# *TDM-1*

## TRANSPARENT OR ADDRESSABLE RADIO DATA MODEM INSTRUCTION MANUAL

## Features

- 1200 baud modem for point to point to multi-point communications
- Simplex or full-duplex operation
- 63 character flow control buffer processor
- Automatic push-to-talk with front porch key-up delay
- Carrier/CTCSS busy detect input
- DB-25 connector houses the electronics
- RJ-11 connector cable picks up the following:
  - battery
  - ground
  - push-to-talk
  - mic audio
  - receive audio
  - Carrier/CTCSS busy from radio
- User to provide their own radio interface connector on free end of RJ-11 cable


Software Version 1.0 5-12-00

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## SPECIFICATIONS

**VOLTAGE/CURRENT**

Operating Voltage ..... 5.5-16 VDC
RX Mode Current..... 15 mA
TX Mode Current..... 20 mA

**TX OUTPUTS**

Output Baud Rate..... 1200 baud FSK
Tone Frequencies..... CCITT V.23, Freq. 1302 & 2097 Hz
PTT Output Current..... 100 mA
TX Audio Output Level .....100 mV –1.3 V p.p.
Audio Output Impedance..... 3KΩ (min)

**RX INPUTS**

RX Audio Input Level.....adjustable, 200 mV p.p. (min)
RX Audio Input Impedance.....50KΩ (min)

**LEDs**

RS232 In Data Indicator .....green
RS2332 Out Data Indicator.....red

**TIMING**

Front Porch Key-Up Delay ..... 0.1-5.9 seconds
PTT Hang Time..... 0.1-5.9 seconds
COR Hold (Busy Lockout) Timer ..... 0.1-5.9 seconds

**MECHANICAL**

Standard DB25 connector
Operating Temperature ..... -25° - 70° C

# 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 by Midian 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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## 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.

| Wire | Function | Instructions |
|---|---|---|
| **RJ-11 Connector (radio)** | | |
| **Black** | Ground | Connect to ground point in the radio. Can usually be connected to the mic jack. |
| **Red** | 5.5 - 16 VDC | Connect to switched B+ in radio. Can usually be connected to the mic jack. |
| **White** | COR/COS (Carrier Detect) In or CTCSS Detect | Connect to point in Squelch or CTCSS circuit that changes logic level between 0 and 5 volts DC when carrier is received. This is usually not available on the mic jack. A jumper can be connected from the COR circuit to a spare pin on the mic jack. The COR wire is not mandatory. It prevents the TDM-1 from producing garbage data on voice or squelch noise. The COR wire could be programm ed for positive polarity and then shorted to the PTT wire. When the unit is transmitting the COR will see a busy and no data will be decoded. In full duplex operation the COR wire can be omitted. The TDM-1 ships with the carrier detect input set for positive polarity (5V =carrier detected). If necessary, re-program the COR polarity via the menu system. |
| **Yellow** | RX Tone Data In | Connect to a receive audio point in receiver, preferably to a point with a fixed audio level (before the volume control). Can usually be connected to the mic jack but be careful to set volume control and mark it. **It will also be necessary to set the RX level pot R6 for proper level (0.5 to 2.0 Vpp at pin 4 of IC-2).** If using the radio's volume control this pot could be set to perhaps mid-range and then the radio's volume control set to the optimal level and marked or somehow prevented from being moved. |
| **Blue** | TX Tone Data Out | Connect to modulator circuit – usually at the mic jack. **Using TX level pot R7 set the modulation on wide band to be about 3-3.5 kHz of modulation**. On narrow band systems set the modulation from 1.5 to 1.8 kHz. Sending a data file during this time will key the transmitter and generate tone data modulation. |
| **Green** | PTT out | Connect to the radio's PTT circuit. TDM-1 now has control of PTT and will key the radio whenever data is being transmitted. Can usually be connected to the mic jack. |
| | | |
| **DB25 Connector P2 (DTE)** | | |
| **P2-7** | Ground | Picks up computer or DTE ground. |
| **P2-5** | Clear to Send | Applies Clear to Send (CTS) to the computer or DTE. |
| **P2-3** | RX Data | Applies RX data to the computer or DTE. |
| **P2-2** | TX Data | Picks up transmit data from the computer or DTE. |

**NOTE:** Be sure to adjust the audio input and output level pots as described above. This will require opening the DB-25 shell.

