

Installing and using the TUD MVT Ultrasonic attenuation analyzer software

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This document tries to explain the requirements and methods of installation for the TUD MVT US analyzer. This program was designed to work with the ultrasonic attenuation spectrometer DT 1200 manufactured by Dispersion Technologies, Inc, and tries to extract the particle size information from measured ultrasonic attenuation spectra. The following descriptions are aimed at users who would like to install the TUD MVT analyzer in addition to the DT software on their DT 1200 device.

1. Introduction

The following description tries to detail the installation of the US analyzer software in its various stages. The installation process may seem tedious and unnecessarily long, but keep in mind that the software was developed in an academic setting, and mainly intended for use by our own laboratory staff. Only after realizing the potential benefit to others by making the software available a distribution was considered. We do not have the time and the resource to create a full-blown standalone application, but we would like to share our findings anyway.

Thus, a number of components, all of them available at no cost and most of them as Free software, were chosen as the basis of development. Consequently, the analyzer can rely on the features of other packages, making life of the developer easier, but requiring the separate installation of these packages.

2. Prerequisites

The US analyzer was written in the programming language Perl (<http://www.perl.org>), and relies on its interpreter and a number of extensions (modules) of Perl to function properly. Consequently, the requirements for installing the analyzer are

- Perl (e.g. ActiveState Perl 5.6.x)
- wxWidgets (version 2.4.1)
- wxPerl (at least version 0.18)
- the PDL modules (version 2.3.4)
- gnuplot (at least version 4.0)

- unicows (Microsoft Layer for Unicode on Windows 95, available at Microsoft (<http://www.microsoft.com/downloads/details.aspx?FamilyId=73BA7BD7-ed06-4F0D-80A4-2A7EEAEE17E2>))
- Microsoft Installer 2.0
- Internet Explorer 5.5
- Microsoft DCOM
- Microsoft MDAC

The following is written under the assumption, that you try to install the software on the original operating system that the DT 1200 was equipped with, which is Windows 95. Only this system needs all of the above components. If the target system is newer than Windows 95, there is no need to install the components Unicows, Microsoft Windows Installer, Internet Explorer 5.5, Microsoft DCOM and Microsoft MDAC, since these components or newer versions are already on your system.

3. Installing Perl

The following is a description of how the Perl interpreter should be installed on a computer such as the one provided with the DT1200 ultrasonic analyzer.

First, install the following freely downloadable Windows extensions and updates which are required by the Perl installation on Windows 95.

- Microsoft Internet Explorer 5.5, e.g. from http://browsers.evolt.org/download.php?ie/32bit/5.5_SP2/ie55sp2.exe (84.1 MB)
- Microsoft Installer 2.0, from <http://downloads.activestate.com/contrib/Microsoft/MSI2.0/9x/InstMsiA.exe> for Windows 9x (1670 KB)
- Microsoft DCOM for Windows 95, from http://www.microsoft.com/com/dcom/dcom95/dcom1_3.asp

Install these extensions by running each of the installation executables. Reboot the computer when asked to do so.

After finishing the installation of Windows extensions, your computer should be ready for the installation of Perl.

Perl itself is available from ActiveState, a free downloadable Windows installer (MSI file) is available at <http://www.activestate.com/Products/Download/Download.plex?id=ActivePerl> (Click on “Next” to proceed to the download page). The analyzer needs version 5.6.x of ActivePerl. Install Perl by opening the downloaded MSI file in an Windows Explorer window. Perl will ask about the installation details. Use the default settings for an installation suitable for the analyzer.

4. Installing WxWidgets

WxWidgets is the toolset responsible for the user interface of the TUD MVT US analyzer. It is freely redistributable and available as source code distribution.

This in turn requires the compilation of the source to get a fully working WxWidgets installation. If you don't have a C compiler at your disposal, get a recent version of OpenWatcom C/C++ (e. g. <http://openwatcom.mirrors.pair.com/watcom/open-watcom-win32-1.2.exe>). Run the executable, which will guide you through the setup of this compiler. Again, the default settings should be sufficient for the compilation of WxWidgets. After the installation finishes, reboot the computer.

