTE products are compatible with our CAD line of Base Commander Modems, which provide complete ANI information display capability. Different models are available for DTMF formats and five-tone formats—in several languages: English, Spanish, Portuguese, German, and Italian.

## 2.0 PROGRAMMABLE FEATURES

### 2.1 RX, TX, Format & Frequency Register Locations

There are 1-64 RX & TX, Format and Frequency memory register locations which are generally addressed using a six line binary input on the micro's Port C, C7,6,5,4, 3, 2 for binary. The front panel four line binary 16 position switch will pick the 4 low order

bits. Bank switch S2B is factory-jumpered to the 5<sup>th</sup> order bit. It will allow you to select 32 codes. If the monitor switch is not needed the user may jumper it to the 6<sup>th</sup> order bit and it will be possible to do 64 codes.

**Note: All 64 memory register locations are programmed in the following manner:**

**R01A. Receive (RX) Format:** This controls the Receive Decode format for a specific memory register location. A "0" selects nothing; a "1" selects CTCSS; a "2" selects DCS; a "3" selects inverted DCS; and a "4" selects Burst Tone. See Tables 2 and 8.

**R01B. Receive (RX) Frequency/Code:** This controls the RX (Receive Decode) CTCSS frequency with four digits, (000.0-999.9) the last digit being tenths of a Hz. Therefore, any CTCSS frequency can be created by the user. Use leading 0s for tone under 100.0 Hz. This location can also program any DCS code in octal from 000 to 777. The first digit must be programmed as a 0, the microprocessor will always send an octal 4 for the first digit (0XXX). Only 83 codes are valid, programming anything other than the 83 standard codes may result in falsing to legitimate or inverted codes.

**R01C and D. Transmit (TX) Format/TX Frequency/Code:** These locations are programmed in the same manner as **RX Format/Frequency**. The transmit and receive formats can be mixed and the frequencies and/or codes can also be different. For example, you could decode CTCSS of 67 Hz and encode DCS 023. See Tables 7, 8, & 9 for standard Tone Squelch Formats. When programming a Burst Tone frequency in this location, enter the frequency with four digits; there are no decimals allowed (0000-3500). Use leading zeros when using frequencies under 1 kHz.

**R01E. TX CTCSS/DCS Level:** This location programs the Transmit Level of the CTCSS or DCS code relative to the ANI modulation level. This is programmed in 2 dB "down" increments in nine steps for a maximum attenuation of 18 dB below the ANI levels. See Table 3, CTCSS/DCS Attenuation Codes. The **Pre-emphasis Enable [System Parameters R71E]** location also enables the pre-emphasis of the ANI tones at the standard 6 dB per octave rate instead of a flat response. Set the modulation pot R43 to 3.3 kHz using the ANI tones. Then, using Table 3, set the CTCSS/DCS tones to 800 Hz to 1 kHz of modulation. If no ANI or Burst Tone is to be used, the CTCSS modulation can be programmed strictly from the mod pots if desired.

**R01F. ANI Select:** enables the ANI for the channel. 0=No ANI; 1=Primary ANI programmed in the **ANI** location for the channel; 2=Secondary ANI programmed in the **Emergency**

**ANI/Secondary ANI** location; and 3=Switch Selectable, allowing the user to ground the auxiliary/emergency input line to change between either ANIs. If **R69B Emergency ANI Repeat Count [Emergency ANI Function & Timings]** is programmed for Emergency ANI, then this location cannot be programmed with a 2 or a 3, because the Emergency ANI is no longer available as a secondary ANI due to its repeat and delay functions.

## 2.2 Global Transmit Parameters-R65

**R65A. Turn Off Format:** for CTCSS. A "0" = No Turn Off Format. A "1" programs a trailing tone that follows the normal CTCSS to act as a shut off code. A "2" programs a phase shift on the normal CTCSS on loss of PTT, also known as Reverse Burst or Squelch Tail Elimination, to dampen reed vibrations in old radios employing reed type filters so that no squelch tail "tish" is heard at the end of a transmission.

**R65B. Turn Off Tone Frequency/Phase Shift:** programs the Tone Frequency Shut Off Tone or the Reverse Burst Phase. This is a 4 digit location and the frequency should be entered from 000.0-999.9 Hz, and the phase should be entered as 0000-0359°.

As an example, if the unit is programmed on channel 1 to send CTCSS code of 210.7, a Turn Off Code of 259.1 could be sent to instantly silence all receiving decoders to eliminate squelch tail. 259.1 is not a standard CTCSS code. 53 Hz could also be used. This frequency must be under 270 Hz, or it will not pass through the receiving decoder's low pass filter. A 500 to 999.9 Hz tone could also be used, but this tone is audible to the listening mobiles and does not pass through the low pass filter in the receiving decoder in order to act as a shut off code. Instead, this could be used as a go-ahead tone on loss of PTT.

As another example, if the BTE encoder is programmed on channel 1, with a 67 Hz CTCSS tone, a 180° phase reversal could be sent for reverse burst squelch tail elimination. Some manufacturers use 90° while others use 270°.

**R65C. Turn Off Tone Time:** determines how long the turn off tone will be transmitted on loss of PTT. Use in the neighborhood of 200 msec. This time must be longer than the **Turn Off Tone Detect Time (CTCSS Decode Functions & Timings)**. If DCS is programmed in memory register locations 1-64, the standard 134 Hz shutoff code is automatically generated and the preceding three global transmit program parameters have no affect on it; they only apply to CTCSS.

**R65D. Front Porch Key-Up Delay Time.** Programs the keyup delay. When transmitting ANI, the transmitter will key, pause for the

repeater lead-in delay, and send the ANI tones. (To compute the front porch key-up delay time, see Section 1.6.)

**R65E. Burst Tone Duration:** programs the length of time that the Burst Tone is transmitted, from 0.0-7.6 seconds. Generally 250 to 500 msec is sufficient. If the repeater decoder is set too short, it may false on voice.

**R65F. Channel Selector Switch Input Format:** For the BTE-3 DMH this register is programmed for a 1 (positive binary 64 codes possible). See Table 1.

## 2.3 ANI – R66

**R66** programs the ANI (Automatic Number Identifier) to be sent when the PTT is pressed and/or when it is released, depending on how **ANI Position [ANI Format/Tone Lengths]** is programmed. The ANI formats are shown in Table 5 and the maximum number of digits is 8.