**MODEM SETTINGS:** Any device connected to the RS-2332 port of this modem must be configured for **1200 baud, 8 data bits, 1 stop bit, and no parity** . Hardware flow control should be enabled if available. The modem is configured as an RS-232 DCE device and therefore must be connected to a DTE device. See description of DTE at the end of this manual for more information.

**OPTIONAL SQUELCH OUTPUT:** Pins 1 or 20 of IC-1 may be connected to customer supplied circuitry to squelch the radio speaker while data is being received by the modem. Pin 20 goes high while data is being received, pin 1 goes low. Squelch outputs are activated as soon as a character is received by the modem. They are deactivated when COR drops. Please note that voice or noise on the channel could be interpreted as data and cause the squelch outputs to activate. **Warning:** These pins are unprotected microprocessor outputs. Customer supplied circuitry must include current limiting and transistor buffering to protect the outputs. Failure to do say may damage the microprocessor and void the warranty.

**ERROR REDUCTION:** Using the COR/COS/CTCSS lead can help minimize falsing on voice or noise. The TDM-1 will receive data at a 12 dB SINAD point with numerous errors. Quieting the radio to about 17 dB will give little or no errors. Most manufacturers will set the squelch point of their radios to about 12 dB SINAD. We recommend tightening the squelch adjustment to 17 dB SINAD so that the radio will not unsquelch on a weak, noisy signal. Most radios have a 12 dB SINAD point for about .25 μV of sensitivity. At 17 dB SINAD the receiver will have about .3 μV of sensitivity. This should give virtually error-free data. Fully quieting the radio at or above .5 μV of sensitivity is recommended.

# 1. OPERATION

## *1.1. General*

The TDM-1 is a 1200 baud FSK modem that employs the CCITT V.23 signaling frequencies of 1302 and 2097 Hz. It is capable of simplex, half, or full duplex operation.

The TDM-1 can serve as a transparent data modem or an addressable transparent data modem. There are 4 registers that can be programmed with a unique 4-character address ID so that the modem will not pass any data sent to it without the proper header ID.

The unit is available in a DB25 connector, which is designed to plug into the back of a PC or any device with a standard RS-232 serial port (also know as Data Terminal Equipment, or **DTE**). In portable PC units it may be necessary to use a 9-pin to 25-pin adapter between the PC and TDM-1 modem.

The radio side of the modem employs an RJ-11 connector with a flying lead cable that can usually be connected to the mic jack of most mobile radios. If possible it is best to utilize a radio with a flat modulation response where the pre-emphasis and de-emphasis can be turned off.

The TDM-1 employs a modem chip, an RS232 converter chip, and a microprocessor buffer to control flow between them. Most simple modems have no flow control or data buffer. They simply apply a request to send line to key the radio's PTT and instantly begin sending data. The TDM-1 buffers approximately 500 milliseconds of data (up to 63 characters). This gives the radio time to key-up and for CTCSS to open the receiving unit's decoder or repeater before sending the data. Upon receipt of the 61st character from the DTE, the TDM-1 will drop the CTS (Clear to Send) line to the DTE, halting further data. This is known as hardware flow control. If the programmed key-up delay exceeds 500 milliseconds, hardware flow control must be enabled in the DTE or data may be lost.

# 2. PROGRAMMABLE FEATURES

## *MENU SYSTEM*

The following describes the TDM-1 menu system used for setting the modem parameters. In order to use the menu system, the modem must be connected some sort of terminal. A personal computer running a dumb terminal program is typically used. See topic **Terminal Software** in the **Troubleshooting** section of this manual.

To enter the menu system, stop transmitting data. Type ### quickly, (within about 1 second). The menu appears after a short delay, provided no other characters are typed. The menu will appear as follows. The values shown are the factory defaults.

```
Midian TDM-1 V1.0

A) Keyup delay   0.4s
B) PTT Hang Time 1.5s
C) COR Hold Time 0.4s
D) COR Polarity  1
E) PTT Polarity  0
F) Busy Lockout  0
G) Cont. Tone    0
H) Address #1    ----
I) Address #2    ----
J) Address #3    ----
K) Address #4    ----
L) Exit menu

Select >
```

There are 3 types of fields, binary fields, 2 digit fields and 4 character fields. Binary fields are either '0' or '1'. A '0' means a feature is OFF or a polarity is NEGATIVE (active LOW). A '1' means a feature is ON or a polarity is POSITIVE (active HIGH).

