



MIL-STD

Data Modem Terminal

Quick Start Guide

Version 1.05

Current for MS-DMT v1.01 Build 1.0.1.2

POC for this document is:

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WARNING: Do **NOT** use greater than a 2.8kHz filter on transmit or a 3.0kHz filter on receive.

NOTE: Authorized MS-DMT users with Amateur Radio licenses be aware that Military data modem serial tone waveforms use 1200 (S4529) or 2400 baud symbol rates which are **NOT** legal for all Amateur Radio use on HF. FCC rules that took effect on 05 MARCH 2012 for 60m band permit data transmission use as long as the emitted signal is held to 2.8Khz BW or less. FCC rules also allow 1200 baud symbol rate use for data transmission at 28Mhz and above, which would allow S4529 on 10m. Also, current FCC rules seem to permit use of military serial tone waveforms for Digital Voice or Image transmissions were such transmissions are permitted. Future FCC rule making will likely improve this situation.

NOTE: The release notes text file in the distribution .ZIP file may contain additional information beyond this document for a build release that is more recent than when this document was last updated.

PREFACE

By reading this short document you are off to a decent start compared to just installing the software and running it. However this document provides the **absolute minimum information** on the MS-DMT software regarding its proper setup and use to get someone up and running for the first time in an emergency use of the software and nothing more.

The "READ_ME_FIRST_MIL-STD_DATA_MODEM.pdf" file if not already read is **MUST** read.

It cannot be stressed enough that it is **HIGHLY RECOMMENDED** that the full "MIL-STD Data Modem Terminal User Guide" be read in whole and each time a new version is released as the best practice for getting the most from the use of the MS-DMT software. Some of the information contained herein is repeated from the MS-DMT User Guide out of necessity, however MS-DMT can only be fully understood and properly applied by reading the full User Guide.

OVERVIEW

The MS-DMT application is a software modem based communications terminal tool developed as a Microsoft Foundation Class (MFC) Multi-threading 32 bit application designed to run under MS-Windows XP SP3 and later MS-Windows operating systems. However as will be detailed herein, for best results the Windows OS used must be tailored for low latency performance and just as with a MIL-STD hardware modem which is a dedicated embedded system, while using software the host computer must be dedicated to the modem application.

The MIL-STD Data Modem Terminal (MS-DMT) software provides MARS with interoperable digital communications with our Military sponsors to the same MIL-STD-188-110A (MS110A) Serial Tone modem standards found in their hardware modems. However, these high symbol rate Military waveforms push the capabilities of both the general purpose computer and Windows operating system and PC sound device as well as the typical HF SSB radio commonly used by the MARS member.

Don't assume that you can just dive in and make use of the MS-DMT software like an Amateur Radio sound card digital mode application as you will likely be very disappointed with the results. This software is much more demanding of the PC Sound Device, PC operating system and radio equipment vs. Amateur Radio digital communications applications which support low symbol rate data modes that make use of the PC Sound Device as the modem hardware.

These complex Military serial tone PSK waveforms being supported by this software have much higher symbol rates, wider bandwidth and higher data rates than do the Amateur Radio, Commercial and Military FSK (RTTY) digital modes commonly used by MARS in the past and were designed to be implemented on dedicated hardware based modems and Military grade HF SSB transceivers having SSB filters with wider bandwidth better characteristics than normally used in Amateur Radio and most Commercial Radio grade transceivers.

Much more care must be taken in the initial configuration and configuration management of the PC operating system and the radio configuration for the best consistent results when using this software. However, with some time and effort, most MARS members can make adjustments to their computer system and radio system equipment that will provide good results when using the MS-DMT to emulate MIL-STD modem communications.

In application, the basic use of the MS110A modem is similar to the use of MT-63 or any non-ARQ FEC protocol. However via the use of 3rd party data terminal applications and Data Link Protocols the MS110A modem can also provide for more than just basic FEC based ASCII messaging. The Military uses the MS110A modem for everything to include FEC ASCII messaging and file transfer in broadcast and multicast, ARQ linked message and file transfers in peer-to-peer, HF e-mail, HTML, Digital Voice and more.