## 2.4 Emergency/Secondary ANI – R67

**R67** contains a Secondary/Emergency ANI activated by the ANI select in memory register locations 1-64 or a low on the Auxiliary/Emergency input when **Emergency ANI Repeat Count** is set to 1-9.

## 2.5 ANI Format/Tone Lengths-R68

**R68A. ANI Format:** This location programs the ANI format selected from Table 5.

**R68B. Tone Time 1:** A separate first tone timing makes it possible to create a preamble tone. If nothing is entered in the first timing field, the unit will default to the industry standard timings for that format. If a time is entered in **Tone Time 1 (Register 68B)** but nothing is entered in **Tone Time 2 (Register 68C)**, the unit will encode all tones for the timing entered in **Tone Time 1**. (See Table 5).

**R68C. Tone Time 2:** Enter the desired time for subsequent tones. If nothing is entered here, all tones will be encoded for the length entered in R68B.

**R68D. ANI Position:** Choose leading or trailing ANI or both in this location if using CTCSS or DCS. If using Burst Tone we recommend using only trailing ANI.

**R68E. Special ANI Functions:** Programming a 1 will delay CTCSS during keyup and ANI. Programming a 3 will delay CTCSS during keyup and ANI, plus it will cause the unit to emit a beep to prompt the user to speak when the microphone is unmuted. Program a 0 for normal ANI. The delayed CTCSS can be used to prevent the repeater from repeating the ANI, so that everyone on the system will not hear it.

**R68F. ANI repeat window:** ANI will not be sent again if PTT is pressed or released during this window time period (0-99 seconds).. This eliminates repetitive ANIs on short key-ups.

## 2.6 Emergency ANI Functions & Timings-R69

The emergency input can be tied to a mercury tilt switch in portable radios or to a hidden foot switch in mobile radios. This provides a "man down" emergency ANI when the user is in danger.

**R69A. Emergency ANI Input Debounce:** controls how long the auxiliary emergency input must go low before the emergency ANI is sent. For example, if a mercury tilt switch is used, it can be timed from 0 to 9 seconds to prevent accidental emergency ANI.

**R69B. Emergency ANI Repeat Count:** controls how many times the emergency ANI is sent. If programmed as a 0, emergency ANI is disabled and the secondary ANI is enabled which is selectable in **ANI Select**, channels 1-64. If programmed as a digit from 1 to 9, the unit will send the emergency ANI for that number of times and then stop.

**R69C. Emergency ANI Repeat Delay Time:** programs the time between emergency ANIs from 00-99 seconds.

**R69D. Emergency Warning Delay:** Provides for an audible warning tone before the emergency ANI is transmitted. This may be used in systems where users forget to turn off their portable radios before setting them down and inadvertently transmit the emergency ANI signal.

## 2.7 Decode Functions & Timings-R70

**R70A. CTCSS Decode Detect Time:** 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 msecs. Lower frequencies will take longer, and higher frequencies will take less time. The BTE-3 DMH can be programmed to decode any tone in 100 msecs. At 67 Hz the microprocessor will count 6.7 cycles in 100 msecs. At 250 Hz, the microprocessor will count 25 cycles in 100 msecs. Going below 100 msecs is possible, but not recommended because the unit will tend to false off. We would generally recommend using approximately 200 msecs., especially below 100 cycles, to increase the number of counts, and thus diminishing the possibility of falsing.

**R70B. Turn Off Code Detect Time:** 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 msecs. **Turn Off Tone Time (R65C)** should be lower than **Turn Off Code Detect Time**. **NOTE:** The BTE-3 DMH Decoder will not reset when a CTCSS phase shift occurs.

**R70C. CTCSS Tone Loss Detect Time:** programs how fast the BTE-3 DMH will resquelch on a loss of CTCSS tone or Carrier. We would recommend a couple hundred msecs so that the radio does not mute during short fades. **Turn Off Tone Time (R65C)** should exceed this time so that no squelch tail "tish" is heard.

## 2.8 System Parameters-R71

**R71A. COR Polarity:** programs the COR active input polarity.

**R71B. Squelch Polarity:** programs the Squelch polarity to accommodate any radio's logic.

**Note:** It may be necessary to change the polarity of the squelch output diode D5 in the squelch output circuit. This location also controls the squelch output line during speaker tone generation (busy, TOT, beep). This accommodates radios which need their audio amps enabled or disabled when the BTE-3 DMH's alert tone emitter-follower is active. Program this location according to Table 4.

**R71C. Monitor Input Polarity:** If using a mic hook hangup button, enter 1 for a voltage going from a low to a high. If using a monitor switch, enter 0 for a voltage going from a high to a low.

**R71D.** When the operator attempts to ANI on a busy channel while the **Busy Channel Lockout** is enabled, the unit will emit a busy tone and prevent the transmitter from being keyed.

**R71E. Pre-emphasis Enable:** a "1" generates 6dB per octave pre-emphasis for the ANI tones. A "0" makes the tones go out with a flat response.

**R71F. PTT Time Out Timer:** a period of 00 to 99 seconds may be programmed in this location. At the end of the time out period, an alert tone will be sent to the radio speaker, and the transmitter will unkey and the penalty timer will be activated.

**R71G. Penalty Timer Period:** This penalizes the user for exceeding his programmed time out timer interval for the amount of time entered here from 00 to 99 seconds.

**R71H. Queuing Signal Delay:** if a 1-9 has been programmed, two beeps will be generated to indicate the channel has become available after a busy was encountered when the user first tried to key-up.

**R71I. PTT In/Out Common:** this allows the BTE-3 DMH to be installed without breaking the PTT line, only if the busy channel lockout and time out timer

features are not enabled. Enter 1 if the PTT In and PTT Out are tied to the same point. This keeps the transmitter keyed during quick PTT clicks to complete the ANI.