A 2-digit field is for timers such as key-up delay. **All timers can be set for 0.1 to 5.9 seconds.** Four character fields are for addresses (see below). To change a particular item, simply press the letter key corresponding to the item to be changed. If for example, B is pressed, the following will be displayed:

```
PTT Hang Time 1.5s >
```

If you do not wish to change the setting, press ENTER. Otherwise, type both digits of the new hang time. The decimal point will be placed automatically. There is no need to press the ENTER key. The entire menu will automatically be re-displayed reflecting the changed parameter. Only legal characters will be accepted, others will be ignored until 2 legal characters are typed (or ENTER is pressed). Binary and address fields operate in a similar manner. Parameter changes are automatically saved to EEPROM as they are typed. When all changes are complete, select option ***L*** to return the modem to normal operation.

## 2.1 PROGRAMMABLE FIELDS

### *A) Keyup Delay (0.4 seconds)*

The amount of time from when data is received from the DTE to the time data begins being sent out by the modem to the radio. PTT is asserted and data carrier tone (1302 Hz) is turned on immediately upon receiving the start bit of the first character.

The key-up delay is programmable from 0.1 to 5.9 seconds, which allows for a front porch key-up delay

time to open a repeater or mobile radio's CTCSS decoder before the data is transmitted. To compute the front porch key-up 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 can vary from a few milliseconds to 100 msec. Also, E & M lead on microwave systems that can be tied to the repeater can add 50 to 100 msec delay. Satellite voting systems can also introduce additional delays.

### *B) PTT Hang Time (1.5 seconds)*

PTT remains asserted for this amount of time after the key-up delay if no more data is being sent by the DTE. If additional data is sent by the DTE, PTT will remain asserted for this amount of time after the DTE stops sending data. This minimizes keying and unkeying for slow typists. This time may be reduced if data is being sent by automatic means. If the key-up delay is 500 ms or less, program this time to be greater than the key-up Delay. This will ensure that enough time is available to transmit characters that were buffered during the key-up Delay. If the key-up delay is 600 ms or more, program this time for at least 600 ms.

### *C) COR Hold Time (0.4 seconds)*

This applies to busy lockout only. The unit will not assert PTT (if busy lockout is enabled) for this amount of time after carrier drops. If the data buffer fills up during this time, the CTS line will be dropped to prevent the DTE from sending more data. Once this time and the front porch key-up delay time have expired, the buffered data will be sent. CTS will once again be asserted to allow data to flow.

If data is being sent over a channel employing voice, this register should probably be programmed for 2 to 3 seconds to prevent the TDM-1 from transmitting between short pauses in someone's conversation.

Note that this parameter is ignored if busy lockout is not enabled in programmable field ***F***.

### *D) COR Polarity (1)*

COR is internally pulled up and the default polarity is positive. COR is used to qualify characters coming into the modem from the radio receiver. If COR is not in the active state, data will not pass from the modem to the RS-232 port.

COR is also used for the busy lockout function (see above).

If using full duplex mode it may not be necessary to connect the COR wire provided it is programmed for positive polarity.

### *E) PTT Polarity (0)*

Normally, the open collector PTT output is pulled to ground to assert PTT. Almost all radios use a PTT switch to ground. If using a radio with positive PTT it may be necessary to add a pull-up resistor to the open collector transistor on the TDM-1. If there is a pull-up resistor in the radio this will not be necessary. The pull-up resistor should be pulled up to 5V logic when connecting to a microprocessor PTT input. Anything higher than 5V could damage the radio's microprocessor.

### *F) Busy Lockout (0)*

Enables busy lockout feature described under **COR Hold Time** (field ***C***).

Government regulations require radio users to open tone squelch and monitor a channel before transmitting. If they do not, they can interfere with other users already on the channel. **Busy Channel Lockout** automatically checks the channel, and will not allow the transmitter to key-up and send data until the COR Hold Time programmed in field ***C*** has expired.

