

ztwaveC Arbitrary Waveform Generator

Introduction:

This instrument driver provides programming support for ztwaveC Arbitrary Waveform Generator.

It contains functions for opening, configuring, taking measurements from, and closing the instrument.

Assumptions:

To successfully use this module, the following conditions must be met:

For GPIB instrument drivers:

- the instrument is connected to the GPIB.
- the GPIB address supplied to the initialize function must match the GPIB address of the instrument.

For VXI instrument drivers:

- the instrument is installed in the VXI mainframe and you are using one of the following controller options:
 - Embedded controller
 - MXI
 - MXI2
 - GPIB-VXI
- the logical address supplied to the initialize function must match the logical address of the instrument.

For RS-232 instrument drivers:

- the instrument is connected to the RS-232 interface.
 - the COM port, baud rate, parity, and timeout supplied to the initialize function must match the settings of the instrument.
-

Error and Status Information:

Each function in this instrument driver returns a status code that either indicates success or describes an error or warning condition.

Your program should examine the status code from each call to an instrument driver function to determine if an error occurred.

The general meaning of the status code is as follows:

Value	Meaning
0	Success
Positive Values	Warnings
Negative Values	Errors

The description of each instrument driver function lists possible error codes and their meanings

How To Use This Document:

Use this document as a programming reference manual.
It describes each function in the

ztwaveC Arbitrary Waveform Generator

instrument. The functions appear in alphabetical order, with a description of the function and its C syntax, a description of each parameter, and a list of possible error codes.

Function Tree Layout:

Class/Panel Name:	Function Name:
Initialize	ztwaveC_initialize
Configure	
Channel Enable	ztwaveC_channel_enable
Vertical	ztwaveC_vertical
Horizontal	ztwaveC_horizontal
Trigger & Arm	ztwaveC_trigger_and_arm
Sync Outputs	ztwaveC_sync_outputs
Output Trigger	ztwaveC_output_trigger
Function Generator	
Function Generator	ztwaveC_function_generator
Pulse	ztwaveC_pulse
Ramp	ztwaveC_ramp
Multi-Tone	ztwaveC_multi_tone
AM	ztwaveC_am
FM	ztwaveC_fm
Pattern Constant	ztwaveC_pattern_constant
Pattern Count	ztwaveC_pattern_count
Pattern Shift	ztwaveC_pattern_shift
Arbitrary Waveform	
Sequence	ztwaveC_sequence
Load Waveform Segment	ztwaveC_load_waveform_segment
Load Sequence	ztwaveC_load_sequence
Operate	
Reset	ztwaveC_reset
Initiate	ztwaveC_initiate
Abort	ztwaveC_abort
Software Arm/Disarm	ztwaveC_soft_arm
Software Trigger	ztwaveC_soft_trigger
Get Operation State	ztwaveC_operation_status_query
Wait for Operation Complete	ztwaveC_operation_complete
Readback	
Read Waveform Segment	ztwaveC_read_waveform_segment
Read Sequence	ztwaveC_read_sequence
Channel Query	ztwaveC_channel_query
Vertical Query	ztwaveC_vertical_query
Trigger & Arm Query	ztwaveC_trigger_and_arm_query
Sync Outputs Query	ztwaveC_sync_outputs_query
Trigger Outputs Query	ztwaveC_output_trigger_query
Function Generator Query	ztwaveC_function_generator_query

Pulse Query	ztwaveC_pulse_query
Ramp Query	ztwaveC_ramp_query
Multi-Tone Generator Query	ztwaveC_multitone_generator_query
AM Query	ztwaveC_am_query
FM Query	ztwaveC_fm_query
Pattern Generator Query	ztwaveC_pattern_generator_query
Horizontal Query	ztwaveC_horizontal_query
Sequence Query	ztwaveC_sequence_query
Utility	
Self-Test	ztwaveC_self_test
Save/Recall State	ztwaveC_save_recall_state
Get Error	ztwaveC_errors
Get Status	ztwaveC_get_status
Get Memory Size	ztwaveC_get_memory_size
Get Trigger Time	ztwaveC_get_trigger_time
Get Max Segment	ztwaveC_get_max_seg
Get Revisions	ztwaveC_get_rev
Get Temperature	ztwaveC_get_temperature
Close	ztwaveC_close

The following functions are in alphabetical order.

ztwaveC_abort

```
ZT_ERROR ztwaveC_abort (ZT_HANDLE *instrumentHandle);
```

Purpose

Terminates all ongoing processes and returns the unit to the idle state. Data resulting from the ongoing processes may be corrupt.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

<http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debu>

[g/base/system_error_codes.asp](http://base/system_error_codes.asp)
or check `winerror.h` or call `FormatMessage(...)` for a text description
of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_am

```
ZT_ERROR ztwaveC_am (ZT_HANDLE *instrumentHandle, u16 channel,  
                    float modulationFrequency, float percent,  
                    float centerFrequency);
```

Purpose

Sets up the frequency and percent modulation for an amplitude modulated (AM) waveform on the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

modulationFrequency

Variable Type float

Sets the frequency of the AM modulation in Hertz.

Range: 1.0 to 1.0e6 Hz

percent

Variable Type float

Selects the AM percent modulation.

Range: 0.0 to 100.0 percent

centerFrequency

Variable Type float

Sets the carrier frequency of the AM waveform.

Range:

2.0e-3 to 79.9999e6 Hz

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_am_query

```
ZT_ERROR ztwaveC_am_query (ZT_HANDLE *instrumentHandle, u16 channel,  
                           float *centerFrequency, float *percent,  
                           float *modulationFrequency);
```

Purpose

Returns the frequency and percent modulation to set up an amplitude modulated (AM) waveform on the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

centerFrequency

Variable Type float (passed by reference)

Returns the frequency of the AM modulation in Hertz.

Range: 1.0 to 1.0e6 Hz

percent

Variable Type float (passed by reference)

Returns the AM percent modulation.

Range: 0.0 to 100.0 percent

modulationFrequency

Variable Type float (passed by reference)

Modulation Frequency in Hertz.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_channel_enable

```
ZT_ERROR ztwaveC_channel_enable (ZT_HANDLE *instrumentHandle,  
                                u16 channel, u16 outputState,  
                                u16 patternState);
```

Purpose

Sets the selected output channel's state

It is good practice to inactivate channels that are not in use.