Next, download the WxWidgets source code zip file. Go to the download web site http://www.wxwidgets.org/dl_msw2.htm#stable and select the file called wxMSW-2.4.x.zip. Unpack it into a directory, preferably named C:\Wx, but any other name (not containing any spaces) will suffice, too. (Its also possible to use the file wxMSW-2.4.x-setup.exe, which extracts a setup program. If you chose this path, extract the zip file into a directory like C:\Wx_installer, run this installer and select C:\Wx as destination folder for wxWidgets.)

Before compiling the unpacked wxWidgets source code, two Windows environment variable need to be set. Open the file C:\autoexec.bat and enter the following line:

```
SET WATCOM=C:\WATCOM
```

at the end of the file. (If you installed OpenWatcom in a different directory than C:\WATCOM, choose the appropriate substitute in the line above).

Also in c:\autoexec.bat, enter the following

```
SET WXWIN=C:\Wx
```

Again, if you specified another directory during the unpacking of wxWidgets , exchange C:\Wx with what you picked.

Reboot the machine to allow the changes to take effect. After the reboot, compilation can be started. Do this by opening an MS-DOS command Window, and change into the directory where you installed WxWidgets.

Next, while still in the command window, type

```
cd wx\src\msw  
or cd src\msw
```

and to finally kick off the compilation, type

```
wmake -f makefile.wat
```

This should build wxWidgets, but does take some time.

5. Installing wxPerl

wxPerl is the interface from Perl to the wxWidgets library. It translates Perl calls to the corresponding functions in the compiled library. wxPerl is available from its website, via <http://wxperl.sourceforge.net/download.html>. Pick the version the fits your installed Perl version ("for ActivePerl 6xx" for Perl 5.6.x). Unzip the downloaded file in C:\temp. Open a DOS Command Window and type

```
C:
```

```
cd C:\Temp
ppm install --location=. Wx-0.19
```

The number in the String Wx-0.19 is the version of wxPerl, and must match the one of the downloaded file. Pick the appropriate number, if your version is newer than 0.19.

6. Installing PDL

The Perl Data Language, or short PDL is the one module responsible for carrying out the matrix operations the analyzer relies on. It is available for download from the PDL web site. Go to http://pdl.perl.org/download/index_en.html and pick the “PDL for Windows” version. In the following screen, locate the file called “PDL-2.3.1-win32-badvals.zip. Unpack the downloaded zip file into C:\Temp. Open a DOS Command Window and type

```
C:
cd C:\Temp
ppm install --location=. PDL
```

When the last command finishes, the installation of all prerequisites for the US analyzer should be complete.

7. Installing the US analyzer

Unpack the zip file TUD_MVT_Analyzer.zip in a directory of your choice, preferably C:\Program Files\TUD_MVT_Analyzer. There is no installation program, unpacking the software is currently the only installation method. Consequently, deleting the unpacked directory is all there is to do to remove the software from your system.

To start the software, run the perl script inverter.pl from the directory. Using the windows explorer, you can create a shortcut to the file inverter.pl to make running the software a little bit more convenient.

If you plan to make modifications to the software, you need to edit the perl files.

Recently, the analyzer was packed into a standalone binary exe file, which does not require the installation of the full perl library. You can use this exe file if you prefer to run a standalone version. If you have made modifications, you might want to pack your modifications into your own exe file. Details on how to do that are listed below.

8. Installing Gnuplot

For the graphical output, the MVT US Analyzing software relies on the open source program “Gnuplot”. The installation of gnuplot is not included in the zip file. The calculation does not require this tool, but if you want to view the result in a graphical form, it is advised that you install Gnuplot.

First create a subdirectory called gnuplot in the path where you installed the analyzer (default: create C:\Program Files\TUD_MVT_Analyzer\gnuplot)

Download a current release at <http://www.gnuplot.info/download.html> as a zip file. Make sure you use at least version 4.0. Unpack the zip file to a directory, e.g. C:\gnuplot, go to the directory C:\gnuplot\bin and copy the file pgnuplot.exe into the gnuplot directory in the tree where you installed the MVT US analyzer (default: C:\Program Files\TUD_MVT_Analyzer\gnuplot).

9. Installing PP

It is not necessary to install the Perl Packager (short PP), but this component is required if you want to create standalone executables of the perl script, a form of the software which can be redistributed. This offers the advantage that the target machine does not need a full install of Perl. PP is available from CPAN, the Comprehensive Perl Archive Network, which is a large online collection of perl modules. Download the current version from <http://search.cpan.org/dist/PAR/> to C:\Temp. Unpack the resulting archive in C:\Temp and then use a DOS Command Window to install the package:

```
C:
cd C:\Temp\PAR-0.92\
perl Makefile.PL
make
make install
```

10. Compiling the Perl scripts

It is possible to create a standalone executable of the analyzer software from the perl scripts, e.g. for deploying the software on another machine.

