DRAFT
MIL-STD
Data Modem Terminal
Quick Start Guide
Version 1.04

Current for MS-DMT v1.01 Build 1.0.1.4 TB#7

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It cannot be stressed enough that reading the full "MS-DMT User Guide" in whole as soon as possible is highly recommended. Reading it again each time a new production version is released is the best practice for getting the most from MS-DMT during its life cycle development.

NOTE: The build release notes text file and MS-DMT Technical Library may contain more recent as well as new information beyond this document's last update.

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

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PREFACE

By reading this short document you are off to a good start compared to just installing the software and running MS-DMT blindly. This document is meant to get someone up and running for the first time in an emergency use of the software and nothing more.

However this document provides the **absolute minimum information** on MS-DMT regarding its proper setup and use.

It can not be stressed enough that reading the full "MIL-STD Data Modem Terminal User Guide" in whole is highly recommended. It should be read in whole each time a new MS-DMT production version is released. Doing so is best practice for getting the most from the use of the MS-DMT software during its life cycle development. All MS-DMT documentation is now contained within the “MS-DMT Technical Library” tool for a better learning experience.

OVERVIEW

The MS-DMT application is a software based MIL-STD-188-110A (MS110A) Serial Tone modem based communications terminal tool. It is developed as a Microsoft Foundation Class (MFC) Multithreading 32 bit application designed and tested to run under Windows 7 and later operating systems.

The MIL-STD Data Modem Terminal (MS-DMT) software provides MARS with interoperable digital communications with our U.S. Military sponsors and U.S. Government customers to the same MS110A PSK modem standards their hardware modems adhere. However, these high symbol rate Military waveforms push the limits 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 MS-DMT like an Amateur Radio low symbol rate sound card digital mode application as you will likely be disappointed with the results. This software is much more demanding of the PC Sound Device, PC operating system and radio equipments vs. Amateur Radio digital communications applications. It will require time and effort to correlate the hardware components to allow the MS-DMT software modem to provide the performance that is capable of providing.

The 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. These Military waveforms 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 equipments 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 MS110A modem data rates of 75, 150, 300, 600, 1200 and 2400bps coded, that is to say with Forward Error Correction (FEC). Both SHORT and LONG Interleave selections are provided. In addition the 4800bps uncoded data rate is also provided.

Most MARS members even using an onboard AC'97 sound device with proper SSB filters will be able to make use of MS110A through 600bps which is a huge increase in throughput for MARS-to-MARS sound device based communications. However many MARS members will have issues at the lower data rates due poor sample clock accuracy and drift, in addition to radio frequency drift if the specified use of an HF radio with a TXCO is not adhered to. Stations that do NOT have an HF SSB radio with a TXCO installed should **NOT** be transmitting with MS-DMT using MS110A for anything but short messages.

In comparison to MT-63 1K LONG, using MS110A 75bps LONG is about 10% slower and MS110A 150bps LONG is about 10% faster, where MS110A 300bps is almost twice as fast and MS110A 600bps is double that. In comparison to MT-63 2K LONG, MS110A 300bps LONG is about 30% faster and MS110A 600bps is about three times as fast.

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 or other 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 C++ runtime libraries are rather low. MS-DMT can be run off a USB stick or other read/write media once properly installed.

No less than an older **1.86Ghz Intel Pentium M or 1.66Ghz Intel Core 2 class processor with 2GB physical RAM and 3GB virtual memory.** The best results on this minimum PC hardware are achieved by the use of **Windows Embedded Standard 7 (WES7)**. This has been proven using WES7 on a Dell GX-520 Intel Pentium 4 system. The MS-DMT software at this time will likely still operate on **Windows XP Home or XP Professional, SP3 Build 2600** as the minimum OS supported.

However testing is no longer performed on less than Windows 7 and in the near future the bar will be raised to desktop Windows 7 as the minimum supported OS. This move takes into consideration the fact that Microsoft dropped Windows XP support in April 2014 and that Windows Vista is scheduled for end of support in April 2017. Also taken into consideration are the issues with XP and Vista and the low number of remaining users in MARS. Most of the Vista user have already moved to Windows 7 or later on their made for Vista PC hardware. This move

will allow taking full advantage of Windows 7 features in the tools and the use of newer compiler libraries in building the MS-DMT executable.