Please note that some frequency/clock rate settings might be incompatible. These incompatibilities typically arise in the following scenarios:

- 1) Using a very high clock rate on one channel and a low clock rate on the other. Example: Channel 1 set to 1 MHz and channel 2 set to 1 Hz.
- 2) A single channel set to a high frequency a high frequency resolution. Example: 1.000001 MHz.
- 3) AM, FM, and tone that have insatiable carrier and modulation frequency settings.

If these incompatibilities exist, the instrument will coerce the frequencies to the nearest compatible value. To check for incompatible settings, you should use the Horizontal Query function to read back the clock rate settings.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

outputState

Variable Type u16

Selects the channel's analog output state

Active - ZTWAVEC_OUTPUT_ACTIVE
Inactive - ZTWAVEC_OUTPUT_INACTIVE
Idle - ZTWAVEC_OUTPUT_IDLE

patternState

Variable Type u16

Selects the channel's digital pattern state

Active - ZTWAVEC_OUTPUT_ACTIVE
Inactive - ZTWAVEC_OUTPUT_INACTIVE
Idle - ZTWAVEC_OUTPUT_IDLE

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_channel_query

```
ZT_ERROR ztwaveC_channel_query (ZT_HANDLE *instrumentHandle,  
                                u16 channel,  
                                unsigned short *outputState,  
                                unsigned short *outputPatternState);
```

Purpose

Returns the status of the selected channel, output_state, and pattern_state.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3

Channel 4 - ZTWAVEC_CH4

outputState

Variable Type unsigned short (passed by reference)

returns the channel's analog output state

ZTWAVEC_OUTPUT_ACTIVE - Active
ZTWAVEC_OUTPUT_INACTIVE - Inactive
ZTWAVEC_OUTPUT_IDLE - Idle

outputPatternState

Variable Type unsigned short (passed by reference)

returns the channel's digital pattern state

ZTWAVEC_OUTPUT_ACTIVE - Active
ZTWAVEC_OUTPUT_INACTIVE - Inactive
ZTWAVEC_OUTPUT_IDLE - Idle

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_close

```
ZT_ERROR ztwaveC_close (ZT_HANDLE instrumentHandle);
```

Purpose

Closes the communication session opened by Initialize.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE

This Instrument Handle is used to differentiate between different sessions of this instrument drive

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_errors

```
ZT_ERROR ztwaveC_errors (ZT_HANDLE *instrumentHandle,  
                        unsigned short *number_ofErrors,  
                        short error[]);
```

Purpose

Returns the number of errors and an array containing the error numbers.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

number_ofErrors

Variable Type unsigned short (passed by reference)

Returns number of errors in queue.

Range: 0 to 32

error

Variable Type short []

Returns all entries in the error log and clears the error log. Multiple errors are stored sequentially in the error log with the oldest error first.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_fm

```
ZT_ERROR ztwaveC_fm (ZT_HANDLE *instrumentHandle, u16 channel,
                    float modulationFrequency, float deviation,
                    float centerFrequency);
```

Purpose

Sets up the frequency and maximum deviation for a frequency modulated (FM) waveform on the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1

Channel 2 - ZTWAVEC_CH2

Channel 3 - ZTWAVEC_CH3

Channel 4 - ZTWAVEC_CH4

modulationFrequency

Variable Type float

Sets the frequency of the FM modulation in Hertz.

Range: 1.0 to 1.0e6 Hz

deviation

Variable Type float

Sets the FM maximum deviation frequency in Hertz.

Range: 1.0 to 1.0e6 Hz

centerFrequency

Variable Type float

Sets the center frequency of the FM waveform.

Range:

2.0e-3 to 79.9999e6 Hz

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_fm_query

```
ZT_ERROR ztwaveC_fm_query (ZT_HANDLE *instrumentHandle, u16 channel,  
                           float *modulationFrequency, float *deviation,  
                           float *centerFrequency);
```

Purpose

Returns the frequency and deviation for a frequency modulated (FM) waveform on the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type ul6

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

modulationFrequency

Variable Type float (passed by reference)

Modulation Frequency in Hertz.

deviation

Variable Type float (passed by reference)

Returns the FM maximum deviation frequency in Hertz.

Range: 1.0 to 1.0e6 Hz

centerFrequency

Variable Type float (passed by reference)

Returns the frequency of the FM modulation in Hertz.

Range: 1.0 to 1.0e6 Hz

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_function_generator

```
ZT_ERROR ztwaveC_function_generator (ZT_HANDLE *instrumentHandle,  
                                     u16 channel,  
                                     unsigned short function,  
                                     float frequency, float phase);
```

Purpose

Sets up standard function generator functions on the selected channel. Options include function type, frequency, and phase.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

function

Variable Type unsigned short

Selects the standard function to generate on the selected channel.

DC - ZTWAVEC_FUNC_DC_WAVE
Sine - ZTWAVEC_FUNC_SINE_WAVE
Square - ZTWAVEC_FUNC_SQUARE_WAVE
Triangle - ZTWAVEC_FUNC_TRIANGLE_WAVE
Sinc - ZTWAVEC_FUNC_SINC_WAVE
Noise - ZTWAVEC_FUNC_NOISE_WAVE

frequency

Variable Type float

Sets the frequency of the output analog waveform. Note that this has

no effect on the Noise Wave function.

Range:

Sine wave: 2.0e-3 to 79.9999e6 Hz
Square wave: 2.0e-3 to 80.0e6 Hz
Triangle wave: 2.0e-3 to 10e6 Hz
Sinc wave: 2.0e-3 to 10e6 Hz

phase

Variable Type float

Sets the function phase in radians for the selected channel. Note that this command has no effect on the Pulse Wave, Ramp Wave, Noise Wave, or Double Pulse Wave functions.

Range: 0 to 2 PI (6.283185307)

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_function_generator_query

```
ZT_ERROR ztwaveC_function_generator_query (ZT_HANDLE *instrumentHandle,  
                                             u16 channel,  
                                             unsigned short *function,  
                                             float *frequency,  
                                             float *phase);
```

Purpose

Returns the configuration parameters for the standard function generator functions on the selected channel, such as function, frequency, phase.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all

subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1

Channel 2 - ZTWAVEC_CH2

Channel 3 - ZTWAVEC_CH3

Channel 4 - ZTWAVEC_CH4

function

Variable Type unsigned short (passed by reference)

Selects the type of waveform function to generate using the selected parameters. The following list shows each waveform function and the parameters that affect it.