The MS-DMT software supports the MS110A modem data rates of 75, 150, 300, 600, 1200 and 2400bps coded, that is to say with FEC and both SHORT or LONG Interleaver selections. In addition the 4800bps un-coded data rate is also provided. In comparison to MT-63, MS110A 75bps is as robust when used with the proper sound device and a low latency operating system. Also in comparing MT-63 1K LONG to using MS110A 75bps LONG, MS110A is about 10% slower and MS110A 150bps LONG is about 10% faster than MT-63. However MS110A 300bps is almost twice as fast and MS110A 600bps is double that vs. MT-63. In comparison to MT-63 2K LONG, MS110A 300bps LONG is about 30% faster and MS110A 600bps is about three times as fast. However the speed of MS110A can only be used when channel conditions support the higher data rates. The 75bps data rate and LONG interleaver on the other hand can always be used to get the message through most any channel conditions just as with MT-63.

Most MARS members even just using an onboard AC'97 sound device if it happens to be clean and provides for low jitter and accurate and stable sample rate may be able to make use of MS110A 75bps through 600bps if using with proper SSB filters. The use of 75bps-600bps is a huge increase in throughput for MARS sound device based communications over MT-63. However many MARS members will have issues at the lower data rates due poor sample clock accuracy and sample clock drift, noise floor and jitter when trying to use anything but external sound devices, In addition any radio frequency drift due to a lack of TXCO is a show stopper.

PC HARDWARE AND OS REQUIREMENTS

The best results when using this software are obtained when it is run on a dedicated PC that has been configured with a fresh OS install that has no networking enabled, especially no wireless networking or other non-essential MS-DMT related applications in use.

There are significant CPU and memory demands on the PC due to the modems receiver DSP processing and significant demands on the PC sound device.

Storage requirements by the MS-DMT and the Microsoft Visual Studio 2008 C++ redistribution runtime libraries are rather low and the application can be run off a USB stick or other media once properly installed, to include installed to bootable portable media.

A computer with one or more older **Intel Pentium 4 HT** processors @ 3.06Ghz (some later Intel P4 models that had Hyper-Threading disabled and are not suitable) or compatible CPU supporting Hyper-Threading Streaming SIMD (Single instruction, multiple data) Extensions (SSE) 2 and a minimum of **1GB** of physical RAM (with **2GB** recommended) and **3GB** virtual memory running **either Windows XP Home or XP Professional, SP3 Build 2600** minimum is required for use with the MS-DMT software. The software will **NOT** work properly on a lesser PC system.

During the continuing development of MARS-ALE v3.00 the minimum PC and OS requirements may again change prior to its entering life cycle maintenance. At this time it can be assumed that

Windows XP support will likely cease, but by then we are talking 1 to 2 years past Microsoft dropping Windows XP support which already occurred in April 2014. Even though Windows Vista is scheduled for end of support in April 2017, it may too may cease to be supported in MARS-ALE when XP support is dropped considering the low number of MARS Vista users, most of which who have already moved to either Windows 7 or Windows 8 with their made for Vista PC hardware. This move will allow taking full advantage of Windows 7 features in MARS-ALE v3.00 by the time it enters life cycle maintenance.

MS-DMT can be used with external Terminal applications such as the Army MARS ACP Communications Terminal or the AMT (BlockTerm) Communications Terminal and future Tactical Chat, MultiCast and other terminal tools under development. The use is similar to using those applications with a hardware modem where the PC that is running the MS-DMT would equate to the stand alone hardware modem.

The minimum systems configuration in the form of a Dell GX-520 was heavily tested with during development of the software and found to provide proper results. However the minimum configuration running the MS-DMT requires any external terminal application running on a second PC via an RS-232 null connection. However the use of an external terminal application on the same PC via VCP based communications requires more processing power and RAM. A minimum system based on a **1.86Ghz Intel Pentium M or 1.66Ghz Intel Core 2 class processor with 2GB physical RAM** will support using the MS-DMT Data Port on the same system via a VCP connection for basic external terminal applications.