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 low noise floor results. However some professional internal PC sound devices exist, complete with TXCO that are suitable for use.

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 should 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.

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 external terminal application is running. This can be viewed as being similar to using those terminal 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: The MS-DMT tool MUST NOT BE subjected to power conservation saving settings and must never shut down the hard drive. The OS must NEVER go into system standby or hibernate modes. All screen savers and wireless networking MUST BE DISABLED. Wired networking may be tolerable on some systems but must be evaluated as to DPC latency.

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INSTALLING MS-DMT FOR THE FIRST TIME

NOTE: Disable all antivirus/spyware software prior to starting the installation process. Should you desire to use antivirus/spyware software when making use of MS-DMT or any of its associated files and have issues with antivirus/spyware software you will need to set an exception to ignore the issue or otherwise resolve issues with the antivirus/spyware software publisher(s).

Run INSTALL.EXE as Administrator. The MSDMT_32.EXE and MSDMTLIB.EXE and the .DLL files will be installed to run as Administrator by INSTALL.EXE when run. If being added manually the user will need to do so.

The install program (INSTALL.EXE) by default installs to "C:\MS-DMT\", which the end user can change as desired.

The software may be installed to any drive on your computer and any user created sub directory. However, Do **NOT** install the software under any Windows system folders. This means you cannot install to "C:\PROGRAM FILES\" etc. when using MS-Vista or later due to file access restrictions imposed with the Windows operating systems.

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 from the full distribution archive file MSDMTxxvxxxBxxxx_FI.ZIP or the partial install distribution MSDMTxxvxxxBxxxx_PI.ZIP by proceeding to step 2 or unzip into a temporary directory and then 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.

The software is now installed and awaiting configuration, skip the next section and proceed to "WINDOWS DESKTOP SHORTCUTS".

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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 first started.

2. After backing up your existing MS-DMT installation either install over it or create a new sub directory to copy over all existing files before installing the updated files to retain it for a any possible continued use.

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_32.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.

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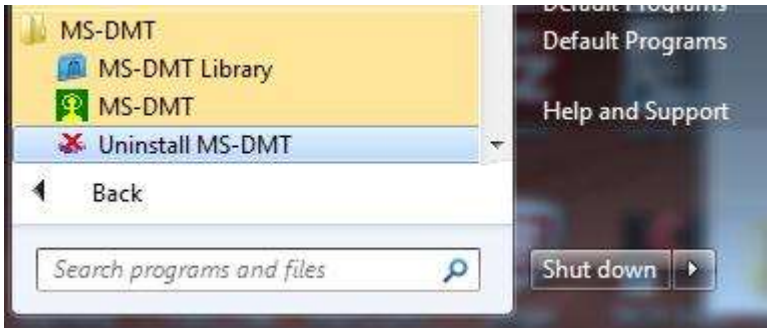
WINDOWS SHORTCUTS

After running INSTALL.EXE there will be two desktop shortcuts created, one green one starts MS-DMT (MSDMT_32.EXE) and the blue one starts the MS-DMT Technical Library (MSDMTLIB.EXE) resource.

The MS-DMT Technical Library is your one-stop resource for both documentation and software updates. It contains all MS-DMT related documentation within a user friendly to navigate tool. The full scope of MS-DMT can only be learned by reading everything.

The Windows menu under "All Programs" will have an MS-DMT selection with three items, MS-DMT, MS-DMT Library and Uninstall.



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MS-DMT GUI INTERFACE

NOTE: MS-DMT v1.01 B1.0.1.4 GUI has changed. This section has yet to be updated to reflect those changes.

MS-DMT on install by default appears on first start as depicted in figure 1. The "Common" panel is active for configuration purposes.