Valid values are:

ZTWAVEC_FUNC_DC_WAVE	- DC
ZTWAVEC_FUNC_SINE_WAVE	- Sine
ZTWAVEC_FUNC_SQUARE_WAVE	- Square
ZTWAVEC_FUNC_TRIANGLE_WAVE	- Triangle
ZTWAVEC_FUNC_SINC_WAVE	- Sinc
ZTWAVEC_FUNC_NOISE_WAVEN	- Noise

frequency

Variable Type float (passed by reference)

Returns the function frequency in Hertz for the selected channel. Note that this has no meaning for the Noise Wave function.

Range:

Sine wave: 2.0e-3 to 79.9999e6 Hz

Square wave: 2.0e-3 to 80.0e6 Hz

Triangle wave: 2.0e-3 to 10e6 Hz

Sinc wave: 2.0e-3 to 10e6 Hz

phase

Variable Type float (passed by reference)

Returns the function phase in radians for the selected channel. Note that this has no meaning for the Pulse Wave, Ramp Wave, Noise Wave, or Double Pulse Wave functions.

Range: 0 to 2 PI (6.283185307)

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_get_max_seg

```
ZT_ERROR ztwaveC_get_max_seg (ZT_HANDLE *instrumentHandle,  
                             unsigned int *maximumSegment);
```

Purpose

Returns the maximum number of unique pattern/waveform segments within memory for segmented memory operation. A segment size unit is defined as a 32-bit wide pattern/waveform.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

maximumSegment

Variable Type unsigned int (passed by reference)

Returns the maximum number of segments in memory.

1 to 65535

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check `winerror.h` or call `FormatMessage(...)` for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

`ztwaveC_get_memory_size`

```
ZT_ERROR ztwaveC_get_memory_size (ZT_HANDLE *instrumentHandle,  
                                  unsigned long *memorySize);
```

Purpose

Returns the maximum waveform memory size. This memory depends on the memory option of the instrument.

Parameter List

`instrumentHandle`

Variable Type `ZT_HANDLE *`

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

`memorySize`

Variable Type `unsigned long (passed by reference)`

Returns the maximum size for a single pattern/waveform. Essentially, this query returns the total available pattern/waveform memory for use as a single segment. A segment size unit is defined as a 32-bit wide pattern/waveform.

Range: 0 to 2,097,152 (maximum memory size)

Return Value

This control contains the status code returned by the function call.

Return success or failure:

`ZT_SUCCESS`
`ZT_FAILURE`

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check `winerror.h` or call `FormatMessage(...)` for a text description

of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_get_rev

```
ZT_ERROR ztwaveC_get_rev (ZT_HANDLE *instrumentHandle, char id[],  
                          char driver_rev[],  
                          unsigned short configuration[]);
```

Purpose

Returns the ID string, driver revision and configuration versions.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

id

Variable Type char []

Returns the instrument identification including manufacturer, model number, serial number and firmware version as a block of ASCII string data up to 44 characters in length. The string will be of this form: "ZTEC,ZT530PXI,S/N nnn,Version n.nn"

driver_rev

Variable Type char []

Returns the version of the C (CVI) driver string in the form Rev x.xx, dd/mm/yy, CVI n.n

configuration

Variable Type unsigned short []

Returns the instrument identification as an array where the first three elements are DSP firmware version, baseboard FPGA version and module FPGA version.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_get_status

```
ZT_ERROR ztwaveC_get_status (ZT_HANDLE *instrumentHandle,  
                             unsigned short eventConditionSwitch,  
                             unsigned short *statusRegister,  
                             unsigned short *frequencyRegister,  
                             unsigned short *testRegister,  
                             unsigned short *operationRegister,  
                             unsigned short *standardRegister);
```

Purpose

Returns the current state of the status, frequency, test, operation and standard registers.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

eventConditionSwitch

Variable Type unsigned short

statusRegister

Variable Type unsigned short (passed by reference)

Returns the present condition of the status register.

Valid values are:

- Bit 1 - Unused Bit
- Bit 2 - Unused Bit
- Bit 3 - Error Log Not Empty Bit
- Bit 4 - Questionable Summary Bit

Bit 5 - Message Available Bit
Bit 6 - Standard Event Summary Bit
Bit 7 - Master Summary Bit
Bit 8 - Operation Summary Bit

frequencyRegister

Variable Type unsigned short (passed by reference)

Returns the present condition of the frequency status register.

Valid values are:

Bit 1 - PLL unlocked Bit
Bit 2 - DAC unlocked Bit

testRegister

Variable Type unsigned short (passed by reference)

Returns the present condition of the test status register.

Valid values are:

Bit 1 - Baseboard Test Failed Bit
Bit 2 - SRAM Test Failed Bit
Bit 3 - ROM Test Failed Bit
Bit 4 - Trigger Output Test Failed Bit
Bit 5 - Reference Oscillator Test Failed Bit
Bit 6 to 8 - Unused Bits
Bit 9 - AWG Test Failed Bit
Bit 10 - Waveform RAM Test Failed Bit
Bit 11 - Sequencer RAM Test Failed Bit
Bit 12 - PLL Test Failed Bit

operationRegister

Variable Type unsigned short (passed by reference)

Returns the present condition of the operation status register.

Valid values are:

Bit 1 - Unused Bit
Bit 2 - Settling Bit
Bit 3 - Ranging Bit
Bit 4 - Unused Bit
Bit 5 - Unused Bit
Bit 6 - Waiting for Trigger Bit
Bit 6 - Waiting for Arm Bit
Bit 8 - Unused Bit
Bit 9 - Outputs1-2 On Bit
Bit 10 - Unused Bit

Bit 11 - Loading Waveforms Bit

standardRegister

Variable Type unsigned short (passed by reference)

Returns the present condition of the standard status register.

Valid values are:

- Bit 1 - Operation Complete Bit
- Bit 2 - Request Control Bit
- Bit 3 - Query Error Bit
- Bit 4 - Device Dependent Error Bit
- Bit 5 - Execution Error Bit
- Bit 6 - Command Error Bit
- Bit 7 - User Request Bit
- Bit 8 - Power On Bit

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_get_temperature

```
ZT_ERROR ztwaveC_get_temperature (ZT_HANDLE *instrumentHandle,  
                                   float *temperature);
```

Purpose

This functions reads the internal temperature sensor.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is

invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

temperature

Variable Type float (passed by reference)

Returns the instrument temperature in degrees C.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_get_trigger_time

```
ZT_ERROR ztwaveC_get_trigger_time (ZT_HANDLE *instrumentHandle,  
float *triggerTimestamp);
```

Purpose

Returns the trigger timestamp of the most recent trigger event in seconds with a 1 second period.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

triggerTimestamp

Variable Type float (passed by reference)

Returns the trigger timestamp of the most recent trigger event in seconds with a 1 second period.