One **AC'97 48khz 16 bit minimum PC Sound Device** that is dedicated to being the radio modem physical layer device and not used as the Windows system sound device. It is preferred that the sound device be external to the PC for best results. For a full run down on sound devices see the file: "READ_ME_FIRST_MIL-STD_DATA_MODEM.pdf"

One **physical RS-232 port** is required for uninterrupted radio push-to-talk (PTT) activated prior to and during data transmission via either RS-232 DTR or RTS lines or CAT PTT.

NOTE: Optionally, an external hardware PTT based very fast VOX activated keying from the modem waveform audio is permitted as long as it is uninterrupted during the data transmission. For example, the DLY setting on the popular fast VOX PTT based Signalink USB must be at full CCW for absolute minimum PTT delay. Radio only based VOX keying MUST NOT be utilized.

One **physical RS-232 port** is required for use of the MS-DMT Data Port if the external terminal program is running on a second PC via a null modem cable.

NOTE: External terminal programs running on the same PC require the use of a paired set of VCP ports where the use of Com0Com for 32 or 64 bit computers is recommended. Use of the 'enable overrun buffer' is recommended. For Window 7 and later a signed version of com0com is required.

This minimum system will support using the MS-DMT Data Port on the same system via a VCP connection for basic external terminal applications. However on a lower end dedicated PC systems the DMT Data Port will need to be configured via a real RS-232 hardware port with a null modem cable connection to your main PC where the Army MARS ACP Communications Terminal or the AMT (BlockTerm) Communications Terminal can be used similar to using those applications with a hardware modem where the PC that is dedicated to running the MS-DMT application would equate to the stand alone hardware modem.

NOTE: MS-DMT must not be subjected to power conservation saving settings and must never shut down the hard drive and the OS must never go into system standby or hibernate modes and screen savers must be disabled as well as wireless networking. Wired networking may be tolerable on some systems but must be evaluated as to DPC latency.

INSTALLING MS-DMT FOR THE FIRST TIME

The install program, INSTALL.EXE, by default installs to “C:\MS-DMT\”. The software may be installed to any Windows directory on your computer using Windows XP. However, Do **NOT** install the software under “C:\PROGRAM FILES\” when using either MS-Vista or later Windows OS due to file access restrictions imposed with these operating systems and be sure to install using Administrator rights.

NOTE: When running on native versions of Windows newer than Windows XP do NOT specify to run as a Windows XP SP3 application or anything else using Compatibility Mode emulation.

The required installation steps are:

1. Either directly install the distribution archive file MSDMTxxvxxxBxxxx_FI.ZIP in step 2 or unzip into a temporary directory and proceed to step 2.
2. Run the INSTALL.EXE and accept the license agreement, then follow all screen prompts through to completion of the install program.
3. If using the MSDMTxxvxxxBxxxx_FI.ZIP file, upon completion of the INSTALL.EXE the Microsoft VS 2008PRO redistribution install (vcredist_x86.exe) will automatically start, accept the license agreement, then follow all screen prompts through to completion.

NOTE: If the INSTALL.EXE used is not the most recent, then before running the MSDMT_xx.EXE file, acquire the partial install archive (MSDMTxxvxxxBxxxx_PI.ZIP) and run its INSTALL.EXE, or just unzip the contents of an update archive (MSDMTxxvxxxBxxxx_UD.ZIP) or run its INSTALL.EXE if one exists, into the sub directory where MSDMT_xx.EXE was originally installed on your computer.

The software is now installed and awaiting configuration, skip the next section and proceed to “MS-DMT GUI LAYOUT”.

INSTALLING AN MS-DMT UPDATE

The process for installation of a software update can be one of two methods as detailed below.

NOTE: If you have NOT previously installed an earlier MS-DMT version, then you MUST run the current full install of MS-DMT before installing an update version.

1. With an existing MS-DMT installation that has been properly configured and tested, make sure you save the existing MSDMT_32.EXE and DMT.DAT file to a safe location as the update may have a changed DMT.DAT file structure, thus your existing DMT.DAT file will be considered corrupt and will be over written if present by the new version when started.
2. Then after backing up your existing MS-DMT installation either write over it or create a new sub directory to copy over all existing files before installing the updated files.
3. Depending on the update distribution contents, either run the INSTALL.EXE contained in the partial install archive (MSDMTxxvxxxBxxxx_PI.ZIP) update or run the INSTALL.EXE if one exists or just extract the files contents of an update archive (MSDMTxxvxxxBxxxx_UD.ZIP) into the sub directory where MSDMT_xx.EXE was originally installed.