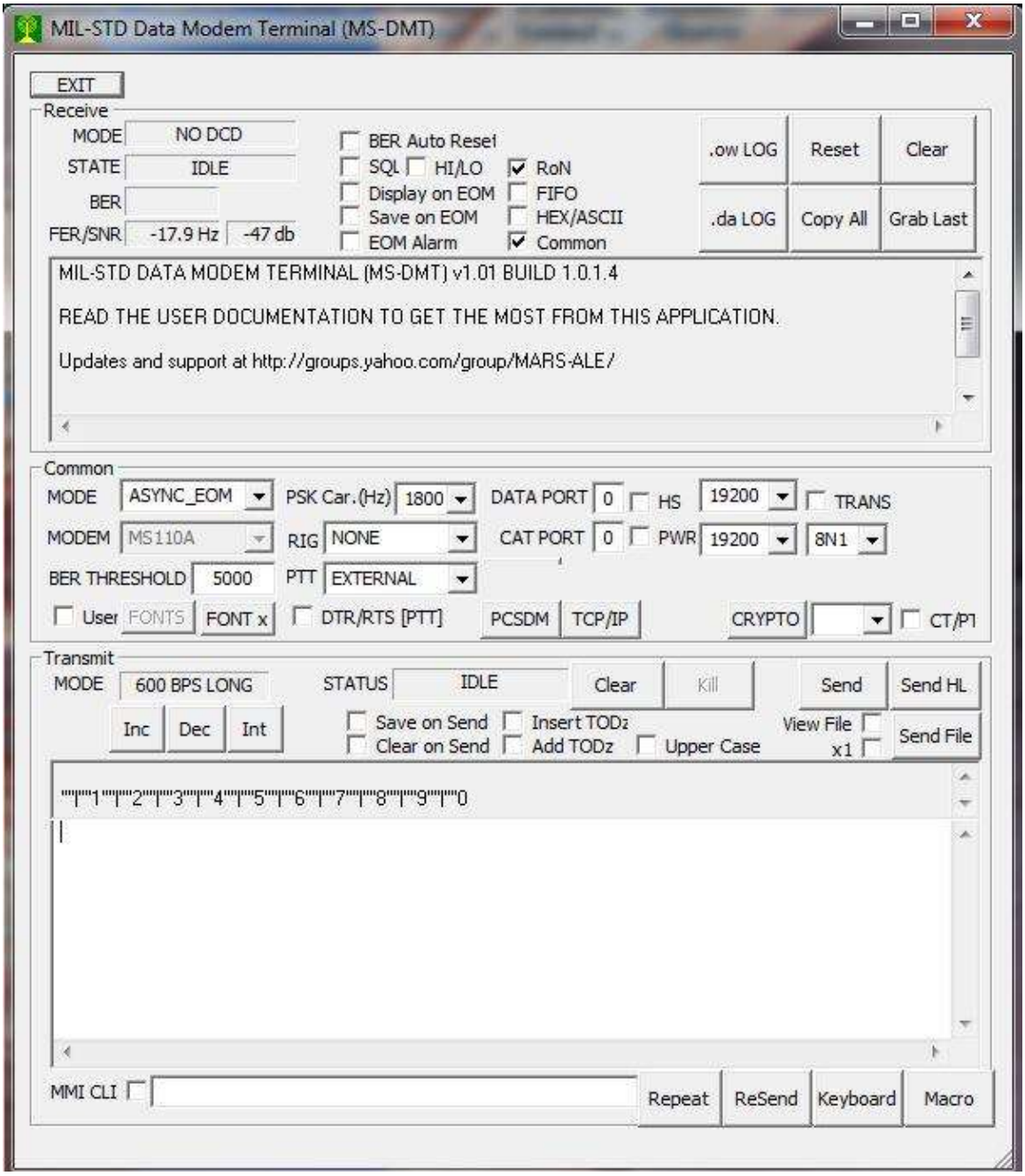


Figure 1.

The MS-DMT software user interface as seen in Figure 1, consists of three panels from top to bottom; "Receive", "Common" and "Transmit". This separates the GUI into a clean user interface. The "Common" panel is only displayed when the "Common" checkbox on the

"Receive" panel is checked. The "Receive" and "Transmit" panels are the focus for actual communications. When the Common checkbox is not checked, window 1 is enlarged and the common panel is hidden as seen below in figure 2.