Range: 0 to 1 second
Resolution: 100 ns

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_horizontal

```
ZT_ERROR ztwaveC_horizontal (ZT_HANDLE *instrumentHandle,  
                             float clockFrequency,  
                             unsigned short clockInterpolate,  
                             unsigned short referenceOscillatorSource,  
                             unsigned int segmentPoints,  
                             unsigned short clockSource);
```

Purpose

Sets up the horizontal or timebase parameters. This is normally only used for the arbitrary waveform functions (although it will work with the function generator functions).

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

clockFrequency

Variable Type float

Sets the sample clock frequency in Hertz.

Range: 0, 1.0e3 to 160.0e6 Hz

Resolution (internal source):

0: Automatic clock frequency select
1 kHz to 10 MHz: 1, 2.5, 5 steps
10 MHz to 50 MHz: 5 MHz steps
50 MHz to 100 MHz: 10 MHz steps
100 MHz to 160 MHz: 20 MHz steps

clockInterpolate

Variable Type unsigned short

Sets the interpolation factor for the function generator. The interpolation factor can be set manually or automatically.

Valid values are:

referenceOscillatorSource

Variable Type unsigned short

Sets the source for the 10 MHz reference clock that provides the instrument timebase. Options are Local reference or PXI backplane reference.

LOCAL - ZTWAVEC_REF_CLK_LOCAL
CHASSIS - ZTWAVEC_REF_CLK_CHASSIS

segmentPoints

Variable Type unsigned int

Sets the length of the pattern/waveform within each memory segment. Valid segment lengths are 8 to the maximum segment size. A segment length unit is defined as a 32-bit wide pattern/waveform. The Segment Points adjusts the pattern/waveform memory segmentation size to next greater binary multiple, affecting the number of available segments for unique patterns/waveforms.

Range: 0 or 8 to 2,097,152 (maximum memory)
0: Automatic segment size selection
1-7: Invalid segment size

clockSource

Variable Type unsigned short

Used to select internal or external sample clock source.

Internal - ZTWAVEC_CLK_INT

External - ZTWAVEC_CLK_EXT

Range: 1MHz to 160MHz

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_horizontal_query

```
ZT_ERROR ztwaveC_horizontal_query (ZT_HANDLE *instrumentHandle,  
float *clockFrequency,  
unsigned short *clockInterpolate,  
unsigned short  
*referenceOscillatorSource,  
unsigned long *segmentPoints,  
unsigned short *clockSource);
```

Purpose

Returns the horizontal or timebase parameters, such as click frequency, interpolation factor, reference oscillator source, segment points, and clock source.

This is normally only used for the arbitrary waveform functions (although it will work with the function generator functions).

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

clockFrequency

Variable Type float (passed by reference)

Returns the sample clock frequency in Hertz.

Range: 1.0e3 to 160.0e6 Hz

Resolution (internal source):

1 kHz to 10 MHz: 1, 2.5, 5 steps

10 MHz to 50 MHz: 5 MHz steps

50 MHz to 100 MHz: 10 MHz steps

100 MHz to 160 MHz: 20 MHz steps

clockInterpolate

Variable Type unsigned short (passed by reference)

Returns the interpolation factor. If the interpolation factor is set to "Auto", this function returns the current interpolation factor selected by the unit.

Valid return values are:

ZTWAVEC_INTERP_AUTO - Automatic

ZTWAVEC_INTERP_X1 - X1

ZTWAVEC_INTERP_X2 - X2

ZTWAVEC_INTERP_X4 - X4

ZTWAVEC_INTERP_X8 - X8

referenceOscillatorSource

Variable Type unsigned short (passed by reference)

Returns the source of the 10 MHz reference clock that provides the instrument timebase.

Valid return values are:

ZTWAVEC_REF_CLK_LOCAL - LOCAL

ZTWAVEC_REF_CLK_CHASSIS - CHASSIS

segmentPoints

Variable Type unsigned long (passed by reference)

Returns the length of the pattern/waveform within each memory segment. Valid segment lengths are 8 to the maximum segment size.

Range: 8 to 2,097,152 (maximum memory size)

clockSource

Variable Type unsigned short (passed by reference)

Returns the selected sample clock source.

Valid return values are:

ZTWAVEC_CLK_INT - Internal
ZTWAVEC_CLK_EXT - External

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_initialize

```
ZT_ERROR ztwaveC_initialize (ZT_RESOURCE resourceName, u16 IDQuery,  
                             u16 reset, ZT_HANDLE *instrumentHandle);
```

Purpose

Sets up the session and establishes communications with the instrument.
An instrument reset may also be selected with this function call.

Parameter List

resourceName

Variable Type ZT_RESOURCE

This control specifies the interface and address of the device that is to be initialized (Instrument Descriptor). The exact grammar to be used in this control is:

[board]::logical address::INSTR

IDQuery

Variable Type u16

Controls whether an instrument ID Query is performed upon initialization. This prevents access to the wrong instrument.

off - ZT_FALSE
on - ZT_TRUE

reset

Variable Type ul6

Controls whether an instrument reset is performed upon initialization. A reset will return all registers to their default condition.

off - ZT_FALSE

on - ZT_TRUE

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_initiate

```
ZT_ERROR ztwaveC_initiate (ZT_HANDLE *instrumentHandle);
```

Purpose

Initiates the instrument. While initiated, the instrument is enabled to generate output patterns and waveforms.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is

invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_load_sequence

```
ZT_ERROR ztwaveC_load_sequence (ZT_HANDLE *instrumentHandle,  
                                unsigned int sequenceLength,  
                                short sequence[]);
```

Purpose

Downloads the sequence array for the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

sequenceLength

Variable Type unsigned int

Determines the length of the sequence array to download.

sequence

Variable Type short []

Passes in the sequence array to be downloaded to the instrument.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_load_waveform_segment

```
ZT_ERROR ztwaveC_load_waveform_segment (ZT_HANDLE *instrumentHandle,  
                                         u16 channel,  
                                         unsigned short segmentNumber,  
                                         unsigned int waveformLength,  
                                         short waveform[]);
```

Purpose

Downloads a waveform array into the selected segment number for the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

segmentNumber

Variable Type unsigned short

Selects the segment number in which to write the waveform.

Range: 0 to 65535

waveformLength

Variable Type unsigned int

Determines the length of the waveform array to download. Valid segment lengths are 8 to the maximum segment size. Setting length to zero chooses automatic segment length.