NOTE: Users of Vista or later should not copy or install updates into additional directories without first uninstalling as the log files in the originally directory will likely be used by both installations.

MS-DMT GUI INTERFACE

The software by default appears on first start as depicted in figure 1, where the “Common” panel is active for configuration purposes or required DMT.DAT database file which resides in the same directory as the MSDMT_32.EXE is either missing or corrupt. Otherwise the program retains all user changed configuration parameters and appearances for use on the next program start.

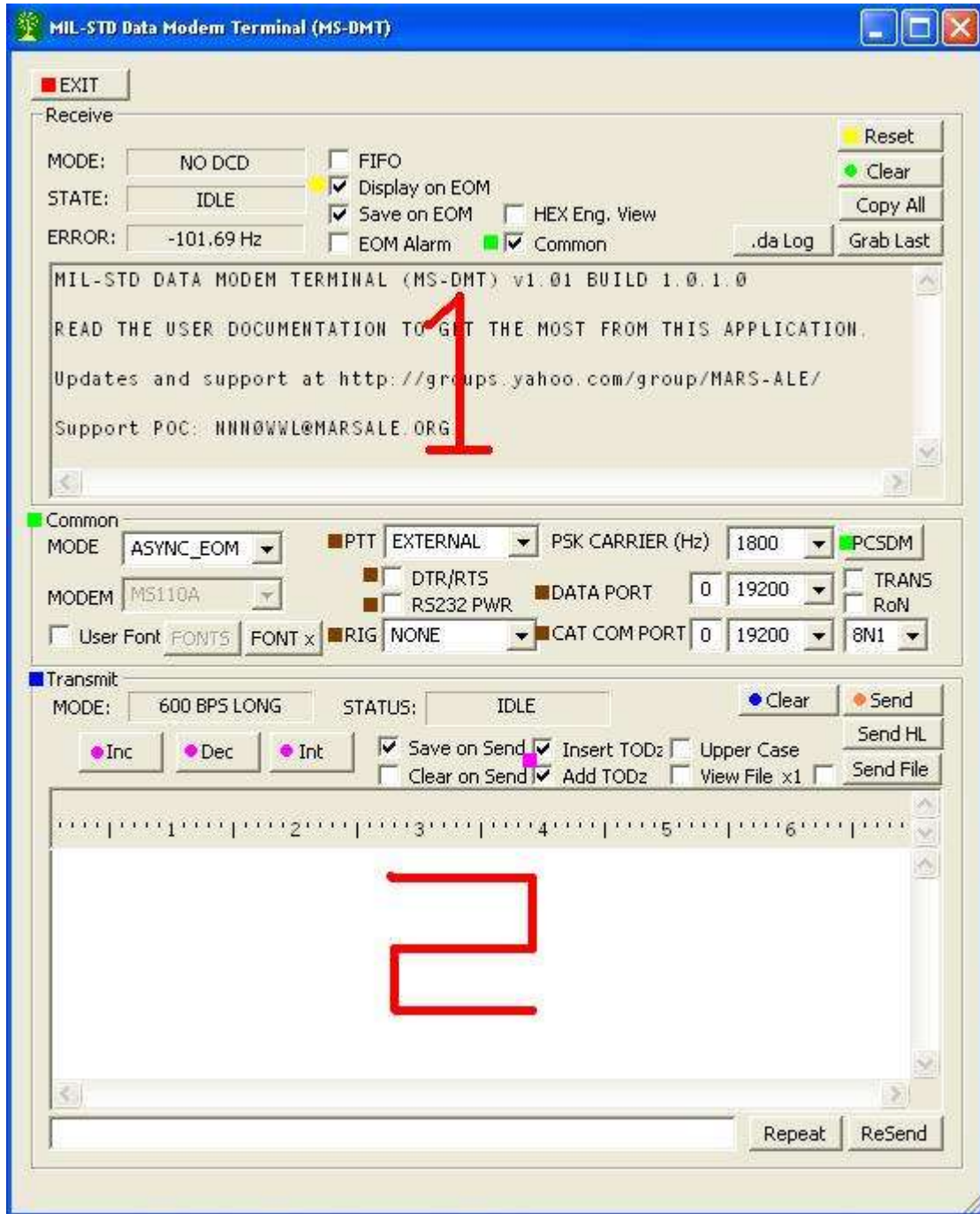


Figure 1.

