# **Using ASCII-Stored Files**

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The ASCII waveform storage feature allows waveforms to be stored to a mass-memory device in any of three ASCII formats: Spreadsheet, Mathcad and MATLAB. Each format is tailored for a commonly used analysis package. The userinterface changes supporting ASCII waveform storage are found in the STORE menu (*see Chapter 13*).

The table below summarizes the three formats' basic layout. Examples of the use of each format are given on the following pages.

Format	Header Format includes some form of header before the data	Time Values Format stores time values with each amplitude value	Amplitude Values Format stores amplitude values	Sequence Times Header contains sequence time information for each sequence segment	Multi- Segment Format concatenates multiple segments of a sequence waveform	Dual Array Format allows dual-array data (i.e. Extrema, or complex FFT) to be stored
Spreadsheet	Yes	Yes	Yes	Yes	Yes	Yes
Mathcad	Yes	Yes	Yes	Yes	Yes	Yes
MATLAB	No	No	Yes	No	Yes	No

*Note:* Once stored in ASCII, waveforms cannot be recalled into the DSO.

# **Using the Spreadsheet Format with Excel**

This example was created using Microsoft Excel, Version 7.0 for Windows. A waveform stored in Spreadsheet format may be read into Microsoft Excel using the <u>File</u> -> <u>Open</u> dialog as follows:

😑 Open	?
Look in: 🔄 A:\lecroy_1.dir 💽 🗈 📧 📰 📰 📰 🎵	
D SC1003.TXT	<u>O</u> pen
	Cancel
	Advanced
	□ <u>R</u> ead Only
Find Glas that match these asitation	
File name: SC1003.txt <b>±</b> Text or property:	Find Now
Files of type: Text Files (*.prn; *.txt; *.csv) 🛨 Last modified: any time 重	Ne <u>w</u> Search
1 file(s) found.	

Excel will now ask for more information about the file type. Ensure that the 'Delimited' option is selected in the first step of the Wizard.

Text Import Wizard - Step 1 of 3	?					
The Text Wizard has determined that your data is Delimited. If this is correct, choose Next, or choose the Data Type that best describes your data.						
Criginal Data Type						
Choose the file type that best describes your data:						
Delimited     Characters such as commas or tabs separate each field (Excel 4.0 standard)     Fixed <u>Width</u> · Fields are aligned in columns with spaces between each field.						
Start Import at <u>R</u> ow: 1 🚔 File <u>O</u> rigin: Windows (ANSI) 🖭						
Preview of file A:\lecroy_1.dir\SC1003.txt.						
1 LECROY9354L,935400000 2 Segments,1,SegmentSize,25002 3 Segment,TrigTime,TimeSinceSegment1 4 #1,02-Apr-2030 11:33:50,0 5 Time,Ampl 6-5e-060.0296875						
4						
Cancel < Back Next > <u>F</u> inish						

The next step allows the specific delimiter to be specified. The Spreadsheet format generated by the scope uses a comma (,) to delimit columns. Ensure that this is selected.

😑 Text Import Wiz	ard - Step 2 of 3 ?						
This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.							
Delimiters	Treat consecutive delimiters as one						
☐ <u>Tab</u> ☐ Se <u>m</u> icolon ¥ <u>C</u> omma ☐ <u>S</u> pace ☐ <u>O</u> ther: ☐	Text <u>Q</u> ualifier:						
Data Preview							
LECROY9354L 935400000 Segments 1 Segment TrigTime #1 02-Apr-2030 11:33: Time Ampl -5e-06 -0.0296875	SegmentSize TimeSinceSegment1						
Cance	el <u>B</u> ack Next > <u>F</u> inish						

Ε	_	3
	-	J

The third and final step allows the format of the columns to be specified. The 'general' format for each column should be used (this is the default).