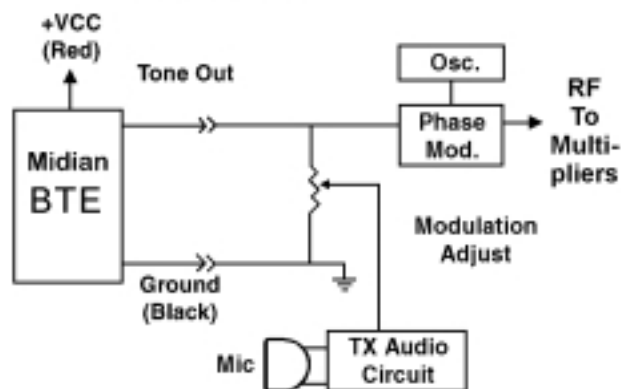
### 3.0 PROGRAMMING

#### 3.1 Programming the BTE-3 DMH

The BTE-3 DMH is a TDS-1 product as stated earlier. When using the KL-2 or KL-3 programmer use a TDS1.prd file to program the BTE-3 DMH.

Enter the programmable features by following the location programming worksheet in the KL-3 programming software on an IBM-compatible PC. Connect the serial programmer to the monitor/hook input (blue wire). Ground the PTT input (white wire), and apply power to the unit, and within five seconds, begin sending the serial programming information from the KL-3. The unit will emit one long beep if it was successfully programmed. If, for any reason, the programming was not successful, check the connections and programming locations and try again.

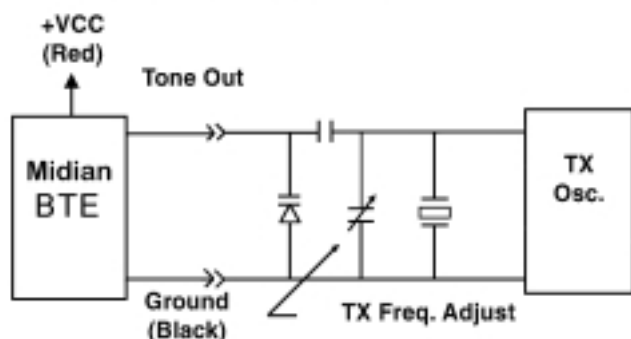
#### Phase Modulation



### 4.0 INSTALLATION DIAGRAM

The following installation diagrams are provided to give you an idea of how the audio wire can be connected. When using DPL, the radio must be a true FM as shown in the first drawing below. In fact, a varactor diode could be added to the oscillator circuit in radios employing phase modulation. Call Midian factory personnel and fax a copy of the actual radio schematic. During actual installation the manufacturer's schematics and instruction manuals should be used to determine the proper tone insertion point.

#### Direct FM Modulation



## 5.0 PROGRAMMING TABLES

| TABLE 1: CHANNEL SWITCH INPUT FORMAT |                                                       |
|--------------------------------------|-------------------------------------------------------|
| MODE                                 | FUNCTION                                              |
| 0                                    | NO CHANNEL SWITCH (CHANNEL 1 ONLY)                    |
| 1                                    | POSITIVE BINARY (000000=CHANNEL 1, 111111=CHANNEL 64) |
| 2                                    | POSITIVE BCD (0001=CHANNEL 1)                         |
| 3                                    | NEGATIVE BINARY (111111=CHANNEL 1, 000000=CHANNEL 64) |
| 4                                    | NEGATIVE BCD (1110=CHANNEL 1)                         |
| 5                                    | POSITIVE DISCRETE (1000000=CHANNEL 1)                 |
| 6                                    | NEGATIVE DISCRETE (0111111=CHANNEL 1)                 |

| TABLE 2: TONE CODED SQUELCH FORMATS |              |
|-------------------------------------|--------------|
| DIGIT                               | FORMAT       |
| 0                                   | NONE         |
| 1                                   | CTCSS        |
| 2                                   | DCS          |
| 3                                   | INVERTED DCS |
| 4                                   | BURST TONE * |

\* - Encode Only

| TABLE 3: CTCSS/DCS ATTENUATION CODES |            |      |            |
|--------------------------------------|------------|------|------------|
| CODE                                 | LEVEL (dB) | CODE | LEVEL (dB) |
| 0                                    | -18        | 5    | -8         |
| 1                                    | -16        | 6    | -6         |
| 2                                    | -14        | 7    | -4         |
| 3                                    | -12        | 8    | -2         |
| 4                                    | -10        | 9    | -0         |

| TABLE 4: BUSY/TOT TONES CONTROLS SQUELCH MUTE/UN-MUTE |                     |
|-------------------------------------------------------|---------------------|
| DIGIT                                                 | SQUELCHED POLARITY  |
| 0                                                     | GROUND POLARITY     |
| 1                                                     | V+ POLARITY         |
| 2                                                     | GROUND WITH MUTE    |
| 3                                                     | V+ WITH MUTE        |
| 4                                                     | GROUND WITH UN-MUTE |
| 5                                                     | V+ WITH UN-MUTE     |

| TABLE 5: ANI FORMATS |        |            |            |
|----------------------|--------|------------|------------|
| #                    | MODE   | TIME 1     | TIME 2     |
| 01                   | DTMF   | TONE ON    | TONE OFF   |
| 50                   | CCIR   | FIRST TONE | NEXT TONES |
| 51                   | EEA    | FIRST TONE | NEXT TONES |
| 52                   | EIA    | FIRST TONE | NEXT TONES |
| 53                   | ZVEI   | FIRST TONE | NEXT TONES |
| 54                   | DZVEI  | FIRST TONE | NEXT TONES |
| 55                   | DDZVEI | FIRST TONE | NEXT TONES |
| 56                   | NATEL  | FIRST TONE | NEXT TONES |
| 60                   | MODAT  | FIRST TONE | NEXT TONES |