Range: 0: Automatic Segment Length
 8 to 2,097,152 (maximum memory)

waveform

Variable Type short []

Passes in the waveform to be downloaded to the instrument.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_multi_tone

```
ZT_ERROR ztwaveC_multi_tone (ZT_HANDLE *instrumentHandle, u16 channel,  
                             short tone, float frequency, float phase,  
                             unsigned short reset,  
                             unsigned short generate);
```

Purpose

Sets up the multitone function on the selected channel.

This function must be called for each tone in the multitone. Normally as the first tone is selected, the reset-all is selected. For each additional tone reset-none is selected. It saves time to not generate a waveform at each tone so the Generate should have no selected. At the last tone the generate switch must be selected.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

tone

Variable Type short

Selectes the tone to setup

Range: 1 to 100

frequency

Variable Type float

Sets the frequency of the selected tone.

Range: 100 to 79.9999e6 Hz

Resolution: 100 Hz

phase

Variable Type float

Sets the function phase in radians for the selected tone.

Range: 0 to 2 PI (6.283185307)

reset

Variable Type unsigned short

The reset command allows the user to perform a reset of the selected tone, all tones, or no tones during setup.

All - ZTAWVEC_TONE_RESET_ALL

Single - ZTWAVEC_TONE_RESET_SINGLE
None - ZTWAVEC_TONE_RESET_NONE

generate

Variable Type unsigned short

NOTE Do not set generate to YES until setting up the final tone. For example: You would set up all parameters for Tone 1, set up all parameters for Tone 2, set up all parameters for Tone 3, etc... with generate set to NO, then send the then on the last tone set the generate to YES.

Yes - ZT_TRUE
No - ZT_FALSE

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_multitone_generator_query

```
ZT_ERROR ztwaveC_multitone_generator_query (ZT_HANDLE *instrumentHandle,  
                                             ul6 channel, short tone,  
                                             float *frequency,  
                                             float *phase,  
                                             unsigned short *maximum);
```

Purpose

Returns the parameters for each tone for the multitone function on the selected channel, such as max tone, frequency, and phase.

This function must be called for each tone in the multitone.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all

subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1

Channel 2 - ZTWAVEC_CH2

Channel 3 - ZTWAVEC_CH3

Channel 4 - ZTWAVEC_CH4

tone

Variable Type short

Selects the tone to read

Range: 1 to 100

frequency

Variable Type float (passed by reference)

Returns the frequency of the selected tone.

Range: 100 to 79.9999e6 Hz

Resolution: 100 Hz

phase

Variable Type float (passed by reference)

Returns the phase in radians for the selected tone.

Range: 0 to 2 PI (6.283185307)

maximum

Variable Type unsigned short (passed by reference)

Returns the maximum tone set in the multitone.

Range: 1 to 100

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check `winerror.h` or call `FormatMessage(...)` for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

`ztwaveC_operation_complete`

```
ZT_ERROR ztwaveC_operation_complete (ZT_HANDLE *instrumentHandle,  
                                     unsigned short  
*operationCompleteBit);
```

Purpose

Wait for the operation complete for all previous commands before continuing execution of the program flow.

Parameter List

`instrumentHandle`

Variable Type `ZT_HANDLE *`

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

`operationCompleteBit`

Variable Type `unsigned short (passed by reference)`

Returns whether or not the operation is complete.

0 - not complete

1 - complete

Return Value

This control contains the status code returned by the function call.

Return success or failure:

`ZT_SUCCESS`

`ZT_FAILURE`

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check `winerror.h` or call `FormatMessage(...)` for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_operation_status_query

```
ZT_ERROR ztwaveC_operation_status_query (ZT_HANDLE *instrumentHandle,  
                                          short *operation_Status);
```

Purpose

Returns the current state of the operation register.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

operation_Status

Variable Type short (passed by reference)

Returns the present condition of the operation status register.

Valid values are:

- Bit 1 - Unused Bit
- Bit 2 - Settling Bit
- Bit 3 - Ranging Bit
- Bit 4 - Unused Bit
- Bit 5 - Waiting for Arm Bit
- Bit 6 - Waiting for Trigger Bit
- Bit 7 - Unused Bit
- Bit 8 - Unused Bit
- Bit 9 - Outputs1-2 On Bit
- Bit 10 - Unused Bit
- Bit 11 - Loading Waveforms Bit
- Bit 12 to 16 - Unused Bits

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check `winerror.h` or call `FormatMessage(...)` for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_output_trigger

```
ZT_ERROR ztwaveC_output_trigger (ZT_HANDLE *instrumentHandle,  
                                unsigned short triggerOutput,  
                                unsigned short state,  
                                unsigned short source,  
                                unsigned short polarity);
```

Purpose

Sets up the trigger and arm parameters, such as trigger source, trigger slope, trigger delay, trigger holdoff, arm source, and arm polarity.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

triggerOutput

Variable Type unsigned short

Selects the output channel to set up for trigger output.

TTL0 - ZTWAVEC_OUTPUT_TTL0
TTL1 - ZTWAVEC_OUTPUT_TTL1
TTL2 - ZTWAVEC_OUTPUT_TTL2
TTL3 - ZTWAVEC_OUTPUT_TTL3
TTL4 - ZTWAVEC_OUTPUT_TTL4
TTL5 - ZTWAVEC_OUTPUT_TTL5
TTL6 - ZTWAVEC_OUTPUT_TTL6
TTL7 - ZTWAVEC_OUTPUT_TTL7

VXI only

ECL0 - ZTWAVEC_OUTPUT_ECL0
ECL1 - ZTWAVEC_OUTPUT_ECL1

state


```

                                unsigned short
*triggerOutputSource,
                                unsigned short
*triggerOutputPolarity);
```

Purpose

Wait for the operation complete for all previous commands before continuing execution of the program flow.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

triggerOutput

Variable Type unsigned short

Selects the output channel to set up for trigger output.

ZTWAVEC_OUTPUT_TTL0 - TTL0
ZTWAVEC_OUTPUT_TTL1 - TTL1
ZTWAVEC_OUTPUT_TTL2 - TTL2
ZTWAVEC_OUTPUT_TTL3 - TTL3
ZTWAVEC_OUTPUT_TTL4 - TTL4
ZTWAVEC_OUTPUT_TTL5 - TTL5
ZTWAVEC_OUTPUT_TTL6 - TTL6
ZTWAVEC_OUTPUT_TTL7 - TTL7

VXI only

ZTWAVEC_OUTPUT_ECL0 - ECL0
ZTWAVEC_OUTPUT_ECL1 - ECL1

triggerOutputState

Variable Type unsigned short (passed by reference)

Returns the output trigger state of the selected channel.