😑 Text Import Wizard	💳 Text Import Wizard - Step 3 of 3				
This screen lets you select each column and set the Data Format.	Column Data Format				
'General' converts numeric values to numbers, date values to dates, and all remaining values to text.	O <u>T</u> ext O <u>D</u> ate: DMY				
	O Do Not <u>I</u> mport Column	(Skip)			
Data Preview General General	General G	enera			
LECROY9354L         935400000           Segments         1           Segment         TrigTime           #1         02-Apr-2030         11:33:50           Time         Ampl           -5e-06         -0.0296875	SegmentSize 2! TimeSinceSegment1 0	5002			
		•			
Cancel	< Back Next >	Finish			

After clicking the  $\underline{F}$ inish button, a display similar to that following should be displayed.



-	Microsoft Excel -	SC1001.TXT		
-	<u>File Edit Viev</u>	w <u>I</u> nsert F <u>o</u>	rmat <u>T</u> ools <u>D</u> ata	
	A	В	С	D
1	LECROY9354L	935400000		
2	Segments	1	SegmentSize	502
3	Segment	TrigTime	TimeSinceSegment1	
4	#1	22.03.30 20:22	0	
5	Time	Ampl		
6	-5.01E-05	-0.00755		
7	-4.99E-05	-0.00755		
8	-4.97E-05	-0.00755		
9	-4.95E-05	-0 00755		
40	73E-05			

**Plotting a Single-**Plotting the data from a single-segment waveform requires the use of a scatter plot based on the data in the first two columns with the Segment Waveform first column used as the X values. **Extracting Segments** The header created for the Spreadsheet format contains all the information required to extract various elements of a sequence from Sequence waveform. The following Formulae may be used to extract Waveforms information such as the start and end row of the data for a given segment, or the trigger time of a given segment. SegmentStartRow := (DesiredSegment \* D2) + B2 + 5 SegmentEndRow := SegmentStartRow + D2 -1 TrigTime= INDIRECT(ADDRESS(DesiredSegment +3;2;4)) TimeSinceFirstTrig= INDIRECT(ADDRESS(DesiredSegment +3;3;4)) Plotting the data from all segments using a scatter plot will result in all segments overlaid (similar to the scope's display of sequence traces in persistence mode).

-	Microsoft	Excel - SC1003.TXT	and the second second										28
-	Eile Edi	t Yiew Insert Fr	prmat Iools	Data We	ndow <u>H</u> ei	lp					_		
	1 i i i i i i i i i i i i i i i i i i i	505 X 96	C OC I	1 24 24		1002	*	Q 1/2					
-	Over 2												
dist.	Δ,	0	c	0	E	F	6	11		1	K	1	1
1	LECROY9	93540000	0										
2	Segments	1	5 SegmentSize	102									
3	Segment	TagTime	TimeSinceSegme	e#1									_
4	#1	02-Apt-2030 12:18:25	Δ,			_		-					-
5	#2	02-Apr-2030 12:18:25	9.48E-05										
6	#3	02-Apt-2030 12:18:25	0.000189962										
1	44	02-Apt-2030 12 18 25	0.000264966		0.00								-1-1
8	#5	02-Apr-2030 12:18:25	0.000380004		0.00								11
-	1005.00	Anai 0.024426	-										
	-1.00E-06	-0.024125	2		0.2 +	100							
쁥	9.35E-07	-0.024125	2			1							11
12	7 94E-00	-0.02412	5		0.15	-							
11	6.94F-07	-0.02412	5			7 1							H
15	A 96E-07	-0.024125	5				2.						11
16	-4.95E-07	-0.0225625	5				6						
17	-3.95E-07	-0.01475	5		;		1						
18	-2.95E-07	0.00243751	1		0.05		1						
19	-1.95E-07	0.0243125	5						-				
20	-9.48E-08	0.044625	5				12		1	~	-	11	
21	5.16E-09	0.0618125	5	-2.000-00	2000-0	0 2	005-06	A COMPANY	and the second		ALC: NO	1.086-05	
22	1.05E-07	0.0805625	5				-	Concernity of			III STORES		
23	2.05E-07	0.0993125	5	-	-0.05 A								
24	3.05E-07	0.114938	8	-		-		•	-				-4
25	4.05E-07	0.125875	5										
26	5.05E-07	0.1362	5			_				1		-	_
1	TELEV SU	.1000/					+	-					•
De	ubla-ciick o	ther to edit						1					

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**E**–6

# **Using Mathcad**

These examples were created using MathSoft's Mathcad for Windows. On this and the next page, the procedure for reading and graphing a file for a single segment is shown, using Mathcad Versions 3.1 and 7, respectively. The example on page E-9 is for multiple segments.