| TABLE 6: SEQUENTIAL SINGLE FREQUENCY CODES & TIMINGS |            |                                          |        |       |       |        |       |          |        |
|------------------------------------------------------|------------|------------------------------------------|--------|-------|-------|--------|-------|----------|--------|
| TONE NUMBER                                          | CODE DIGIT | EUROPEAN FIVE/SIX TONE FREQUENCIES IN Hz |        |       |       |        |       | MOTOROLA |        |
|                                                      |            | EEA                                      | CCIR   | ZVEI  | DZVEI | DDZVEI | NATEL | EIA      | MODAT  |
| TONE 0                                               | 0          | 1981                                     | 1981   | 2400  | 2200  | 2400   | 1633  | 600      | 637.5  |
| TONE 1                                               | 1          | 1124                                     | 1124   | 1060  | 970   | 1060   | 631   | 741      | 787.5  |
| TONE 2                                               | 2          | 1197                                     | 1197   | 1160  | 1060  | 1160   | 697   | 882      | 937.5  |
| TONE 3                                               | 3          | 1275                                     | 1275   | 1270  | 1160  | 1270   | 770   | 1023     | 1087.5 |
| TONE 4                                               | 4          | 1358                                     | 1358   | 1400  | 1270  | 1400   | 852   | 1164     | 1237.5 |
| TONE 5                                               | 5          | 1446                                     | 1446   | 1530  | 1400  | 1530   | 941   | 1305     | 1387.5 |
| TONE 6                                               | 6          | 1540                                     | 1540   | 1670  | 1530  | 1670   | 1040  | 1446     | 1537.5 |
| TONE 7                                               | 7          | 1640                                     | 1640   | 1830  | 1670  | 1830   | 1209  | 1587     | 1687.5 |
| TONE 8                                               | 8          | 1747                                     | 1747   | 2000  | 1830  | 2000   | 1336  | 1728     | 1837.5 |
| TONE 9                                               | 9          | 1860                                     | 1860   | 2200  | 2000  | 2200   | 1477  | 1869     | 1987.5 |
| REPEAT TONE                                          | R          | 2110                                     | 2110   | 2600  | 2400  | 970    | 1805  | 459      | 487.5  |
| GROUP TONE                                           | G          | 1055                                     | 2400   | 2800  | 885   | 885    | 1995  | 2010     | ---    |
| ALARM TONE                                           | A          | 2400                                     |        |       |       |        |       |          |        |
| TONE WIDTH (MS)                                      |            | 40±4                                     | 100±10 | 70±15 | 70±15 | 70±15  | 70    | 33±.5    | 40±5   |
| SEQ LENGTH (MS)                                      |            | 200                                      | 500    | 350   | 350   | 350    | 350   | 165      | 280    |
| MAX INTERTONE TIME (MS)                              |            | 4                                        | 7.5    | 15    | 15    | 15     |       | 0        |        |
| MIN GAP BEFORE/BETWEEN SEQ (MS)                      |            | 100                                      | 290    | 140   | 140   | 140    |       | 33       |        |
| ENCODER TOLERANCE                                    |            | ±1%                                      | ±8HZ   | ±1.5% | ±1.5% | ±1.5%  |       | ±.1%     |        |
| MUST DECODE BW                                       |            | ±1%                                      | ±1%    | ±1.5% | ±1.5% | ±1.5%  |       | ±16HZ    |        |
| MUST REJECT BW                                       |            | ±3%                                      | ±3%    | ±4.5% | ±4.5% | ±4.5%  |       | NS       |        |

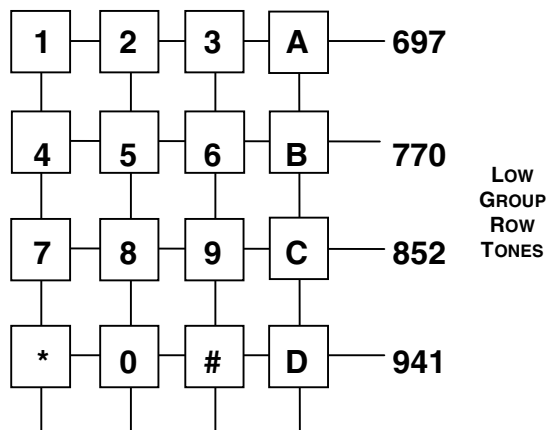
| TABLE 7: RS-220-A EIA STANDARD CTCSS TONE FREQUENCIES |           |                    |           |                            |           | NON-STANDARD                                                                                                            |
|-------------------------------------------------------|-----------|--------------------|-----------|----------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------|
| EIA CODE GROUP A                                      |           | EIA CODE GROUP B   |           | EIA CODE GROUP C           |           | CTCSS SPLITS                                                                                                            |
| MOTOROLA REED CODE                                    | FREQ (Hz) | MOTOROLA REED CODE | FREQ (Hz) | MOTOROLA REED CODE         | FREQ (Hz) | FREQ (Hz)                                                                                                               |
| XZ                                                    | 67.0      | XA                 | 71.9      | WA                         | 74.4      | 69.4                                                                                                                    |
| XB                                                    | 77.0      | YZ                 | 82.5      | SP                         | 79.7      | 97.4                                                                                                                    |
| YB                                                    | 88.5      | ZA                 | 94.8      | YA                         | 85.4      | 159.8                                                                                                                   |
| 1Z                                                    | 100.0     | 1A                 | 103.5     | ZZ                         | 91.5      | 165.5                                                                                                                   |
| 1B                                                    | 107.2     | 2Z                 | 110.9     | SPECIAL<br>NON EIA         |           | 171.3                                                                                                                   |
| 2A                                                    | 114.8     | 2B                 | 118.8     |                            |           | 177.3                                                                                                                   |
| 3Z                                                    | 123.0     | 3A                 | 127.3     |                            |           | 183.5                                                                                                                   |
| 3B                                                    | 131.8     | 4Z                 | 136.5     |                            |           | 189.9                                                                                                                   |
| 4A                                                    | 141.3     | 4B                 | 146.2     | ZB                         | 97.4      | 196.6                                                                                                                   |
| 5Z                                                    | 151.4     | 5A                 | 156.7     | MIDIAN<br>SHUT-OFF<br>CODE |           | 199.5                                                                                                                   |
| 5B                                                    | 162.2     | 6Z                 | 167.9     |                            |           | 206.5                                                                                                                   |
| 6A                                                    | 173.8     | 6B                 | 179.9     |                            |           | 229.1                                                                                                                   |
| 7Z                                                    | 186.2     | 7A                 | 192.8     |                            |           | 254.1                                                                                                                   |
| M1                                                    | 203.5     | M2                 | 210.7     | ---                        | 259.1     | Use caution when<br>using these non-<br>standard codes.<br>Older equipment<br>operating on either<br>side may be falsed |
| M3                                                    | 218.1     | M4                 | 225.7     |                            |           |                                                                                                                         |
| ---                                                   | 233.6     | ---                | 241.8     |                            |           |                                                                                                                         |
| ---                                                   | 250.3     |                    |           |                            |           |                                                                                                                         |

