User’s Manual

Model 707713
WVF File Access Toolkit for MATLAB
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Foreword

Thank you for purchasing the WVF File Access Toolkit for MATLAB (Model 707713). This user's manual describes the installation procedure, the program model, and the functions of the WVF File Access Toolkit for MATLAB. Read this manual along with the Model 707712 WVF File Access API User’s Manual (IM 707712-61E), and the Model 707741 WE Control API User’s Manual (IM 707741-61E).

After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.

Notes

• The contents of this manual describe the WVF File Access Toolkit for MATLAB Ver. 1.01. If you are using another version of the WVF File Access Toolkit for MATLAB, the information given in this manual may differ from the version that you are using.
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Revisions

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How to Read This Manual

This manual covers only the settings that are specific to the software and functions for MATLAB. The manual has been prepared with the premise that it be read along with the Model 707712 WVF File Access API User’s Manual (IM 707712-61E), and the Model 707741 WE Control API User’s Manual (IM 707741-61E).

For details on the settings of functions and settings of ASCII commands, see the Model 707712 WVF File Access API User’s Manual (IM 707712-61E), and the WE Control API User’s Manual (IM 707761-61E).
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1. Overview

This user's manual describes the interface functions (WVF File Access Toolkit for MATLAB) used to access the waveform data files (WVF files). The WVF File Access Toolkit for MATLAB is used to access from MATLAB the waveform data file (.wvf extension) measured using the WE7000, DL Series Oscilloscopes, and other instruments. Using this toolkit allows you to read/write measured data and header information on MATLAB by The MathWorks, Inc. without being conscious of the internal structure of the file. It also allows you to perform advanced data analysis using the extensive computation, analysis, and display functions provided by MATLAB.

There is a one-to-one relationship between the mex functions of the WVF File Access Toolkit for MATLAB and the functions of the WVF File Access API.

Supported OSs
Microsoft Windows 95/98/Me, Windows NT 4.0, Windows 2000 Pro or Windows XP Professional/Home Edition

Supported Development Platforms
The MathWorks, Inc. MATLAB 6.1 (R12.1) or 6.5 (R13)

Note
The WVF File Access API (707712) or the WE Control API (707741) sold separately is required for using this software.

Applicable Models
WE7000
DL708, DL708E, DL716, and DL750
DL1720 and DL1740
DL1600 Series
DL1500 Series
DL7100 and DL7200
DL7400 Series

Installed Files
When you install the WVF File Access Toolkit for MATLAB, the directory \YOKOGAWA\WE7000 is created under the directory where MATLAB is saved (the default directory for MATLAB 6.5 is C:\MATLAB6p5\toolbox), and the following files are copied to the directory.
IM707713-61J.pdf User’s manual
*.dll mex functions for WVF File Access
*.m Sample programs
WVFreadme*.txt Description of the sample programs

Note
If MATLAB is installed to a directory other than the default directory, change the directory in which the toolkit is installed accordingly.
2. Installation

This chapter explains the procedure for installing the WVF File Access Toolkit for MATLAB. WVF File Access API (Model 707712) or WE Control API (Model 707741) must be installed before you install the WVF File Access Toolkit for MATLAB.

1. Start Windows.

Note
When installing the toolkit on Windows NT 4.0, Windows 2000 Pro, or Windows XP, log onto Windows using the user name “Administrator” or a user name with administrator privileges and then install the toolkit.

2. Insert the “WVF File Access toolkit for MATLAB” setup disk into the CD-ROM drive. An installer automatically starts and the following dialog box opens. If the program does not start automatically, choose Start > Run, then specify setup.exe in the disk1 directory of CD-ROM to Name and click OK. The following dialog box appears. Click Next.

3. The following dialog box appears containing license agreement information. Confirm the license agreement, click the I accept the terms in the license agreement option button, and click Next.
4. The following dialog box appears for registering the name and the organization of the user. After entering the appropriate information into each box, click Next.

5. A dialog box appears for you to confirm the start of the installation. To proceed with the default installation (Complete), click Next. To select which components to install, or to change the installation destination, choose the Custom option then click Next.

6. A dialog box appears confirming that you wish to begin installation. Click Install.
7. The installation starts and a dialog box appears indicating the progress of the installation. A dialog box appears notifying you that the installation has been completed. Click **Finish**.