Single-Segment, Version 3.1 This single-segment example illustrates the use of Mathcad Version 3.1:

a := READPRN( sc1004)	Read data from file sc1004.prn into matrix 'a'
$n := 2 \dots \left( 1 + a_{0,1} \right)$	Create ramp over all rows containing data
time := a <sup>&lt;0&gt;</sup>	Extract time vector
$amp1 := a^{\leq 1 >}$	Extract amplitude vector



**Single-Segment, Version 7** This single-segment example is valid for more recent versions of Mathcad:

### A := READPRN(file)

$$\mathbf{K} := \operatorname{last} \left( \mathbf{A}^{<0>} \right)$$

A := submatrix(A, 2, K, 0, 1)

$$t := A^{<0>}$$
  $v := A^{<1>}$   $K := last(t)$   $k := 0... K - 1$ 





#### **Multi-Segment Example**

The following Mathcadexample demonstrates how to extract data from a given segment. The data used for this example consisted of two segments of three samples each, allowing the entire imported matrix to be shown.

#### Read data from file

a := READPRN(sc1000)		2	3	
Extracting the first segment only (or only segment if not sequence trace)		1	0	
$\mathbf{n} := \left( 1 + \mathbf{a}_{\mathbf{n}} \right) \dots \left( \mathbf{a}_{\mathbf{n}} + \mathbf{a}_{\mathbf{n}} \right) \qquad \mathbf{n}$		2	999	
m := 01 3		1	1	
firsteed is a 4	a =	1.1	2	
$m_{0,0} = 1 - n_{0,0} + m_{n,m}$ 5		1.2	3	
/1 1)		1	1.1	
firstseg = 1.1 2		1.1	2.1	
$\begin{pmatrix} 1.2 & 3 \end{pmatrix}$		1.2	3.1	

#### Extracting a given segment

y := a<sup><1></sup>

i := segstart.. segend

numsegments := a <sub>0,0</sub>	Total number of segments in trace				
seglen := a <sub>0,1</sub>	Number of samples in each segment				
segment := 0 Desired segment		umber			
segstart := 1 + numsegments + segment seglen segend := segstart + seglen - 1		Index of first point in segment Index of last point in segment			
segtime := a <sub>segment + 1,1</sub>		Segment trigger time			
x := a <sup>&lt;0&gt;</sup>					



# **Using MATLAB**

This example was created using MathWorks' MATLAB Version 4.2c.1 for Windows.

Reading and graphing a waveform in MATLABmay be achieved with two simple commands, as the following example shows. The first command loads the file into a matrix which is automatically named after the file. The second command plots this matrix.

🗖 MATLAB Command Window 🔽	
<u>F</u> ile <u>E</u> dit <u>O</u> ptions <u>W</u> indows <u>H</u> elp	
Commands to get started: intro, demo, help help Commands for more information: help, whatsnew, info, subscribe	+
» load a:\lecroy_1.dir\sc1000.dat » plot(sc1000) »	•
•	





## **Detailed Description of the Formats**

#### Spreadsheet

#### Format

**Note:** Fields in bold type are constants that are present in the output file as shown. Fields in italic are variables that are filled in when the file is written.