### 1209 1336 1477 1633

HIGH GROUP COLUMN TONES

| TABLE 8: STANDARD BURST TONE FREQUENCIES                                         |      |
|----------------------------------------------------------------------------------|------|
| 1600                                                                             | 2150 |
| 1650                                                                             | 2200 |
| 1700                                                                             | 2250 |
| 1750                                                                             | 2300 |
| 1800                                                                             | 2350 |
| 1850                                                                             | 2400 |
| 1900                                                                             | 2450 |
| 1950                                                                             | 2500 |
| 2000                                                                             | 2550 |
| 2100                                                                             |      |
| Other Burst Frequencies can exist from 600 to 3150 Hz in 50 or 25 Hz increments. |      |

| TABLE 9: DIGITAL CODED SQUELCH CODES           |            |            |            |            |            |            |            |
|------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
| STANDARD 83 CODES USED IN THE DCS SCHEME       |            |            |            |            |            |            |            |
| LOW SERIES                                     | 100 SERIES | 200 SERIES | 300 SERIES | 400 SERIES | 500 SERIES | 600 SERIES | 700 SERIES |
| 023                                            | 114        | 205        | 306        | 411        | 503        | 606        | 703        |
| 025                                            | 115        | 223        | 311        | 412        | 506        | 612        | 712        |
| 026                                            | 116        | 226        | 315        | 413        | 516        | 624        | 723        |
| 031                                            | 125        | 243        | 331        | 423        | 532        | 627        | 731        |
| 032                                            | 131        | 244        | 343        | 431        | 546        | 631        | 732        |
| 043                                            | 132        | 245        | 346        | 432        | 565        | 632        | 734        |
| 047                                            | 134        | 251        | 351        | 445        |            | 654        | 743        |
| 051                                            | 143        | 261        | 364        | 464        |            | 662        | 754        |
| 054                                            | 152        | 263        | 365        | 465        |            | 664        |            |
| 065                                            | 155        | 265        | 371        | 466        |            |            |            |
| 071                                            | 156        | 271        |            |            |            |            |            |
| 072                                            | 162        |            |            |            |            |            |            |
| 073                                            | 165        |            |            |            |            |            |            |
| 074                                            | 172        |            |            |            |            |            |            |
|                                                | 174        |            |            |            |            |            |            |
| TURN OFF CODE IS 200 MILLISECONDS OF 134 HERTZ |            |            |            |            |            |            |            |



**Note:** DCS employs a fixed octal digit 4 as the first digit, followed by three octal digits shown in the table above. Code words are 23 bit-long string: 12 bits of octal code, followed by 11 bits of CRC. Each bit is 7.5 ms, adding up to 172.5 ms per word. While it might appear that 512 codes are possible, only 83 exist, because a code word that is misaligned when serially shifted into the decoder can match a different code word.

**For R01-R64:** A). RX Format (See Table 2). 0=None, 1=CTCSS, 2=DCS, 3=Inverted DCS

B). RX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX

C). TX Format (See Table 2). 0=None, 1=CTCSS, 2=DCS, 3=Inverted DCS, 4=Burst Tone (0001-3500 Hz)

D). TX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX E). TX CTCSS/DCS Level Relative to ANI (See Table 3).

F). ANI Select: 0=None, 1=Primary, 2=Secondary, 3=Switch Selectable or Emergency when R69B is programmed 1-9.

**R01: Register 01 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R06: Register 06 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R11: Register 11 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R02: Register 02 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R07: Register 07 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R12: Register 12 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R03: Register 03 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R08: Register 08 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R13: Register 13 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R04: Register 04 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R09: Register 09 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R14: Register 14 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R05: Register 05 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R10: Register 10 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R15: Register 15 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

B). RX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX

C). TX Format (See Table 2). 0=None, 1=CTCSS, 2=DCS, 3=Inverted DCS, 4=Burst Tone (0001-3500 Hz)

D). TX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX E). TX CTCSS/DCS Level Relative to ANI (See Table 3).

F). ANI Select: 0=None, 1=Primary, 2=Secondary, 3=Switch Selectable or Emergency when R69B is programmed 1-9.

**R16: Register 16 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R21: Register 21 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R26: Register 26 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R17: Register 17 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R22: Register 22 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R27: Register 27 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R18: Register 18 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R23: Register 23 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R28: Register 28 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R19: Register 19 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R24: Register 24 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R29: Register 29 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R20: Register 20 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R25: Register 25 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R30: Register 30 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**B). RX CTCSS Freq/DCS Code:** CTCSS=000.0, DCS=0XXX

**C). TX Format** (See Table 2). 0=None, 1=CTCSS, 2=DCS, 3=Inverted DCS, 4=Burst Tone (0001-3500 Hz)

**D). TX CTCSS Freq/DCS Code:** CTCSS=000.0, DCS=0XXX **E). TX CTCSS/DCS Level Relative to ANI** (See Table 3).

**F). ANI Select:** 0=None, 1=Primary, 2=Secondary, 3=Switch Selectable or Emergency when R69B is programmed 1-9.

**R31: Register 31 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R36: Register 36 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R41: Register 41 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R32: Register 32 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R37: Register 37 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R42: Register 42 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R33: Register 33 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R38: Register 38 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R43: Register 43 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R34: Register 34 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R39: Register 39 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R44: Register 44 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R35: Register 35 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R40: Register 40 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R45: Register 45 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

B). RX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX

C). TX Format (See Table 2). 0=None, 1=CTCSS, 2=DCS, 3=Inverted DCS, 4=Burst Tone (0001-3500 Hz)

D). TX CTCSS Freq/DCS Code: CTCSS=000.0, DCS=0XXX E). TX CTCSS/DCS Level Relative to ANI (See Table 3).

F). ANI Select: 0=None, 1=Primary, 2=Secondary, 3=Switch Selectable or Emergency when R69B is programmed 1-9.

**R46: Register 46 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R51: Register 51 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R56: Register 56 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R47: Register 47 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R52: Register 52 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R57: Register 57 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R48: Register 48 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R53: Register 53 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R58: Register 58 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R49: Register 49 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R54: Register 54 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R59: Register 59 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R50: Register 50 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R55: Register 55 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**R60: Register 60 (12 digits)**

A). RX Format

B). RX Frequency

C). TX Format

D). TX Frequency

E). TX Level

F). ANI Select

**F). ANI Select:** 0=None, 1=Primary, 2=Secondary, 3=Switch Selectable or Emergency when R69B is programmed 1-9.

**R63: Register 63 (12 digits)**

- A). RX Format ☐
- B). RX Frequency ☐ ☐ ☐ ☐
- C). TX Format ☐
- D). TX Frequency ☐ ☐ ☐ ☐
- E). TX Level ☐
- F). ANI Select ☐

A). RX Format ☐

B). RX Frequency ☐ ☐ ☐ ☐

C). TX Format ☐

D). TX Frequency ☐ ☐ ☐ ☐

E). TX Level ☐

F). ANI Select ☐

A). **Turn Off Format (squelch tail eliminator)**  
(0=None, 1=Tone, 2=Phase Shift)  
A 0 disables this feature, a 1 generates a turn off tone, a 2 generates a reverse burst phase shifted signal.