Valid values are:

ZTWAVEC_OUTPUT_INACTIVE - inactive state
ZTWAVEC_OUTPUT_ACTIVE - active state

triggerOutputSource

Variable Type unsigned short (passed by reference)

Returns the output trigger source for the selected output trigger channel.

Valid values are:

ZTWAVEC_OUTPUT_ARM_EVENT - Arm Event
ZTWAVEC_OUTPUT_TRIG_EVENT - Trigger Event
ZTWAVEC_OUTPUT_CONST_STATE - Constant State
ZTWAVEC_OUTPUT_OP_COMPLETE - Operation Complete

triggerOutputPolarity

Variable Type unsigned short (passed by reference)

Returns the output trigger polarity. Positive polarity is a positive going pulse while negative polarity is a negative going pulse.

Valid values are:

ZTWAVEC_POLARITY_NEG - negative polarity
ZTWAVEC_POLARITY_POS - positive polarity

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_pattern_constant

```
ZT_ERROR ztwaveC_pattern_constant (ZT_HANDLE *instrumentHandle,  
                                     ul6 channel,  
                                     unsigned short patternConstant);
```

Purpose

Sets up the parameters for the digital pattern constant on the digital output bus.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

patternConstant

Variable Type unsigned short

Selects the pattern waveform constant value (16-bit number).

Range: 0 to 65535 (may be easier to visualize in Hex)

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_pattern_count

```
ZT_ERROR ztwaveC_pattern_count (ZT_HANDLE *instrumentHandle,  
                                u16 channel, unsigned short direction,  
                                unsigned short start,  
                                unsigned short stop,  
                                unsigned short step);
```

Purpose

Sets up the count direction, beginning and end count values, and increment for the digital pattern count on the digital output bus.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

direction

Variable Type unsigned short

Control the direction of the count pattern to count up (increment) or count down (decrement).

Count up - ZTWAVEC_PAT_COUNT_UP
Count down - ZTWAVEC_PAT_COUNT_DOWN

start

Variable Type unsigned short

The beginning or start count value.

Range: 0 to 65535

stop

Variable Type unsigned short

The ending or stop count value.

Range: 0 to 65535

step

Variable Type unsigned short

The increment or step count value.

Range: 0 to 65535

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_pattern_generator_query

```
ZT_ERROR ztwaveC_pattern_generator_query (ZT_HANDLE *instrumentHandle,
                                           u16 channel,
                                           unsigned short *patternType,
                                           unsigned short *patternConstant,
                                           unsigned short *startPattern,
                                           unsigned short *stopPattern,
                                           unsigned short *patternStep,
                                           unsigned short
*shiftStartPattern,
                                           unsigned short *bitWidth);
```

Purpose

Returns the parameters for the digital pattern on the digital output bus, such as pattern type, pattern constant, start/stop pattern, pattern step, shift start pattern, and bit width.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

patternType

Variable Type unsigned short (passed by reference)

Returns the selected pattern waveform type to be generated on the selected channel.

Valid values are:

ZTWAVEC_PATT_CONST - Constant Pattern
ZTWAVEC_PATT_COUNT_UP - Up Count Pattern
ZTWAVEC_PATT_COUNT_DOWN - Down Count Pattern
ZTWAVEC_PATT_SHIFT_RIGHT - Shift Right Pattern
ZTWAVEC_PATT_SHIFT_LEFT - Shift Left Pattern

patternConstant

Variable Type unsigned short (passed by reference)

Returns the pattern waveform constant value (16-bit number).

Range: 0 to 65535

startPattern

Variable Type unsigned short (passed by reference)

Returns the beginning or start count value.

Range: 0 to 65535

stopPattern

Variable Type unsigned short (passed by reference)

Returns the ending or stop count value.

Range: 0 to 65535

patternStep

Variable Type unsigned short (passed by reference)

Returns the increment or step count value.

Range: 0 to 65535

shiftStartPattern

Variable Type unsigned short (passed by reference)

Returns the beginning or start value.

Range: 0 to 65535

bitWidth

Variable Type unsigned short (passed by reference)

Returns the number of bits to shift around. If less than 16 bits, the LSB's are used.

Range: 1 to 16

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_pattern_shift

```
ZT_ERROR ztwaveC_pattern_shift (ZT_HANDLE *instrumentHandle,  
                                u16 channel, unsigned short direction,  
                                unsigned short startPattern,  
                                unsigned short bitWidth);
```

Purpose

Sets up the shift direction, start pattern, and bit width for the digital pattern shift on the digital output bus.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

direction

Variable Type unsigned short

Select the direction of the shift. Select shift right or shift left.

Shift Right - ZTWAVEC_PAT_SHIFT_RIGHT
Shift Left - ZTWAVEC_PAT_SHIFT_LEFT

startPattern

Variable Type unsigned short

The beginning or start value.

Range: 0 to 65535 (may be easier to visualize in Hex)

bitWidth

Variable Type unsigned short

The number of bits to shift around. If less than 16 bits, the LSB's are used.

Range: 1 to 16

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

```
ZT_ERROR ztwaveC_pulse (ZT_HANDLE *instrumentHandle, u16 channel,  
                        float period, float width, float delay,  
                        float leadingTransition,  
                        float trailingTransition,  
                        unsigned short doublePulse);
```

Purpose

Sets up the pulse waveform function on the selected channel. Options include, pulse period, pulse waveform width, rising edge delay, pulse mode, rise time, and fall time.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

period

Variable Type float

Selects the period of the pulse. The period is the spacing between single or double pulses.

width

Variable Type float

Sets the pulse waveform width (in seconds) for the selected channel.

Range: 0 to Pulse Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

delay

Variable Type float

Set the pulse waveform rising edge delay (in seconds) for the selected channel.

Range: 0 to Pulse Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

leadingTransition

Variable Type float

Sets the pulse waveform rise time (in seconds) for the selected channel.

Range: 0 to Pulse Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

trailingTransition

Variable Type float

Sets the pulse waveform fall time (in seconds) for the selected channel.

Range: 0 to Pulse Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

doublePulse

Variable Type unsigned short

Selects the single or double pulse mode.