All user selected parameters are saved to the DMT.DAT database file which resides in the same directory as the MSDMT_32.EXE file. MS-DMT creates a default DMT.DAT file when one is missing or corrupt. All user selected settings as well as the current GUI size and screen location of the application are retained for use each time program is terminated. The "EXIT" button is the proper way to terminate the application.

The GUI has two large windows that provide display of incoming and outgoing message text which will scroll when required. The top window (1) is largest when the Common panel is not active. It displays the startup information received messages when using the internal terminal. It also displays some status messages when the Data Port is enabled in support of external terminal use.

The bottom window (2) supports entering or pasting up to a 32kb ASCII text message for sending. There is a third single line transmit window at the bottom for up to a 1kb messages that are sent on the "Enter" key stroke intended for rapid peer-to-peer communications.

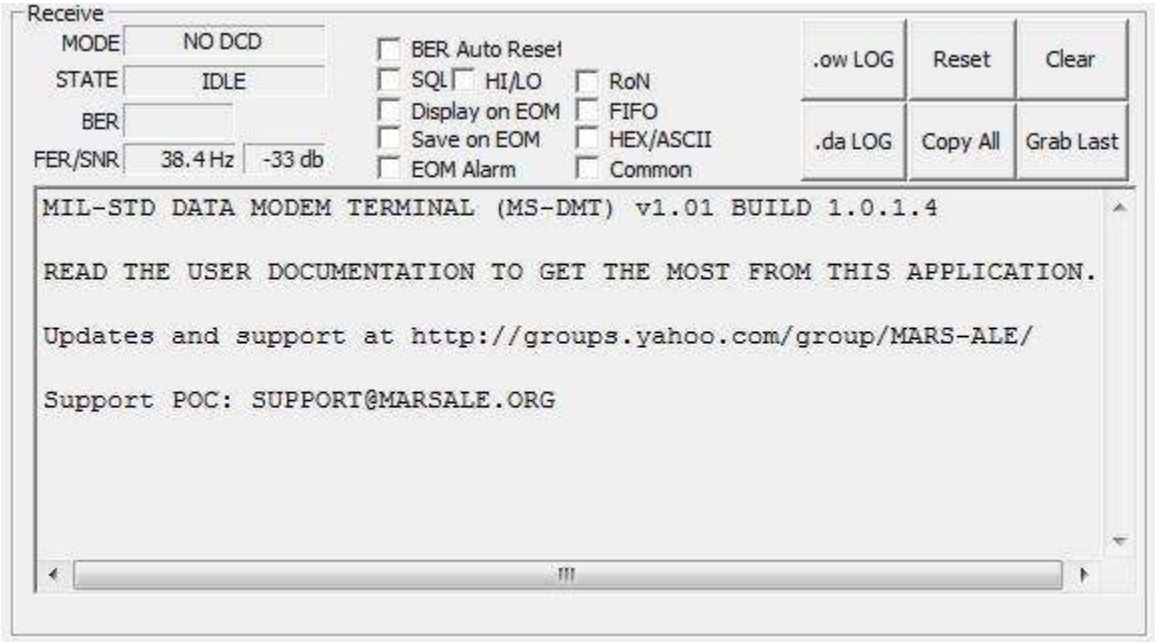
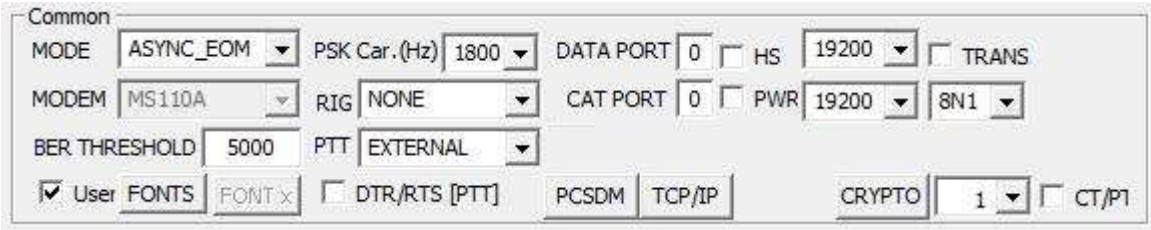


Figure 2.