B). **Turn Off Tone Frequency/Phase Shift**  
(000.0 -999.9 Hz/0000-0359 degrees)  
This register sets the turn off tone frequency or the phase shift of the regular CTCSS tone.

C). **Turn Off Tone Time**  
(.00-.99 seconds)  
This programs how long the turn off tone will be transmitted on loss of PTT. Use in the neighborhood of 200 msec. Must be longer than the turn off detect time in R70B.

D). **Front Porch Key-Up Delay Time**  
(.00-.99 seconds)  
Enter a front porch key-up delay of .00-.99 seconds. When ANling, transmitter will key, pause for the lead-in key-up delay, then transmit the ANI, This gives the repeaters time to open before sending ANI.

E). **Burst Tone Duration**  
(0.0-7.6 seconds)  
This programs how long the burst tone is transmitted. Generally, 250-500 msec is sufficient. If the repeater decoder is set too short, it may false on voice.

F). **Channel Switch Input Format**  
See Table 1 for programming binary, BCD, or 1 of 8.

Enter the ANI sequence of 1-8 digits. This will be transmitted when PTT is pressed and/or released, depending on the ANI position setting in R68D.

**R67: Register 67 - Emergency/Secondary ANI (0-8 digits)**

Programs the desired Emergency ANI here. Also see R69.

       
**R68: Register 68 - ANI Format, Tone Lengths & Functions (12 digits)****A). ANI Format**

(00-60; see Table 5)

Enter the 2 digits that correspond to the desired format from Table 5.

 
**B). Tone Time 1**

(.000-.999 seconds)

Enter the desired time for the first tone. This separate timing makes possible a preamble tone. If nothing is entered, industry standard timings will be generated.

  
**C). Tone Time 2**

(.000-.999 seconds)

Enter the desired time for subsequent tones. If nothing is entered in R68C, all tones will be encoded for the length entered in R68B.

  
**D). ANI Position**

(1=leading, 2=trailing, 3=both)

Enter a number corresponding to the desired ANI position at beginning or end of PTT, or both.

**E). Special ANI Functions**

(0=normal, 1=delayed CTCSS, 3=beep after ANI)

Enter a 1 to delay CTCSS during key-up and ANI, enter 3 to delay CTCSS during key-up and ANI, then emit a beep to prompt the user to speak when the mic unmutes.

Program 0 for normal ANI.

**F). Repeat Window**

(00-99 seconds)

Program the time corresponding to the desired repeat window. If PTT is pressed or released within the repeat window, ANI will not be transmitted again. Eliminates repetitive ANIs on short key-ups.

 
**R69: Register 69 - Emergency ANI Functions & Timings (5 digits)****A). Emergency ANI Input Debounce**

(0-9 seconds)

Program the desired time from 0-9 seconds that the emergency input must remain low before the emergency ANI is sent.

**B). Emergency ANI Repeat Count**

(0=disabled, 1-9=# of transmissions)

Program the number of times the emergency ANI will be sent. 0 disables the emergency ANI, and activates the secondary ANI which is enabled in R01F-R64F. 1-9=the number of times the ANI will be transmitted before resetting.

**C). Emergency ANI Repeat Delay**

(00-99 seconds)

Program the desired time for the repeat delay between each of the emergency ANIs.

 
**D). Emergency Warning Delay**

(0=None, 1-9 seconds)

Program the desired time for a warning tone to be sent before the emergency ANI is transmitted. For example, if R69A is programmed as 9, R69D could be programmed for 5 seconds. If a mercury tilt switch is used and the radio is accidentally placed on its side, a warning tone will be emitted at 5 seconds, indicating that in 4 more seconds, the emergency ANI will be transmitted.

**R70: Register 70 - CTCSS Decode Functions & Timings (6 digits)**A). **CTCSS Decode Detect Time**

(.00-.99; see Section 2.7)

This is the time it takes the micro to recognize a CTCSS tone. Do not use less than 100 msec to avoid falsing.

B). **Turn Off Code Detect Time**

(.00-.99 seconds)

This is how long it will take the decoder to recognize the Turn Off Tone programmed in R65B. R65B should be longer than R70B.

C). **CTCSS Tone Loss Detect Time**

(.00-.99 seconds)

This is the time the micro will wait to re-mute the radio on loss of CTCSS or COR. Make sure this time is shorter than the Turn Off Time in R65C to prevent hearing squelch tail.

**R71: Register 71 - System Parameters (11 digits)**A). **COR Polarity**

(0=GND, 1=V+)

Enter the digit corresponding to the radio's COR polarity in the active state. If not using COR lead must program to a 0.

B). **Squelch Polarity**

(0-5; See Table 4)

Enter the digit corresponding to the polarity required to squelch radio. Check the polarity of squelch diode D5 so that it corresponds to the digit entered here. See Table 4 for mute and not-mute during Busy/TOT/Beep.

C). **Monitor Input Polarity**

(0=GND, 1=V+)

If using hook switch, enter 1 for voltage going from a low to a high in the active state. If using a monitor switch, enter 0 for voltage going from a high to a low in the active state.

D). **Busy Channel Lockout Enable**

(0=No, 1=Yes)

Enter 1 if busy channel lockout is desired. Enter 0 if not desired. When the user attempts to ANI on a busy channel, if programmed as 1, the unit will emit a busy tone and prevents transmitter for keying. If queuing is enabled in R71H, a tone will be heard when a channel is available.

E). **Pre-emphasis Enable**

(0=No, 1=Yes)

Programming a 0 causes a flat frequency response during ANI. A 1 produces a 6 db per octave pre-emphasis for the ANIs.