### *G) Continuous Tone (0)*

By default, the modem will generate a data carrier tone only during PTT. If full duplex or wire-to-wire operation is desired, the carrier tone may be enabled continuously by setting this field to a 1.

### *(H, I, J, K) Addressability Feature*

Normally, all data received from the modem is passed to the RS-232 port. If the addressability feature is enabled, the modem will not pass data to the RS-232 port until one of the four, 4-character decode addresses appears in the data stream.

By default, the addressability feature is disabled. If any of the address fields have a non-dash character as the first character, the addressability feature will be enabled. Any four printable characters may be used as a decode address. There are a total of four, 4-character decode addresses available (H-K).

If, for example, address field H is programmed to *123, the modem will not pass data until the address string *123 appears in the incoming data stream. All data following the *123 will be passed from the modem to the RS-232 port. Data will continue to pass until COR drops. The decode system will be reset immediately after COR drops and will have to be addressed again in order to pass data. For this reason, COR must be connected in order to use the adressability feature.

To disable the addressability feature, make certain the first character of all four decode addresses is a dash (-) character (the characters following the dash are ignored).

# 3. TECHNICAL INFORMATION

## 3.1 RS-232 HANDSHAKING

The CTS line is used by the modem during key-up delay to prevent the DTE it is connected to from sending more characters. The modem will buffer up to 63 characters during the key-up delay, which allows for 500 ms of key-up delay even if the CTS signal is ignored by the device connected to the RS-232 port.

If the CTS signal is ignored or not connected, and the key-up delay exceeds 500 ms, data will be lost: Each new character after the 63rd will cause the oldest character in the buffer to be discarded.

Normally, the CTS signal will be dropped as soon as the 61st character is received, with the expectation being that the connected device will buffer characters itself until CTS is once again asserted (after front porch key-up delay period is complete).

There is no buffering or handshaking in the opposite direction. The DTE must be able to accept data coming in from the modem at the same rate as the data is being received off the air.

## 3.2 MODEM TO RADIO INTERFACE

As soon as data is received from the DTE, PTT to the radio will be asserted (except when busy lockout is active). The modem carrier tone is also turned on. Actual data transmission on the TX out wire begins after the front porch key-up delay.

Audio recieved from the radio is fed to the RX in wire and translated to data and sent to the DTE's RS-232 port. In order to prevent noise on the air being translated as garbage characters, COR is used. If COR is not active the modem ignores incoming noise, voice, or data. If no COR wire is used, data will pass all of the time since COR is pulled high and programmed for positive polarity (by default). In this configuration, the COR wire may be tied to PTT (of negative polarity) to enforce simplex operation. This will also keep noise or voice on the RX path from being interpreted as garbage data while transmitting.

## 3.3 TROUBLESHOOTING Q & A

***Is there any way I can test my TDM-1 to be sure it is okay?***

Yes, you can perform a loop-back self-test. The TDM-1, as shipped from the factory, may be self-tested using a dumb terminal or dumb terminal program. Configure the terminal settings for 1200 baud, 8 data bits, 1 stop bit, and no parity. Also configure the terminal for FULL DUPLEX operation. Connect the blue and yellow wires of the TDM-1 together, connect the TDM-1 to the computer (or terminal), and apply power to the TDM-1. Characters typed at the terminal should be echoed back to the terminal by the modem. Note that there will be a 0.4 second delay from the time the 1st character is typed, to the time it is echoed back. This is due to the default front porch key-up delay of 0.4 seconds.

***What is a 'dumb terminal program'?***

A real 'dumb terminal' is a device passes data from its keyboard to its RS-232 (serial) port. It also displays data coming into it from its RS-232 port, usually to a CRT monitor. A 'dumb terminal program' is a software package that simulates the operation of a dumb terminal on a personal computer. Examples of dumb terminal programs are PROCOMM (a popular shareware program), and HYPER-TERMINAL, a program that is provided with the Windows 95 and 98 operating systems. Using a dumb terminal is typicaly the most convenient way to configure the TDM-1 parameters before placing the product into service.