COMMON PANEL

The main MS-DMT GUI depicted in Figure 1, provides a number of options on both the "Receive" and "Transmit" panels. However the Common panel provides access to all configuration parameters that a user is unlikely to change frequently, if at all after initial setup.

However some users may find the need to change some of the parameters often. As such, having them on the main GUI in the panel format with the Common check box as the selector addresses both classes of users. It has been found that having then up front speeds the process verses navigating conventional menu's to find the needed selection in the heat of two-way communications.



The PCSDM button opens the "PC Sound Device Setup" dialog as seen in Figure 2. The PC Sound Devices selected as the Input and Output sound devices are used as the PC Sound Device Modem. These selections almost never change once made.

NOTE: The system "Default Device" should NEVER be used as the PCSDM. Should it be used, system sounds MUST be disabled.

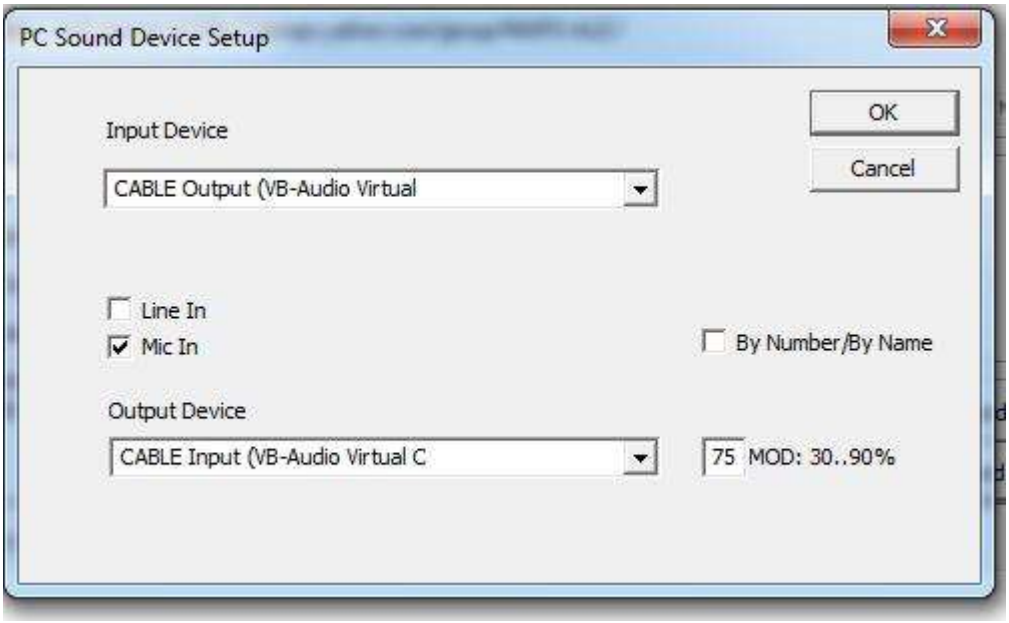


Figure 3.

On the "PC Sound Device Setup" dialog depicted in Figure 3 above provides a clean interface to 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. The selection of the device by "Name" is default, if after selection the device is not retained, then try doing so by "Number".

"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. Today most sound devices in use are USB port types where "Mic In" must be selected.

All levels are currently selected via the Windows sound panel for the device being used. Do NOT change the **MOD** value, it should remain at 75% unless all other means of adjusting the drive level for no ALC on TX fail. Please 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.

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. For each radio type coded, default values are provided. The user may change the value for each radio type selected. 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.

The 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 for hard code radios selections. The use of DMT-RADIO or DMT-RADIO_HS supports users creating custom radio control classes. The details of DMT-RADIO are found in Appendix N the “MS-DMT User Guide”.

If the given hard coded 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”.

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Receive Panel

There are no selections required receive data rate or interleave as MS110A provides for autobaud detection. The “MODE” window displays the current incoming data rate and interleave. It will read “NO DCD” and the “STATE” window will read “IDLE” while the modem is hunting for an MS110A signal.