F). **Time Out Timer Period**

(00-99 seconds)

Enter a time out timer period of 00-99 seconds. At the end of this period an alert tone will be sent to the speaker and the transmitter will unkey, and the penalty timer will be activated.

G). **Penalty Timer Period**

(00-99 seconds)

Penalizes the user for exceeding his programmed time out timer interval for the amount of time entered here.

H). **Queuing Signal Delay**

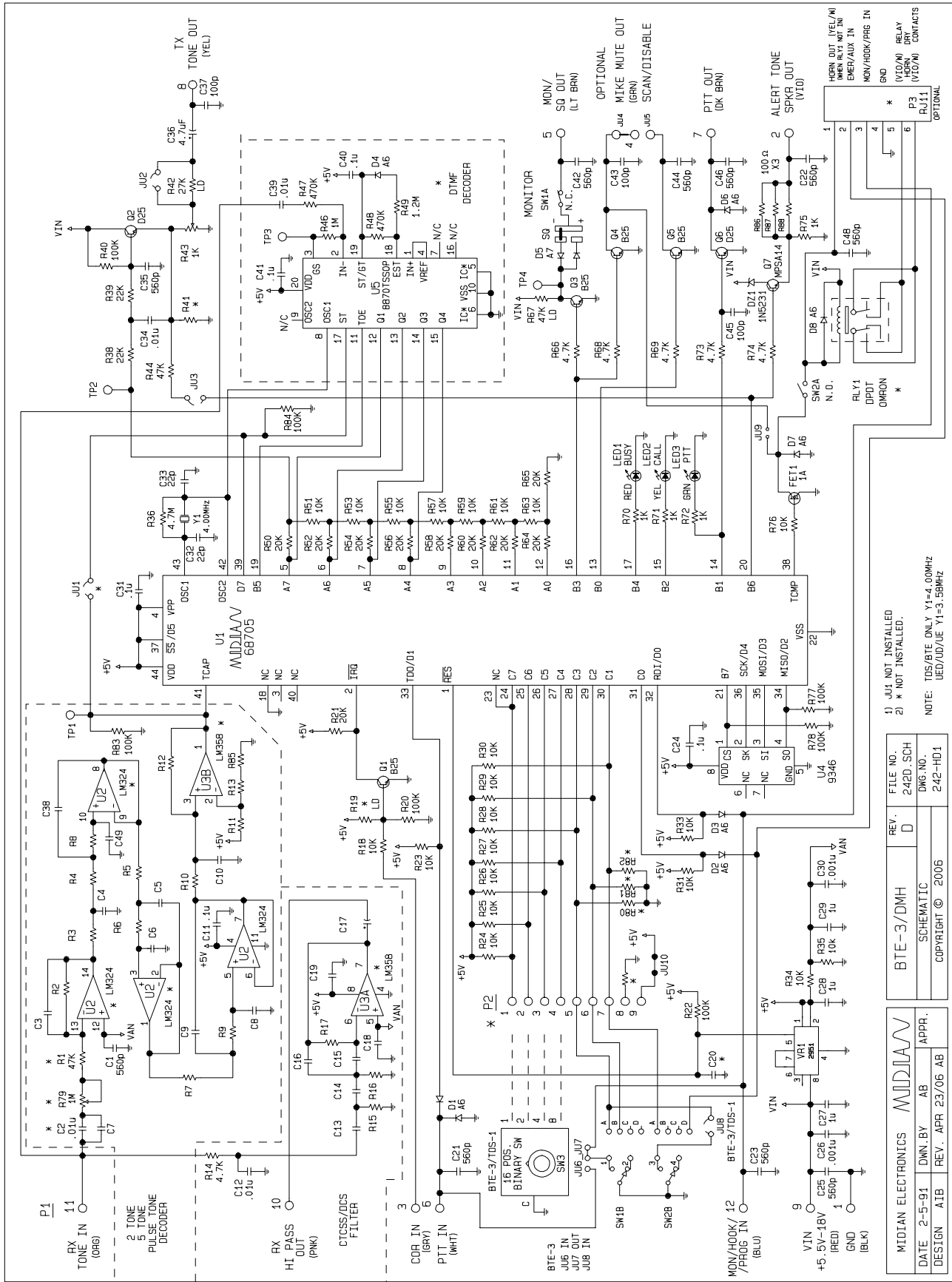
(0=Disabled, 1-9 seconds)

The unit will monitor the channel until it has been idle for the time entered here, and then generate 2 beeps indicating the channel is now available.