**Please note:** Midian does not make or sell dumb terminal software for use with the TDM-1. Many such programs are available at low or no cost such as PROCOMM or HYPERTERMINAL. For assistance in using such programs, or any device connected to the TDM-1, please contact the manufacturer of that program or device. A wealth of information on this topic is also available on the Internet.

***Why can't I see anything I am typing using a dumb terminal program?***

Your dumb terminal is set for FULL DUPLEX operation. It is relying on the remote device to 'echo' what you type back to screen. A terminal set for HALF DUPLEX will echo the characters itself. Please refer to the instructions for your dumb terminal for more information.

***I am using the TDM-1 menu system with my dumb terminal, why does everything I type appear twice?***

The TDM-1 menu system automatically echoes everything you type back to you for positive confirmation. If you operate your terminal in HALF DUPLEX mode, it too will echo the characters you type. Place the terminal in FULL DUPLEX mode while configuring your TDM-1 to avoid this nuisance. Please refer to the instructions for your dumb terminal for more information.

***Why does everything I type appear on the same line after I hit the ENTER key?***

The ENTER key actually sends what is known as a Carriage Return (CR) character. The CR character

places the cursor at the beginning of the line. To move to the next line, a Line Feed (LF) character must be sent with the CR character to go to a new line. Most terminal programs can do this for you. Please refer to the instructions for your dumb terminal for more information.

***I am using the TDM-1 menu system with my dumb terminal and a blank line appears after each line of the menu and now I cannot see all of the options. What is causing this?***

The TDM-1 automatically places a carriage return and a line feed (see above) at the end of each line so that the menu options will not type over themselves on the same line. Your terminal is itself adding a line feed for each carriage return character it receives. This is typically a configurable option on a dumb terminal. Please refer to the instructions for your dumb terminal for more information.

***Can I transfer data files between computers with the TDM-1?***

Yes, the TDM-1 will support straight ASCII or binary file transfers (uploads and downloads). The TDM-1 will generally **not** support file transfer protocols such as XMODEM, YMODEM, KERMIT, etc. This is because the TDM-1 was designed to accommodate 2-way radios and thus incorporates PTT key-up delay, hang time, etc. These delays interfere with the normal handshake of these full-duplex protocols.

***Why are there errors in the data?***

There are many possible causes for errors in data transmitted over the air. These can range from a weak signal to outright interference. The V.23 protocol does not implement any error detection or correction. If you are seeing frequent data errors and have a strong signal, you may need to adjust the **TX and RX level** pots. You will need to open the DB-25 shell to make these adjustments. See the installation page for details.

***Why are there extraneous characters at the end of each transmission?***

The squelch tail heard on some radios at the end of a transmission is often the cause of extraneous data. Try using PL/DPL reverse burst on your radio to eliminate squelch tail. Other possibilities include ANI signaling, voice talk-off, etc.

***I connected my TDM-1 to a terminal and all I see is the word TEST printing over and over again? What do I do?***

The TDM-1 performs an EEPROM checksum test upon power-up. This is done to verify the integrity of the programmed parameters stored in EEPROM. Should this test fail, the unit will repeatedly send the message TEST to the DTE. To cancel the test mode and restore factory defaults, send data from the DTE to the modem while the TEST message is printing (eg. press any key). If this does not restore operation, contact Midian for diagnostic proc edures.

## 4. ACRONYMS

This section is provided to clarify certain acronyms used in this manual.

**COR**

This old radio term stands for Carrier Operated Relay. For the purpose of this manual, this refers to any signal which changes state when a radio detects an RF carrier. Also known as Carrier Operated Switch (COS).

**CTS**

Clear to Send. An RS-232 signal from a DCE to a DTE used to control the flow of data from the DTE (see definition of DTE below).

**DCE**

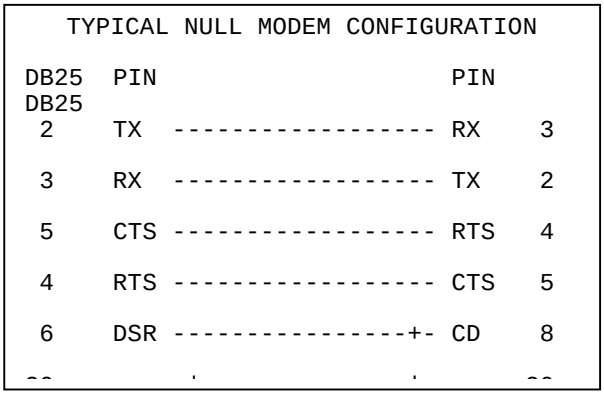
Data Communications Equipment (see DTE).