All received messages using the internal terminal are displayed on the Receive panel. At this time they are printed to the incoming message window one character at a time. However should “**Display on EOM**” be checked, the message received will display at one time, when/if the End of Message (EOM) sequence is received properly. Failure of the EOM will result in no message being displayed. Successive messages received when “**Display on EOM**” is checked will clear the previous message received.

When “Save on EOM” is enabled, the current Zulu day’s incoming message log can be viewed by clicking the “.ow LOG” button.

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.

The “RoN” check box enables “Reset on Null” automatic modem receiver reset. It is only useful when dealing with pure ASCII content message receipt when using the internal terminal.

The “SQL” and “HI/LO” check boxes provide for Digital Squelch support where “SQL” not checked provides for the most receiver sensitivity and best performance on deep fades and multipath channels. The combination of “SQL” checked and “HI/LO” unchecked reduces receiver sensitivity and brings about 75bps automatic reset should false detection at 75bps occur, DCD or EOM be lost. The combination of “SQL” checked and “HL/LO” checked further reduces receiver sensitivity another notch.

The “Auto BER Reset” when checked, coupled with the value of “BER THRESHOLD” on the common panel will reset the modem receiver when the current incoming transmission exceeds the value set as read on the BER display window. This is useful when using the tool in unattended guard channel application and “RoN” is not checked. The “BER THRESHOLD” setting should be set a bit higher than expected worst case current channel conditions will provide. If the goal is just to achieve a fast modem reset on loss of DCD or EOM then set BER THRESHOLD to 100.

The “FIFO” checkbox, “First In, First Out”, when checked and when "Display on EOM" is not checked, causes the latest message received to be inserted at the top of the message display buffer character by character during decoding. When “FIFO” is not checked, each message will be appended to the message buffer for display.

The “Copy All” button with send the entire contents of the received message buffer to the clipboard.

The “Grab Last” button will send the last message received to the clipboard.

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

Transmit Panel

The transmit data rate and interleave settings and the Send and Clear buttons are the most used items on this panel by most users.

The "Send HL" button is the next most used button. It supports high lighting a portion of the message desired to send as a fill.

The "**Inc**" and "**Dec**" buttons change the data rate and the "**Int**" button changes the interleave selection.

A number of objects on this and other panels are disabled during the duration of data transmission.

Refer to the "MS-DMT User Guide" for details on all of the items in the Transmit panel.

MS-DMT AND COMMUNICATIONS

When receiving a message, as configured by default at install, MS-DMT uses its internal terminal where MS110A EOM detection is required to reset the modem receiver. This supports the display and logging of ASCII messages as well as passing the full extended ASCII character set to include Null (0x00h) bytes.

NOTE: This is the required configuration for support by the internal terminal for crypto operation when enabled. At present crypto support is currently under development.

When "Display on EOM" and "Save on EOM" are checked, all incoming messages will be displayed on the incoming message window only upon receipt of the EOM and will be automatically saved for later review. Each additional new message received will clear the message window when displayed upon EOM.

When "Save on EOM" is checked, the incoming 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 or else an error message will display on each attempt to save a received message.

When transmitting a message, the main operation is that of placing the message to be sent in the outgoing message window. Then the Send button must be clicked. Portions of the message in the outgoing message window may be highlighted and then just that highlighted portion sent by use of the "Send HL" button. Additionally messages may be loaded from files for review and editing or sent directly from files using the "Send File" button to navigate and select one or more files of interest.

The "Save on Send" and the two time stamp options, "Insert TODz" and "Add TODz" can be enabled. The current time will be inserted ahead and at the end of the message and the message being sent will be saved if all three are user enabled.

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.

MESSAGING

The program is easy to configure for basic use in sending and receiving messages via the internal terminal. To send a message just select the mode, data rate and interleave parameters and type or paste your message. Optionally the use of "Send File" or the Drag & Drop files method onto the outgoing message window can be used to send the contents of a file.

Message reception could not be simpler when using MS110A with it being Auto Detect as no selection of parameters are required to receive any combination of transmit parameters.