I). **Common PTT**

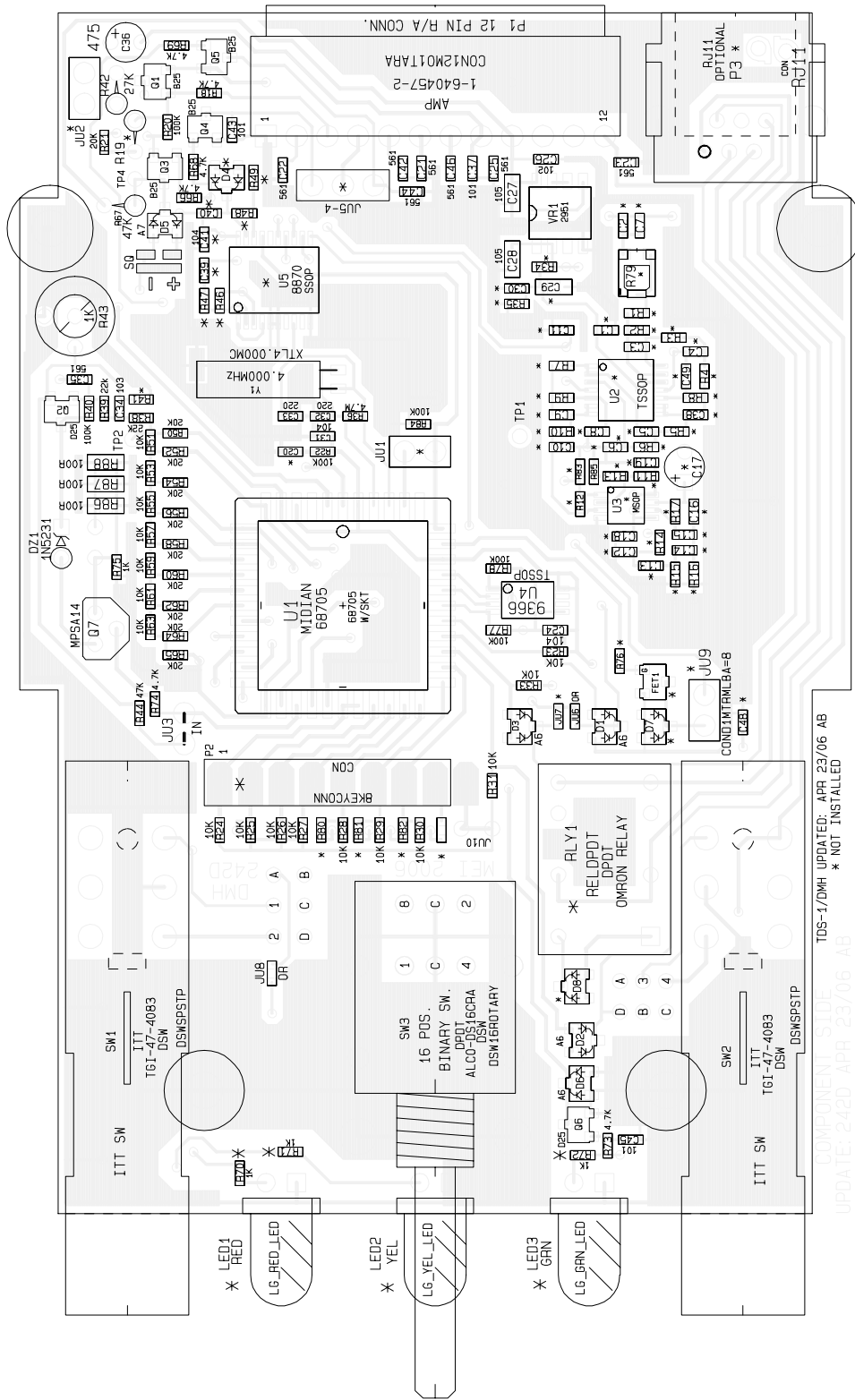
(0=No, 1=Yes)

Enter 1 if PTT In and PTT Out are tied to the same point. This keeps the transmitter keyed during quick PTT to complete the ANI.



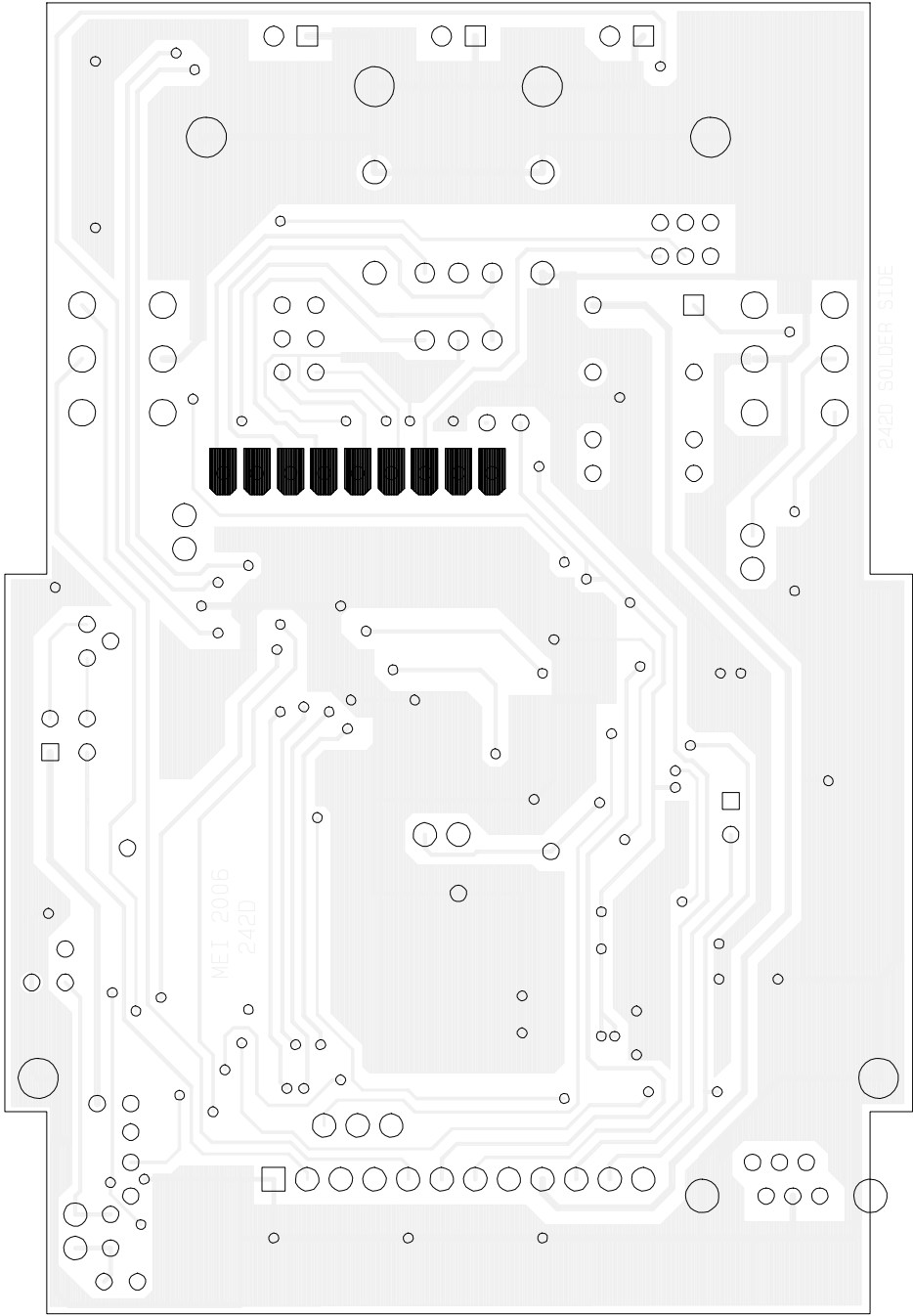
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| MIDIAN ELECTRONICS | REV. D            | FILE NO. 242D SCH |
| DATE 2-5-91        | DWG. NO. 242-HD1  |                   |
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COMPONENTS LIST  
 TDS-1/DMH UPDATED: APR 23/06 AB  
 UPDATE: 242D APR 23/06 AB \* NOT INSTALLED



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