WFT

The Nicolet WFT format is a compact 16-bit binary file format containing an ASCII header to retain scale factors, channel titles, time/date, etc. It is used by all Nicolet digital oscilloscopes and is supported by a variety of software. Each channel is stored in a separate file of 2-byte integers. It is the most compact export format. The WFT format is documented in detail below so the user can open and extract data directly.

Waveform File Specifications

File Header

The WFT file header size is determined by the value entered in the field "Header_Size." The individual file header fields are fixed in length and are ASCII alphanumeric strings, each terminated by a null (00) byte. The simplest file, containing a single timebase, will have a header of 1538 bytes. A file containing multiple waveform segments or multiple timebases will expand the header length as needed.
All fields are left justified ASCII character strings, followed by a null byte, followed by spaces if needed to fill the allotted space. If a particular field is not used, its first byte is a null byte.
Since the header contains only ASCII characters and ends with a CONTROL-Z character, the header text can be conveniently viewed on a PC screen by using the MS-DOS "TYPE" command, for example "TYPE WAVE0001.WFT <Return>."

Data Type

"Integer" means an ASCII whole number, for example "2" or "262144." Note that the values are not limited to a 16-bit range: the "Time" field, in milliseconds since midnight, may contain a number as large as 89,400,000.
"Character" means ASCII text, for example "V" or "Test #12."
"Float" means an ASCII number in scientific notation, for example "5.0000000E-6."

Actual Data

The actual data (raw data) follows immediately after the file header. The data is in binary format. Please note that the data type (number of bytes per point, and byte sex) are described in the file header.
In all applications to date, data is in a 16-bit integer range from -32768 to +32767, with the low byte appearing first.

Raw data is converted into time and voltage values by the calculations shown below.

Time = ((point# * HORIZONTAL_NORM) + HORIZONTAL_ZERO) * USER_HORIZONTAL_NORM + USER_HORIZONTAL_ZERO

point# = Represents the n-th point in a sweep.
HORIZONTAL_NORM = Time per point, in seconds.
HORIZONTAL_ZERO = Trigger to 1st point, in seconds.
USER_HORIZONTAL_NORM = User defined multiplier, unitless (normally 1)
USER_HORIZONTAL_ZERO = User defined time offset, in seconds (normally 0)

Volts = ((data - VERTICAL_ZERO) * VERTICAL_NORM) * USER_VERTICAL_NORM + USER_VERTICAL_ZERO

data = Raw digitizer data (-32,768 through 32,767)
VERTICAL_ZERO = Absolute zero reference from the ADC
VERTICAL_NORM = Voltage per level
USER_VERTICAL_NORM =User defined multiplier (normally 1)
USER_VERTICAL_ZERO = User defined offset in volts (normally 0)

Offset	Max. Size (Bytes)	Field Description	ASCII Data Type	Field Description
0	2	Nic_id0	Integer	CPU type ID (byte sex) 1 = VAX, 2 = 68000, 3 = Intel: normally 3
2	2	Niv_id1	Integer	Nicolet division indicator: always 2
4	2	Nic_id2	Integer	Nicolet file format: 1 = Time domain, 2 = Frequency domain
6	2	User_id	Integer	User ID
8	12	Header_size	Integer	Length of file header in bytes
20	12	File_size	Integer	Length of file in bytes
32	12	File format version	Integer	Version of file format
44	81	Waveform title	Character	Waveform title
125	3	Date_year	Integer	Date of trigger of segment #1 - year
128	3	Date_month	Integer	Date of trigger of segment #1 - month
131	3	Date_day	Integer	Date of trigger of segment #1 - day
134	12	Time	Integer	Time of trigger of segment #1 - msec since midnight
146	12	Data_count	Integer	Total number of data points
158	12	Vertical_zero	Integer	Data value at which the voltage value is 0.00 volts - VZERO
170	24	Vertical_norm	Float	Voltage magnitude between levels - VNORM
194	24	User_vertical_zero	Float	User voltage offset
218	24	User_vertical_norm	Float	User units per volt
242	11	User_vertical_label	Character	User vertical label: default = "V"
253	24	User_horizontal_zero	Float	User time offset
277	24	User_horizontal_norm	Float	User seconds per unit
301	11	User_horizontal_label	Character	User horizontal label: default = "s"
312	129	User_Notes	Character	Note field, additional information
441	196	Audit	Character	Audit array of all calculations
637	21	Nicolet_Digitizer_Type	Character	Nicolet digitizer description
658	3	Bytes_per_data_point	Integer	Amount of bytes to store 1 data point: normally 2
661	3	Resolution	Integer	Number of active bits in a data point
664	81	Forward_link	Character	Pathname/file following in time the current file (Note 1)
745	81	Backward_link	Character	Pathname/file preceding in time the current file (Note 1)
826	3	Process flag	Integer	Process Flag - # of memory altering math functions performed
829	3	Data compression	Integer	Type of data compression used on raw data: 0 = none
832	12	Number of segments	Integer	Number of segments
844	12	Length of each segment	Integer	Length of each segment
856	12	Number of timebases	Integer	Number of timebases per segment
868	156	Reserved N/A	N/A	Reserved for Nicolet internal use only
1024	12	Length of zone 1	Integer	Length in points of zone 1
1036	24	Horiz. norm. zone 1	Float	Time between data points (tpp) - HNORM
1060	24	Horiz. zero zone 1	Float	Time of 1st point in zone 1 with respect to trigger
1084	12	Length of zone 2	Integer	Length in points of zone 2 (Note 1)
1096	24	Horiz. norm. zone 2	Float	Time between data points (tpp) - HNORM (Note 1)
1120	24	Horiz. zero zone 2	Float	Time of 1st point in zone 2 with respect to the trigger (Note 1)
1144	12	Length of zone 3	Float	Time between data points (tpp) - HNORM (Note 1)
1156	24	Horiz. norm zone 3	Float	Time between data points (ttp) - HNORM (Note 1)
1180	24	Horiz. zero zone 3	Float	Time of 1st point in zone 3 with respect to the trigger (Note 1)
1204	332	Reserved N/A	N/A	Reserved for Nicolet internal use only
1536 (Note 2)	24	Segment #2 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1560 (Note 2)	24	Segment #3 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1584 (Note 2)	24	Segment #4 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1608 (Note 2)	24	Segment #5 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1632 (Note 2)	24	Segment #6 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1656 (Note 2)	24	Segment #7 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1680 (Note 2)	24	Segment #8 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
1704 (Note 2)	24	Segment #9 HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1

Offset	Max. Size (Bytes)	Field Description	ASCII Data Type	Field Description
1536 + (24 * (n-2))	24	Segment #n HDELTA	Float	Time value of 1st point relative to time of 1st point of seg. #1
Header_Size - 2	1	End of HDELTA's	Null	
Header_size - 1	1	End of readable file	Control Z	End of readable data - Raw data follows
Header_size	Data_Count	Start of raw data	Raw	Binary data: normally 16-bit words in two's compliment arranged in low byte/high byte order
File_size - 1	Data_Count * Bytes_per_data_point	End of raw data		

Note 1: Not currently used with your instrument.
Note 2: These fields are presently only in multi-waveform files.