Yes - ZT_TRUE
No - ZT_FALSE

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_pulse_query

```
ZT_ERROR ztwaveC_pulse_query (ZT_HANDLE *instrumentHandle, u16 channel,
                               unsigned short *function, float *period,
                               float *width, float *delay,
                               float *leadingTransition,
                               float *trailingTransition);
```

Purpose

retuiurns the pulse waveform function on the selected channel. Options include, pulse period, pulse waveform width, rising edge delay, pulse mode, rise time, and fall time.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

function

Variable Type unsigned short (passed by reference)

Selects the type of waveform function to generate using the selected parameters. The following list shows each waveform function and the parameters that affect it.

Valid values are:

ZTWAVEC_FUNC_DC_WAVE - DC
ZTWAVEC_FUNC_SINE_WAVE - Sine
ZTWAVEC_FUNC_SQUARE_WAVE - Square
ZTWAVEC_FUNC_TRIANGLE_WAVE - Triangle
ZTWAVEC_FUNC_SINC_WAVE - Sinc

ZTWAVEC_FUNC_NOISE_WAVEN - Noise

period

Variable Type float (passed by reference)

Returns the pulse period in seconds.

Range:

1e-7 -> 500 seconds

width

Variable Type float (passed by reference)

Returns the waveform width (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

delay

Variable Type float (passed by reference)

Returns the waveform delay (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

leadingTransition

Variable Type float (passed by reference)

Returns the waveform rise time (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

trailingTransition

Variable Type float (passed by reference)

Returns the waveform fall time (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run `GetLastError()` to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check `winerror.h` or call `FormatMessage(...)` for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_ramp

```
ZT_ERROR ztwaveC_ramp (ZT_HANDLE *instrumentHandle, u16 channel,  
                      float period, float delay,  
                      float leadingTransition);
```

Purpose

Sets up the ramp waveform function on the selected channel. Options include period, delay, and leading transition.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

period

Variable Type float

Selects the period of the ramp. The period is the spacing between one ramp and another.

delay

Variable Type float

Set the pulse waveform rising edge delay (in seconds) for the selected channel.

Range: 0 to Pulse Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

leadingTransition

Variable Type float

Set the ramp leading transition time in seconds.

Range: 0 to Ramp Period
Resolution: 1 Sample Interval

(Note that these are affected by the sample clock frequency)

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_ramp_query

```
ZT_ERROR ztwaveC_ramp_query (ZT_HANDLE *instrumentHandle, u16 channel,  
                             unsigned short *function, float *period,  
                             float *width, float *delay,  
                             float *leadingTransition,  
                             float *trailingTransition);
```

Purpose

returns the pulse waveform function on the selected channel. Options include, pulse period, pulse waveform width, rising edge delay, pulse mode, rise time, and fall time.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

function

Variable Type unsigned short (passed by reference)

Selects the type of waveform function to generate using the selected parameters. The following list shows each waveform function and the parameters that affect it.

Valid values are:

ZTWAVEC_FUNC_DC_WAVE - DC
ZTWAVEC_FUNC_SINE_WAVE - Sine
ZTWAVEC_FUNC_SQUARE_WAVE - Square
ZTWAVEC_FUNC_TRIANGLE_WAVE - Triangle
ZTWAVEC_FUNC_SINC_WAVE - Sinc
ZTWAVEC_FUNC_NOISE_WAVEN - Noise

period

Variable Type float (passed by reference)

Returns the pulse period in seconds.

Range:
1e-7 -> 500 seconds

width

Variable Type float (passed by reference)

Returns the waveform width (in seconds) for the selected channel.

Range: 0 to Period
Resolution: 1 Sample Interval

delay

Variable Type float (passed by reference)

Returns the waveform delay (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

leadingTransition

Variable Type float (passed by reference)

Returns the waveform rise time (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

trailingTransition

Variable Type float (passed by reference)

Returns the waveform fall time (in seconds) for the selected channel.

Range: 0 to Period

Resolution: 1 Sample Interval

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_read_sequence

```
ZT_ERROR ztwaveC_read_sequence (ZT_HANDLE *instrumentHandle,  
                                unsigned long sequenceLength,  
                                short sequence[]);
```

Purpose

Reads the sequence array for the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

sequenceLength

Variable Type unsigned long

Selects the length of the sequence array to read.

sequence

Variable Type short []

Passes out the sequence array read from the instrument.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_read_waveform_segment

```
ZT_ERROR ztwaveC_read_waveform_segment (ZT_HANDLE *instrumentHandle,  
                                         ul6 channel,  
                                         unsigned short segmentNumber,  
                                         unsigned long waveformLength,  
                                         short waveform[]);
```

Purpose

Reads the waveform array from the selected segment number and waveform length for the selected channel.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

segmentNumber

Variable Type unsigned short

Selects the segment number from which to read the waveform.

Range: 0 to 65535

waveformLength

Variable Type unsigned long

Selects the length of the waveform array to read.

waveform

Variable Type short []

Passes out the waveform array read from the instrument.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_reset

```
ZT_ERROR ztwaveC_reset (ZT_HANDLE *instrumentHandle);
```

Purpose

Performs a hardware reset function that returns the instrument to the initial default condition.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_save_recall_state

```
ZT_ERROR ztwaveC_save_recall_state (ZT_HANDLE *instrumentHandle,  
                                     unsigned short state,  
                                     unsigned short stateNumber);
```

Purpose

Stores the current state of the instrument to the selected storage index in non-volatile memory or returns the state of the instrument from a stored condition.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

state

Variable Type unsigned short

Controls if a state should be stored or recalled.

Save - 0

Recall - 1

stateNumber

Variable Type unsigned short

Instrument storage index (location) control.

Range: 1 to 31

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_self_test

```
ZT_ERROR ztwaveC_self_test (ZT_HANDLE *instrumentHandle,  
                             unsigned short *self_Test_Status);
```

Purpose

Initiates an instrument self test and returns the test status register.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

self_Test_Status

Variable Type unsigned short (passed by reference)

Returns the test status register.

Valid values are:

- Bit 1 - Baseboard Test Failed Bit
- Bit 2 - SRAM Test Failed Bit
- Bit 3 - ROM Test Failed Bit
- Bit 4 - Trigger Output Test Failed Bit
- Bit 5 - Reference Oscillator Test Failed Bit
- Bit 6 to 8 - Unused Bits
- Bit 9 - AWG Test Failed Bit
- Bit 10 - Waveform RAM Test Failed Bit
- Bit 11 - Sequencer RAM Test Failed Bit
- Bit 12 - PLL Test Failed Bit
- Bit 13 to 16 - Unused Bits

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_sequence

ZT_ERROR ztwaveC_sequence (ZT_HANDLE *instrumentHandle,
 unsigned short sequenceSize,
 unsigned short advance,
 unsigned short trigger,

```
unsigned short looping,  
unsigned short repeatCount);
```

Purpose

Sets up the sequence size, advance mode, trigger mode, looping mode, and repeat count for arbitrary waveform sequencing.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

sequenceSize

Variable Type unsigned short

Sets the length of the sequence with loaded pattern/waveform segments in the sequence table.