![InstallShield Wizard Completed](image)

**Note**

If you installed MATLAB to a directory other than the default directory, change the installation directory of the WVF File Access Toolkit for MATLAB.

**Installed Files**
The installed files are in `toolbox\YOKOGAWA\WE7000` in the directory of MATLAB.

- **IM707713-61E** User’s Manual
- ***.dll** Mex function for WVF file access
- ***.m** Sample Program
- **WVFreadme*.txt** Information about the sample programs
3. Executing the WVF File Access Toolkit for MATLAB

On the WVF File Access Toolkit for MATLAB, programming is done interactively, which is a feature of MATLAB. Below is an example of function usage on the MATLAB command window and M-files.

MATLAB Screen

Execution Example on the Command Window

```matlab
>> filename = 'wvf1'
filename =
  wvf1
>> [ret, ComInfo, ChInfo] = mexWeDPHeaderReadS(filename, 0, 4)
ret =
  0
ComInfo =

  Comment: '
  SamplingNum: 1000
  ChanelNum: 4
  SamplingInterval: 0.0010
  PreTrigger: 0
  XUnit: 's'
  Date: '2003/05/23'
  Time: '13:17:12'

ChInfo =

  1x4 struct array with fields:
  ChanelName
  ScaleA
  ScaleB
  Unit

>> [ret, data] = mexWeDPDataRead(filename, 0, -1, 50, 1000*4);
>> filename = 'wvf1_2'
```
filename = wvf1_2
>> [ret, AcqInfo] = mexWeDPInitializeAcqInfo(2, -2, 1000, 0.001, 4)
ret = 0

AcqInfo =

1x4 struct array with fields:
  channel
dataType
  blockNum
  startBit
effectiveBit
  trigActive
  record
  recordLen
  trigPosition
time
  interval
  vResolution
  vOffset
  trigLevel
  trigWidth
  plusOverData
  minusOverData
  nonData
dispMaxData
dispMinData

>> ret = mexWeDPHeaderWriteS(filename, 0, ComInfo, 4, ChInfo, AcqInfo)
ret = 0
>> ret = mexWeDPDataWrite(filename, 0, 1000, 4, AcqInfo, 50, data)
ret = 0

M-file Example
sourceFilename = 'wvf1';
destinationFilename = 'wvf1_dup';
blockNo = 0;
ch = -1; % All channel
dataForm = 50; % WE_DOUBLE
maxData = -Inf;
minData = Inf;

[ret, SampleNum, ChNum] = mexWeDPGetSampleChNum(sourceFilename, blockNo)
SampleNum = double(SampleNum);
ChNum = double(ChNum);
% Read the header file
[ret, ComInfo, ChInfo] = mexWeDPHeaderReadS(sourceFilename, blockNo, ChNum)
samplingInterval = ComInfo.SamplingInterval
% read the data file
[ret, data] = mexWeDPDataRead(sourceFilename, blockNo, ch, dataForm, SampleNum * ChNum);
for ch=1 : ChNum
[ret, value] = mexWeDPHeaderItemRead(sourceFilename, 'VResolution', ch, blockNo)
VRes = str2num(value)
[ret, value] = mexWeDPHeaderItemRead(sourceFilename, 'VOffset', ch, blockNo)
VOfs = str2num(value)
for i=(ch-1)*SampleNum+1 : ch*SampleNum
    data(i) = data(i) * VRes + VOfs;    % Convert to the voltage values from the file values.
end
[ret, value] = mexWeDPHeaderItemRead(sourceFilename, 'VMaxData', ch, blockNo)
work = str2num(value) * VRes + VOfs;
if maxData < work
    maxData = work
end
[ret, value] = mexWeDPHeaderItemRead(sourceFilename, 'VMinData', ch, blockNo)
work = str2num(value) * VRes + VOfs;
if minData > work
    minData = work
end
end
plot(data(1:SampleNum))     % Display on graph
[ret, AcqInfo] = mexWeDPInitializeAcqInfo(maxData, minData, SampleNum, samplingInterval, ChNum)
AcqInfo(1)
% Write the header file
ret = mexWeDPHeaderWriteS(destinationFilename, blockNo, ComInfo, ChNum, ChInfo, AcqInfo)
for ch=1 : ChNum
    [ret, VUnit] = mexWeDPHeaderItemRead(sourceFilename, 'VUnit', ch, blockNo)
    ret = mexWeDPHeaderItemWrite(destinationFilename, 'VUnit', ch, blockNo, VUnit)
end
% Write the data file
ret = mexWeDPDataWrite(destinationFilename, blockNo, SampleNum, ChNum, AcqInfo, dataForm, data)
4. File Operation Functions

The function names obtained by removing “mex” from the mex function names correspond to the WVF File Access API functions.