**DTE**

Data Terminal Equipment. For the purpose of this manual, this is any device connected to the RS-232 port of the TDM-1. The TDM-1 can connect to any device with an RS-232 port configured as a DTE. This includes PC's, laptop computers, handheld terminals, dumb terminals, data terminals, GPS modules, etc.

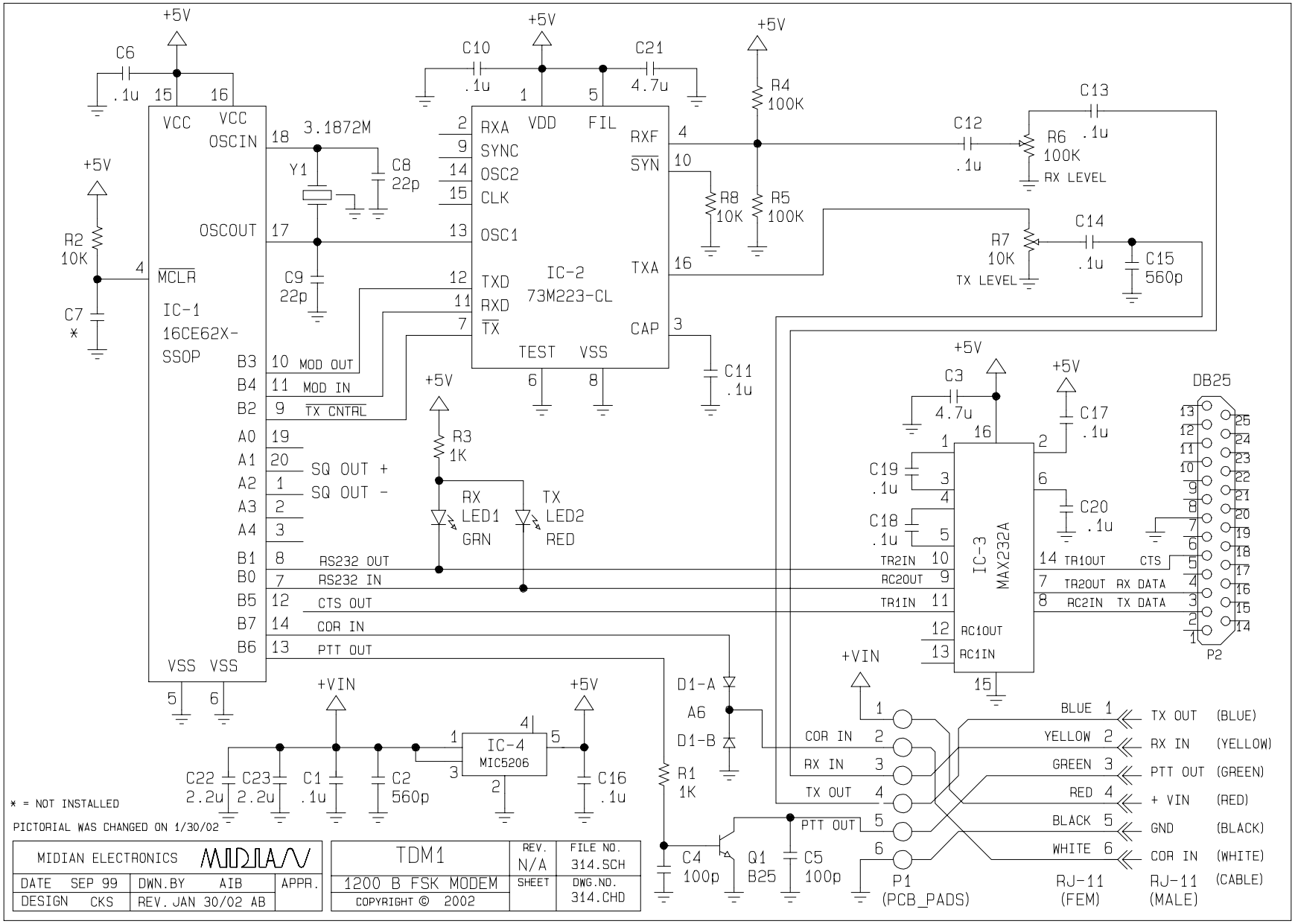
Historically, DTE refers to a dumb computer terminal with an RS-232 port that can be connected to a modem. A modem such as the TDM-1 is considered to be Data Communications Equipment (DCE).