<scopeid>, Segments,</scopeid>	<scopeserial> <numseg>,</numseg></scopeserial>	SegmentSize,
Segment, TimeSinceFirs	TrigTime, tSegment	
#1,	<trigtime(1)>,</trigtime(1)>	0.0
 # <numseg>, <trigdelta(nums Time, x(0), x(1),</trigdelta(nums </numseg>	 <trigtime(<i>numse <i>eg</i>)&gt; <b>Ampl,</b> <i>y</i>(0), <i>y</i>(1),</trigtime(<i>	eg)>, <b>[Ampl1]</b> [y1(0)] [y2(0)]
 x(numgseg*numpts), [y1(numseg*numpts)]	y(numseg*num)	ots),

#### Single-Segment Example

```
LECROY9354,935412345
Segments,1,SegmentSize,502
Segment,Trig Time,TimeSinceFirstSegment
#1,21 Mar 1990 9:37:08,0.0
Time,Ampl
0.0,1
0.1,2
...
```



#### Multi-Segment Example

LECROY9354,935412345 Segments,3,SegmentSize,502 Segment,Trig Time,TimeSinceFirstSegment #1,21 Mar 1990 9:37:08,0.0 #2,21 Mar 1990 9:37:13,5.0 #3,21 Mar 1990 9:37:15,7.0 Time,Ampl 0.0,1 0.1,2 ... 0.0,1.1 0.0,2.1 ... 0.0,1.05 0.0,2.05

#### **Dual-Array Example**

```
LECROY9354,935412345
Segments,1,SegmentSize,502
Segment,Trig Time,TimeSinceFirstSegment
#1,21 Mar 1990 9:37:08,0.0
Time,Ampl
0.0,1.1,1.1
0.1,2.1,2.1
...
```

#### Note:

- The basic structure of the Spreadsheet format is a header containing scope identification information, followed by a block containing trigger times for multisegment waveforms, followed by the data itself.
- This format is compatible with the ASCII import of the LeCroy LW4xx Arbitrary Function Generator.



#### Mathcad

### Format

<"scopeid">		
<"TriggerTime">		
<numseg></numseg>	<numpts></numpts>	
Segment	TimeSinceFirstSegment	
1	0.0	
 <numseas< td=""><td> <triadelta(<i>numsea)&gt;</triadelta(<i></td><td></td></numseas<>	 <triadelta(<i>numsea)&gt;</triadelta(<i>	
Time	Ampl	Ampl1
<x(0)></x(0)>	<y(0)></y(0)>	[ <y1(0)>]</y1(0)>
<x(1)></x(1)>	<y(1)></y(1)>	[ <y1(1)>]</y1(1)>
 <v(numasea*numnts)></v(numasea*numnts)>	 <v(numsea*numnts)></v(numsea*numnts)>	

<x(numgseg\*numpts)> <y(numseg\*numpts)> [<y1(numseg\*numpts)>]

### Single-Segment Example

"LECROY9354,93	35412345″	
"23-March-90,12:44:23"		
1	502	
Segment	TimeSinceFirstSegment	
1	0.0	
Time	Ampl	
0.0	1	
0.1	2	

### **Multi-Segment Example**

"LECROY9354,935412345"		
"23-March-90,12:44:23"		
3	502	
Segment	TimeSinceFirstSegment	
1	0.0	
2	5.0	
3	7.0	
Time	Ampl	
0.0	1	
0.1	2	
0.0	1.1	
0.1	2.1	
0.0	1.05	
0.1	2.05	

#### Note:

- The format created for MathCad is very similar to the Spreadsheet format, but with some differences due to the way MathCad interprets the header information.
- One of the most important of these is that the absolute trigger time is only given for the first segment, with relative times (in units of seconds) being included for each segment.
- Another difference is that the scope identification and trigger time are wrapped in quotes to ensure that MathCad does not attempt to import them.



### **MATLAB** Files

### Format *y(0)*

y(1) ... y(numseg\*numpts)

#### Single Segment Example

- 1.0
- 1.1 1.2
- ....
- 4.5

#### Notes

- > The MATLAB format is simple, without header information and having amplitude values only.
- > Multiple segments will be appended without a separator.
- Only one value from the pair of amplitude values present in a dual-array will be stored.