4.1 The List of Functions

Single File Access

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Access the Specified Item of the Header File

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</table>
4.2 Single File Access

mexWeDPHeaderReadS

Description
Reads the data from the header file by specifying the block number.

Syntax
\[
[\text{ret}, \text{ComInfo}, \text{ChInfo}] = \text{mexWeDPHeaderReadS}(\text{filename}, \text{blockNo}, \text{ChNum})
\]

Output Parameters
- ret: Returns 0 if successful. Returns an error code if unsuccessful.
- ComInfo: Structure of the read information (ComInfo)
- ChInfo: Structure of the read information (ChInfo)

Input Parameters
- filename: Name of the file to be read without the extension
- blockNo: Number of block to be read (0 origin)
- ChNum: Number of channels to be read (number of ChInfo structures)

mexWeDPDataRead

Description
Reads the data from the data file by specifying the block number.

Syntax
\[
[\text{ret}, \text{data}] = \text{mexWeDPDataRead}(\text{filename}, \text{blockNo}, \text{ch}, \text{dataForm}, \text{dataNum})
\]

Output Parameters
- ret: Returns 0 if successful. Returns an error code if unsuccessful.
- data: Read data

Input Parameters
- filename: Name of the file to be read without the extension
- blockNo: Number of the block to be read
- ch: Number of the channel to be read
- dataForm: Type of data to be read
  - 1 = WE_UBYTE
  - 17 = WE_SWORD
  - 33 = WE_SLONG
  - 34 = WE_FLOAT
  - 50 = WE_DOUBLE
- dataNum: Number of data points to be read

Note
The parameter dataNum does not exist in the WVF File Access API or the WE Control API function, but is required in the mex function.
mexWeDPHeaderWriteS

Description
Writes the header information at once to the header file by specifying the block.

Syntax
ret = mexWeDPHeaderWriteS(filename, blockNo, ComInfo, ChNum, ChInfo, AcqInfo)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.

Input Parameters
filename: Name of the file to be written without the extension
blockNo: Block number to be written (0 origin)
ComInfo: Structure of the written information (ComInfo)
ChNum: Number of channels to be written (number of ChInfo structures)
ChInfo: Structure of the written information (ChInfo)
AcqInfo: Data information structure to be written

mexWeDPDataWrite

Description
Writes the data to the data file in units of blocks.

Syntax
ret = mexWeDPDataWrite(filename, blockNo, sampleNum, ChNum, AcqInfo, dataForm, data)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.

Input Parameters
filename: Name of the file to be written without the extension
blockNo: Number of the block to be written
sampleNum: Number of samples to be written
ChNum: Number of channels to be written
AcqInfo: Data information structure to be written
dataForm: Type of data to be written
   1=WE_UBYTE
   17=WE_SWORD
   33=WE_SLONG
   34=WE_FLOAT
   50=WE_DOUBLE
data: Data to be written
4.3 Sequential File Access

mexWeDPHeaderCsReadS

**Description**
Collectively reads the header information from a header file.

**Syntax**
```
[ret, ComInfo, ChInfo] = mexWeDPHeaderCsReadS(filename, seriesNo, ChNum)
```

**Output Parameters**
- ret: Returns 0 if successful. Returns an error code if unsuccessful.
- ComInfo: Structure of the read information (ComInfo)
- ChInfo: Structure of the read information (ChInfo)