Creating a standalone executable of the software requires the execution of the Perl Packager (PP). This is one simple call of pp, but the call requires the location of some libraries. These have to be supplied as command line options. You can use the Windows batch file pp_build.bat supplied with the analyzer, which includes these options. The script creates a file called inverter.exe, which is a standalone executable that can be distributed to other computers.

The provided batch file pp_build.bat looks like this:

```
pp -o inverter.exe -M Wx::DND -M Wx::DocView -M Wx::FS -M Wx::Help -M Wx::HTML
-M Wx::Grid -M Wx::MDI -M Wx::Print -M Wx::Socket -M Wx::Calendar
-M PDL::Graphics2D -M PDL::Lvalue
-l C:\Perl\site\lib\auto\Wx\wxbase26u_gcc_custom.dll
-l C:\Perl\site\lib\auto\Wx\mingwm10.dll
-l C:\Perl\site\lib\auto\Wx\wxmsw26u_adv_gcc_custom.dll
-l C:\Perl\site\lib\auto\Wx\wxmsw26u_core_gcc_custom.dll
-l C:\Perl\site\lib\auto\Wx\wxmsw26u_html_gcc_custom.dll
-l C:\Perl\site\lib\auto\Wx\wxbase26u_net_gcc_custom.dll
-l C:\Perl\site\lib\auto\pdl\complex\complex.dll
-l C:\Perl\site\lib\auto\pdl\core\core.dll
-l C:\Perl\site\lib\auto\pdl\io\io.dll
-l C:\Perl\site\lib\auto\pdl\math\math.dll
-l C:\Perl\site\lib\auto\pdl\matrixops\matrixops.dll
-l C:\Perl\site\lib\auto\pdl\ops\ops.dll
```

```
-l C:\Perl\site\lib\auto\pdl\primitive\primitive.dll
-l C:\Perl\site\lib\auto\pdl\slices\slices.dll -l C:\Perl\lib\auto\B\B.dll
inverter.pl
```

If the execution of pp_build.bat fails, it is probably due to library locations being different than listed in the batch file. If this is the case, track down which library is missing and change or add -l options (paths to the dlls) in the script. This may happen if you make modifications to the Perl code, e.g. by using other Perl libraries.

11. Installing the Microsoft Unicode Layer

This component is only needed if you attempt to run a software version built with PP (see section Section 10) built with unicode support. On some computers, the Microsoft Unicode Layer is missing (e.g. Windows 95 systems). Download the Layer from Microsoft at <http://www.microsoft.com/downloads/details.aspx?FamilyId=73BA7BD7-ed06-4F0D-80A4-2A7EEAEE17E2>. Run the downloaded exe file and specify a directory where windows will find DLL files (preferably C:\Windows\system) when asked to select a directory for unpacking

12. Database access

The MVT analyzer can access data stored in the database created by the DT1200 during measurement campaigns. Based on the date and time of the measurement, the record set can be read selected. The analyzer then copies the attenuation data to the software input fields and thus allows for the calculation of size distributions from already present data. This is a convenient method, because it is not necessary for the user to export data from the measurement software.

To access the database of the DT 1200, a system library for the interaction with databes files needs to be installed. For Windows 95, such a library called MDAC must be downloaded, for other Windows versions, MDAC may already be part of your system. In any case, you need to install the library only if the database access performed by the analyzer does not work. An indication that MDAC is missing is the error message that the analyzer cannot access the database.

If you need MDAC, fetch the relevant installer from the Microsoft Webseite <http://www.microsoft.com/downloads/details.aspx?FamilyID=9f081fca-39c4-4fb8-927e-58efa127d3a7&DisplayLang=de>. Version 2.1 works well with Windows 95. Run the downloaded file, which may be called something along the lines of mdac_tpxger1.exe. Running this file will spawn the installer form MDAC. Follow the guidelines on the installation screens.

The DT 1200 database is usually stored in the directory C:\data_aco\. The analyzer looks for the database in that directory by default. It is also possible to specify a different database from the menu of the installer.