Sometimes bar-code scanners and GPS modules are configured as a DCE. If it is desired to connect this modem to a device configured as a DCE, a null modem will be required.




**EEPROM**

Electrically Erasable Programmable Read Only Memory. This is a type of computer memory. EEPROM retains the data stored in it for many years, even if power is not applied. The TDM-1 employs EEPROM to store the user programmable parameters such as Key-up delay. The EEPROM may be re-programmed several thousand times.


+5V
C6
.1u
IC-1
16CE62X-
SSOP
VCC
OSCIN
OSCOUT
MCLR
VSS
3.1872M
Y1
C8
22p
C9
22p
R2
10K
C7
*
B3 10 MOD OUT
B4 11 MOD IN
B2 9 TX CNTRL
A0 19
A1 20
A2 1
A3 2
A4 3
SQ OUT +
SQ OUT -
B1 8 RS232 OUT
B0 7 RS232 IN
B5 12 CTS OUT
B7 14 COR IN
B6 13 PTT OUT
C10
.1u
C21
4.7u
IC-2
73M223-CL
RXA
SYNC
OSC2
CLK
OSC1
TXD
RXD
TX
TEST
VDD
FIL
RXF
SYN
TXA
CAP
VSS
R4
100K
R8
10K
R5
100K
C11
.1u
C12
.1u
R6
100K
RX LEVEL
C13
.1u
R7
10K
TX LEVEL
C14
.1u
C15
560p
R3
1K
RX
LED1
GRN
TX
LED2
RED
C3
4.7u
IC-3
MAX232A
C19
.1u
C18
.1u
TR2IN
RC2OUT
TR1IN
RC1OUT
RC1IN
TR1OUT
TR2OUT
RC2IN
C17
.1u
C20
.1u
DB25
CTS