The MS-DMT software user interface as seen in Figure 1 above, is presented in three panels from top to bottom; “Receive”, “Common” and “Transmit” which segments the software into a clean user interface. Furthermore, the “Common” panel is only displayed when the “Common” checkbox on the “Receive” panel is checked, otherwise it is hidden.

The program is easy to configure and use, the basic use for sending a message is to just select the mode, data rate and interleave parameters and type or paste and send your message or use “Send File” or the Drag & Drop method to send the contents of a file. Message reception could not be simpler when using MS110A as being Auto Detect as no selection of parameters are required.

All user selected settings as well as the current GUI size and screen location of the application are saved each time program is terminated where using the "EXIT" button is the proper way to terminate the application..

There are two major scrolling windows that provide display of incoming and outgoing message text, **window 1** (which is its largest when the Common panel is not active) in the Receive panel displays the received message and **window 2** in the Transmit panel supports typing and pasting and editing of up to a 32kb ASCII text message. There is a third single line transmit window at the bottom typing or pasting up to a 1kb messages that are sent on the “Enter” key stroke intended for rapid peer-to-peer communications.

The software provides an upfront display of all user entered parameters aside from those pertaining to PC sound device. Many of the parameters will likely be changed infrequently if at all after initial setup by, however many MARS members will find the need to change many often, and it has been found that having then up front speeds the process verses navigating menu’s to find the needed selection in the heat of two-way communications.

When the Common checkbox is not checked **window 1** is enlarged and the common panel is hidden as seen below in figure 2.

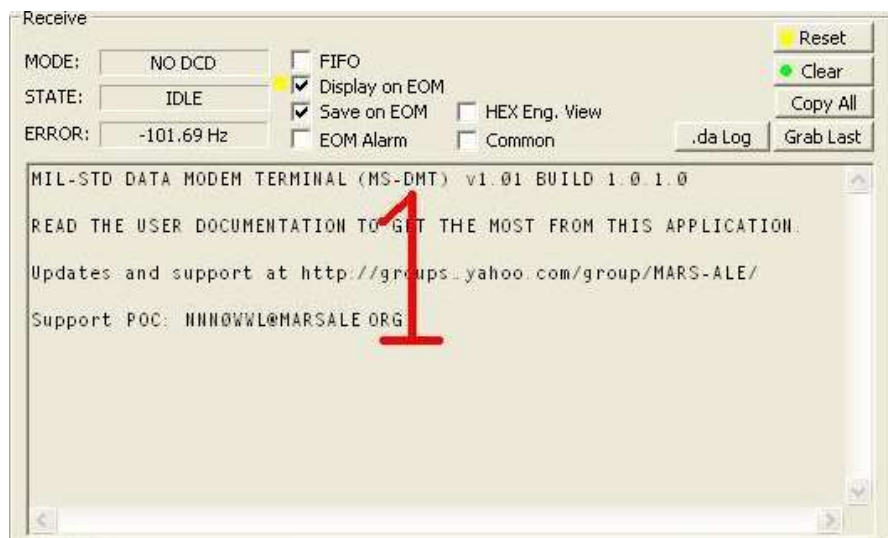


Figure 2.

PC Sound Device Setup

The “PC Sound Device Setup” dialog as seen in Figure 2 below is the starting point to setup and one area that after selected, almost never changes. To get to this dialog, click on the “PCSDM” button at 3 o’clock on the Common panel at the center of the application, refer to Figure 3.