**Input Parameters**
- filename: Name of the file to be read without the extension
- seriesNo: First sequence number of the file to be read
- ChNum: Number of channels to be read (number of ChInfo structures)

mexWeDPCsRead

**Description**
Reads the data from the data files (sequential files) by specifying the number of samples.

**Syntax**
```
[ret, data] = mexWeDPCsRead(filename, seriesNo, start, length, ch, dataForm, dataNum)
```

**Output Parameters**
- ret: Returns 0 if successful. Returns an error code if unsuccessful.
- data: Read data

**Input Parameters**
- filename: Name of the file to be read without the extension
- seriesNo: First sequence number of the file to be read
- start: Start point of the data to be read
- length: Number of data points to be read
- ch: Number of the channel to be read
- dataForm: Type of data to be read
  - 1=WE_UBYTE
  - 17=WE_SWORD
  - 33=WE_SLONG
  - 34=WE_FLOAT
  - 50=WE_DOUBLE
- dataNum: Number of data points to be read

**Note**
The parameter dataNum does not exist in the WVF File Access API or the WE Control API function, but is required in the mex function.
mexWeDPHeaderCsWriteS

Description
Collectively writes the header information to the header file.

Syntax
ret = mexWeDPHeaderCsWriteS(filename, seriesNo, ComInfo, ChNum, ChInfo, AcqInfo)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.

Input Parameters
filename: Name of the file to be written without the extension
seriesNo: First sequence number of the file to be written
ComInfo: Structure of the written information (ComInfo)
ChNum: Number of channels to be written (number of ChInfo structures)
ChInfo: Structure of the written information (ChInfo)
AcqInfo: Data information structure to be written

mexWeDPCsWrite

Description
Write data to a sequence file.

Syntax
ret = mexWeDPCsWrite(filename, seriesNo, sampleNum, ChNum, AcqInfo, dataForm, data)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.

Input Parameters
filename: Name of the file to be written without the extension
blockNo: Number of the block to be written
sampleNum: Number of samples to be written
ChNum: Number of channels to be written
AcqInfo: Data information structure to be written
dataForm: Type of data to be written
1 = WE_UBYTE
17 = WE_SWORD
33 = WE_SLONG
34 = WE_FLOAT
50 = WE_DOUBLE
data: Data to be written
4.4 Access the Specified Item of the Header File

**mexWeDPHeaderItemRead**

**Description**
Reads the information of the specified item name and specified channel from the header information of the header file.

**Syntax**

\[
\text{[ret, data]} = \text{mexWeDPHeaderItemRead}(\text{filename}, \text{itemName}, \text{ch}, \text{blockNo})
\]

**Output Parameters**

- **ret**: Returns 0 if successful. Returns an error code if unsuccessful.
- **data**: Read data

**Input Parameters**

- **filename**: Name of the file to be read without the extension
- **itemName**: Name of the item to be read
- **ch**: Number of the channel to be read
- **blockNo**: Number of the block to be read

**mexWeDPHeaderItemWrite**

**Description**
Writes data to the specified item name and specified channel in the header information of the header file.

**Syntax**

\[
\text{ret} = \text{mexWeDPHeaderItemWrite}(\text{filename}, \text{itemName}, \text{ch}, \text{blockNo}, \text{data})
\]

**Output Parameters**

- **ret**: Returns 0 if successful. Returns an error code if unsuccessful.

**Input Parameters**

- **filename**: Name of the file to be written without the extension
- **itemName**: Name of the item to be written
- **ch**: Number of the channel to be written
- **blockNo**: Number of the block to be written
- **data**: Data to be written
4.5 Data Operation

mexWeDPGetSampleChNum

Description
Gets the number of samples and number of channels of the specified file.

Syntax
[ret, SampleNum, ChNum] = mexWeDPGetSampleChNum(filename, blockNo)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.
SampleNum: Number of data points read
ChNum: Number of channels read

Input Parameters
filename: Name of the file to be read without the extension
blockNo: Number of the block to be read

mexWeDPGetBlockNum

Description
Gets the number of blocks of the specified file.

Syntax
[ret, blockNum] = mexWeDPGetBlockNum(filename)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.
blobkNum: Number of block read

Input Parameters
filename: Name of the file to be read without the extension

mexWeDPInitializeAcqInfo

Description
Stores the required data in the data information structure.

Syntax
[ret, AcqInfo] = mexWeDPInitializeAcqInfo(VMaxData, VMinData, sampleNum, sampInterval, infoNum)

Output Parameters
ret: Returns 0 if successful. Returns an error code if unsuccessful.
AcqInfo: Data information structure

Input Parameters
VMaxData: Max data
VMinData: Min data
sampleNum: Number of data samples
sampInterval: Sampling frequency of the data
infoNum: Number of data information structures
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