RX DATA
TX DATA
P2
+VIN
IC-4
MIC5206
C22
2.2u
C23
2.2u
C1
.1u
C2
560p
C16
.1u
D1-A
A6
D1-B
R1
1K
C4
100p
Q1
B25
C5
100p
PTT OUT
COR IN
RX IN
TX OUT
P1
(PCB_PADS)
BLUE 1 TX OUT (BLUE)
YELLOW 2 RX IN (YELLOW)
GREEN 3 PTT OUT (GREEN)
RED 4 + VIN (RED)
BLACK 5 GND (BLACK)
WHITE 6 COR IN (WHITE)
RJ-11
(FEM)
RJ-11
(MALE)
(CABLE)
* = NOT INSTALLED
PICTORIAL WAS CHANGED ON 1/30/02
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DATE SEP 99
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DESIGN CKS
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TDM1
1200 B FSK MODEM
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REV. N/A
SHEET
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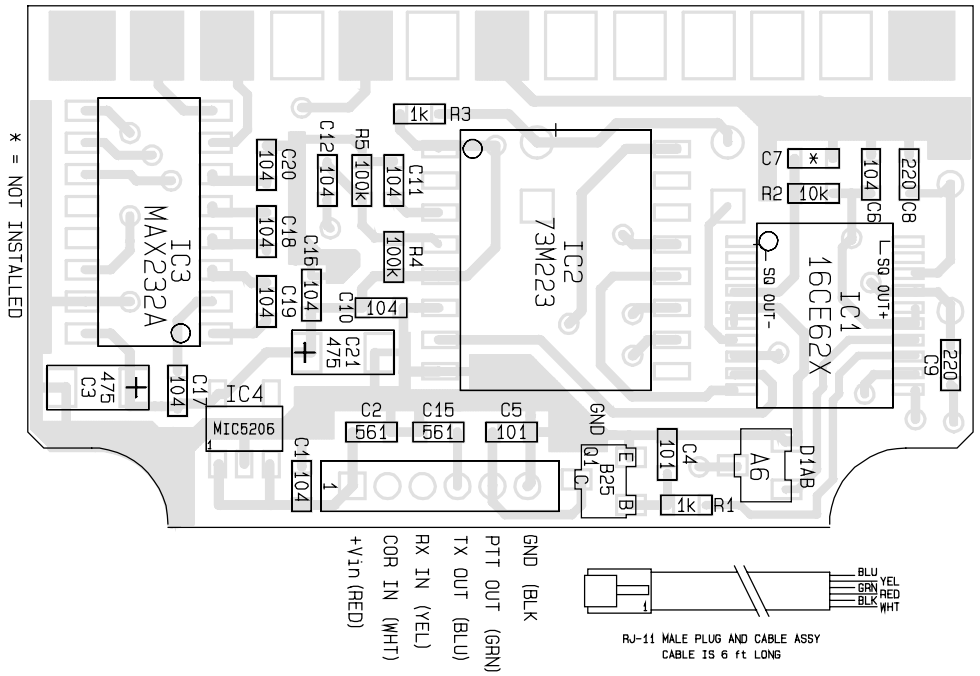
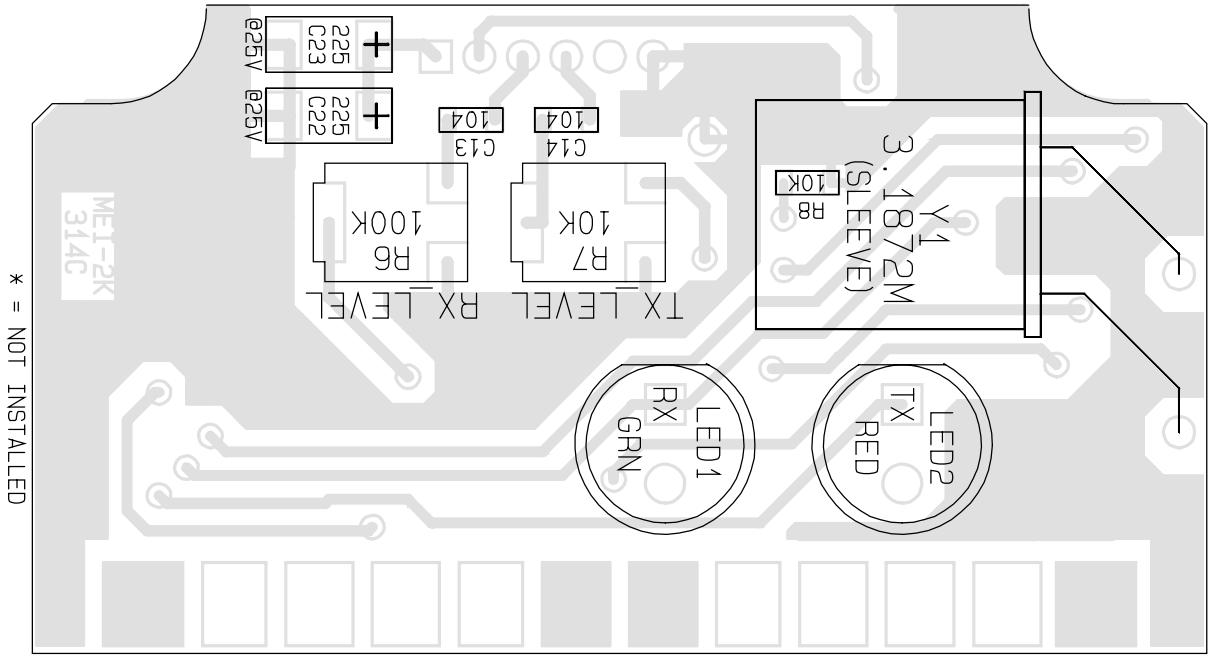
DWG.NO. 314.CHD

P1
DB25_FEMALE

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|---|---|---|---|---|---|
| MIDIAN ELECTRONICS | | | TDM1 | REV. C | FILE NO. 314C.PCB |
| DATE SEP 99 | DWN.BY AB | APPR. | 1200 B FSK MODEM | SHEET | DWG.NO. 314-HCP |
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