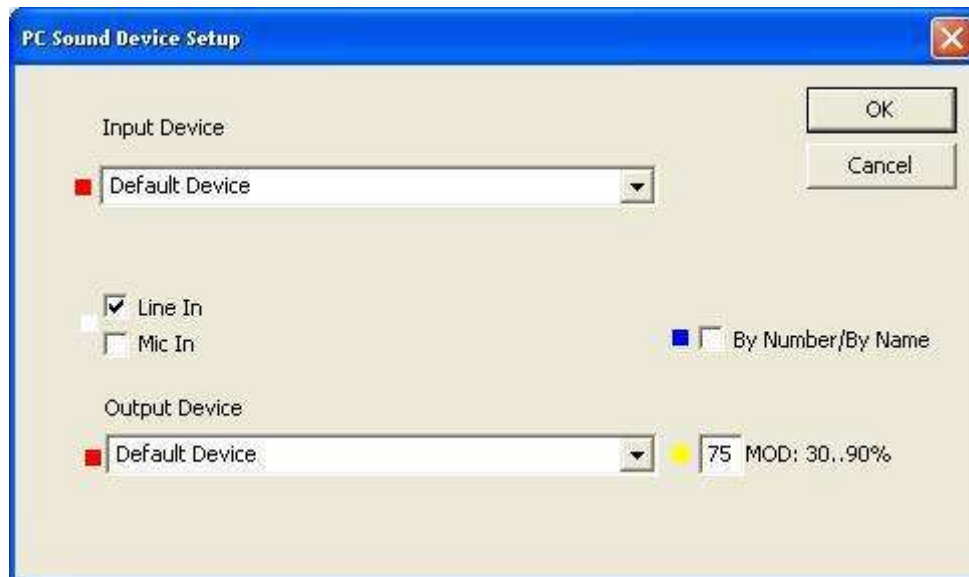


Figure 3.

On the “PC Sound Device Setup” dialog depicted in Figure 2, select your **Input Device** (RX) and **Output Device** (TX). If using Vista or later, it may be necessary to check the “**By Number/By Name**” box to select the device by Number for retention when restarting the software. “Line In” is recommended if available, if “Mic In” must be used be sure no enhanced boost features are enabled via the device driver in Windows. Do NOT change the **MOD** value, it should remain at 75% unless all other sound device means of adjusting the drive level for no ALC on TX fail, refer to the “MS-DMT User Guide” for further details. When done, click “OK”.

NOTE: If using a USB or other interface port, external portable sound device, be sure to test each port with the device for the lowest sample clock error, refer to the MS-DMT User Guide for further details.

The main MS-DMT GUI as seen in Figure 1. above, provide various the remaining set up parameters, where various options pre-enabled or configured (boxes checked, combo selections and values entered) set to starting point default values on the program first start, which offer the best results as to displaying receiving messages and saving sent and received messages and inserting time stamps on transmit or are best guest values as to the unknown station equipments to be used.

Common Panel

The PCSDM button has already been used, now the user must configure for their choice of PTT and for any Radio CAT control and interface power. In addition the panel supports configuration of the optional Data Port, these areas as seen in Figure 1 above are mostly setup once and grouped together in that regard.

However the most used area of this panel is the modem Mode selection combo box, where the over-the-air data mode used is selected.

The least used parameter on the panel is the modem waveform PSK Carrier selection, which is best left at the default 1800hz for interoperability, refer to the “MS-DMT User Guide” for details regarding the PSK Carrier.

CAT Com Port

By default CAT serial support is OFF, this is achieved by setting the CAT com port to 0. To make use of CAT a com port between 1..16 must be entered. The com port parameters are user selectable for baud rate and framing if other than the default values for each radio type selected are required. For those radio models that require handshaking, the appropriate handshaking is hard coded for the radio type selected and not user selectable.

You can also set the CAT com port to 0 temporarily to run another program, this is faster than shutting down the MS-DMT to start another program and also alleviates the possibility of shutting down and starting the next program too fast and having com port access issues.

It is best to always set the data rate for the CAT com port to the highest rate supported by the radio to minimize latency, this is especially true if CAT PTT is being used or CAT commands are being sent in support of automatic Data/Voice port selection.

Radio PTT

The software provides for user selectable RS232 DTR/RTS line hardware PTT as well as CAT PTT and or no software controlled PTT.

The first time the program is started CAT com port is set to 0, thus the software provides no type of PTT support. This is often the only configuration used with fast VOX based external interfaces providing a source of hardware PTT. However even if CAT PTT support is not required, for some make/model radios with dedicated digital ports, CAT support may be desired to automate the switching between the digital port for TX and back to the Mic port on RX for mixed Data/Voice nets.

The PTT pull down menu is used to select the PTT mode if the CAT com port is active. By default when the program is first used, EXTERNAL is selected. The choices are CAT ONLY, CAT&RS232, RS232 and EXTERNAL.



PTT TYPE	COMMENTS
CAT ONLY	Sends CAT PTT ON and CAT PTT OFF
CAT&RS232	As above plus either DTR or RTS as below.
RS232	Asserts and de-asserts either the DTR or RTS lines for PTT on the CAT port predicated on the DTR/RTS box being checked or not.
EXTERNAL	None of the above PTT methods are used which allows for the use of an external hardware PTT method based on the modem audio out from the PCSDM such as the with VOX based external units.

DTR/RTS AND RS232 PWR

For RS232 or CAT&RS232 selections, by default DTR/RTS is not checked, as such if the serial port is other than 0, RTS will be selected, if DTR/RTS is checked, DTR will be selected. Should an external interface be in use that requires D.C. power from the RS-232 port, check “RS232 Power”, whichever line, RTS or DTR is not being used for PTT will be used for DTR power.

CAT Radio Type

The RIG pull down menu is used to select the radio type for CAT support. By default when the program is first started radio type NONE is selected, which precludes the sending of any CAT commands.



All CAT serial port parameters are automatically configured when the radio type is selected, the fast baud rate should always be used to minimize latency, there is no provision for the user to change either handshaking parameters or radio addressing parameters. If the given radio type selected ends with _DV or _DVx, the CAT commands are sent in support of Data/Voice switching between Mic and Digital ports, even if CAT PTT is not selected for use. The details of all the radio type selections are found in Appendix G the “MS-DMT User Guide”.

Receive Panel

The most important item that can trip one up is “**Display on EOM**” which is checked by default, when checked a message received will only display in the received message window if the “End Of Message” (EOM) sequence is received.

There are no selections for receive data rate or interleaver as MS110A is autobaud.

The “**Reset**” button causes the modems receiver to reset and start hunting for a legitimate modem waveform preamble.

The “**Clear**” button clears the current content of the incoming message window.

Refer to the “MS-DMT User Guide” for details on the remaining the items in the Receive panel.

Transmit Panel

Here the data rate and interleaver settings for transmit via the selection over-air-mode and the Send and Clear buttons are the most used items.

The “**Inc**” and “**Dec**” buttons change the data rate and the “**Int**” button changes the interleave selections.

A number of items on this panel and a few on the other panels are disabled during the duration of the transmission to include both the “Send” and “Send HL” buttons.

MS-DMT AND COMMUNICATIONS

When receiving a message, as configured by default, with “Display on EOM” and “Save on EOM” checked, all incoming messages will display in the incoming message upon receipt of the EOM and will be automatically saved for later review. Each new message received will clear the message window and display upon EOM.

The log files are saved to the “..\dalog\” log directory using the file naming convention of MMDDYYYY.da where the subdirectory must exist in the directory where MSDMT_32.EXE resides else an error message will display on each attempt to save a received message.

For transmitting a message, the message to be sent is placed into outgoing message window and the Send button must be clicked on. as configured by default with “Save on Send” and the two time stamp selections, “Insert TODz” and “Add TODz” checked, the current time will be inserted ahead and at the end of the message and the message being sent will be saved.

The log files are saved to the “..\owlog\” log directory using the file naming convention of MMDDYYYY.ow where the subdirectory must exist in the directory where MSDMT_32.EXE resides else an error message will display on each attempt to save a sent message.

It cannot be stressed enough that it is highly recommended that the full "MIL-STD Data Modem Terminal User Guide" be read in whole and each time a new version is released as the best practice for getting the most from the use of the MS-DMT software.