Range: 1 to 65535

advance

Variable Type unsigned short

Sets the sequence advance mode to auto sequence advance to automatically step through the loaded segments, or to triggered sequence advance to stop and wait for a trigger at the end of each segment.

Auto - ZTWAVEC_SEQUENCE_AUTO
Triggered - ZTWAVEC_SEQUENCE_TRIG

trigger

Variable Type unsigned short

Selects the sequence trigger mode. Valid modes are to ignore next trigger until done and to restart waveform on next trigger.

Ignore - ZTWAVEC_TRIG_IGNORE
Restart - ZTWAVEC_TRIG_RESTART

looping

Variable Type unsigned short

Sets the looping mode of the instrument to looping "off" (sequence once) or looping "on" (sequence continuously). Looping off causes

the instrument to step through the sequence table once. Continuous looping mode causes the instrument to continuously repeat the entire sequence table.

Once - ZTWAVEC_LOOP_ONCE
Continuous - ZTWAVEC_LOOP_CONT

repeatCount

Variable Type unsigned short

Sets the number of times a pattern/waveform segment is repeated before going on to the next segment in the sequence table.

Range: 0 to 65535
0: Causes infinite repeat of segments.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_sequence_query

```
ZT_ERROR ztwaveC_sequence_query (ZT_HANDLE *instrumentHandle,  
                                unsigned short *sequenceSize,  
                                unsigned short *advance,  
                                unsigned short *triggered,  
                                unsigned short *looping,  
                                unsigned short *repeatCount);
```

Purpose

Returns the parameters for arbitrary waveform sequencing, such as sequence size, advance mode, trigger mode, looping mode, and repeat count.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

sequenceSize

Variable Type unsigned short (passed by reference)

Returns the length of the sequence with loaded pattern/waveform segments in the sequence table.

Range: 1 to 65535

advance

Variable Type unsigned short (passed by reference)

Returns the sequence advance mode of the instrument.

Valid return values are:

ZTWAVEC_SEQUENCE_AUTO - auto sequence advance
ZTWAVEC_SEQUENCE_TRIG - for triggered sequence advance

triggered

Variable Type unsigned short (passed by reference)

Returns the status of the sequence trigger mode.

Valid return values are:

ZTWAVEC_TRIG_IGNORE - ignore next trigger until done
ZTWAVEC_TRIG_RESTART - restart waveform on next trigger

looping

Variable Type unsigned short (passed by reference)

Returns the looping mode of the instrument. Looping off causes the instrument to step through the sequence table once. Continuous looping mode causes the instrument to continuously repeat the entire sequence table.

Valid return values are:

ZTWAVEC_LOOP_ONCE - looping off (Sequence once)
ZTWAVEC_LOOP_CONT - looping on (Sequence continuous)

repeatCount

Variable Type unsigned short (passed by reference)

Returns the number of times a pattern/waveform segment is repeated before going on to the next segment in the sequence table.

Range: 0 to 65535

0: Indicates infinite repeat of segments

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_soft_arm

```
ZT_ERROR ztwaveC_soft_arm (ZT_HANDLE *instrumentHandle,  
                           unsigned short arm_state);
```

Purpose

Arms or disarms the unit through software. If arm source is set to software, the this function is used to either arm or disarm the unit. When armed the unit will begin trigger detection. When disarmed, the unit will ignore triggers.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

arm_state

Variable Type unsigned short

Software arm control to arm or disarm the instrument.

Arm - ZTWAVEC_ARM
Disarm - ZTWAVEC_DISARM

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_soft_trigger

```
ZT_ERROR ztwaveC_soft_trigger (ZT_HANDLE *instrumentHandle);
```

Purpose

Causes an immediate trigger event for any selected trigger source. If enabled, the trigger outputs will also toggle when a trigger manual is executed.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_sync_outputs

```
ZT_ERROR ztwaveC_sync_outputs (ZT_HANDLE *instrumentHandle,  
                                unsigned short syncBit,  
                                unsigned short syncPolarity,  
                                float syncStartTime, float syncStopTime,  
                                unsigned short syncSource,  
                                unsigned short syncMode,  
                                unsigned long syncStartPosition,  
                                unsigned int syncStopPosition);
```

Purpose

Sets up the trigger and arm parameters, such as trigger source, trigger slope, trigger delay, trigger holdoff, arm source, and arm polarity.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

syncBit

Variable Type unsigned short

Selects the sync bit (1-4 or 1-8 for VXI) to set up.

- 1 - ZTWAVEC_SYNC_BIT1
- 2 - ZTWAVEC_SYNC_BIT2
- 3 - ZTWAVEC_SYNC_BIT3
- 4 - ZTWAVEC_SYNC_BIT4

VXI only

- 5 - ZTWAVEC_SYNC_BIT5
- 6 - ZTWAVEC_SYNC_BIT6
- 7 - ZTWAVEC_SYNC_BIT7
- 8 - ZTWAVEC_SYNC_BIT8

syncPolarity

Variable Type unsigned short

Selects positive going (positive polarity) or negative going

(negative polarity) for the selected sync bit.

Positive - ZTWAVEC_POLARITY_POS

Negative - ZTWAVEC_POLARITY_NEG

syncStartTime

Variable Type float

Sets the sync start time in seconds.

Range: 0 to waveform period

Resolution: 1 sample interval

(Note that these values depend on the sample clock frequency)

syncStopTime

Variable Type float

Sets the sync stop time in seconds.

Range: 0 to 2,097,152 sample intervals

Resolution: 1 sample interval

(Note that these values depend on the sample clock frequency)

syncSource

Variable Type unsigned short

Sets the two Least Significant Bits of the digital output to DAC bits (allowing full 16 bits digital output) or to user defined sync bits (allowing only the top 14 bits for digital output).

DAC - ZTWAVEC_SYNC_DAC_BIT

User - ZTWAVEC_SYNC_USER_DEFINED

syncMode

Variable Type unsigned short

Sets the Sync output mode for selecting sync position in time or points.

Time Mode - ZTWAVEC_SYNC_TIME_MODE

Position Mode - ZTWAVEC_SYNC_POSITION_MODE

syncStartPosition

Variable Type unsigned long

Sets the sync start position by sample number.

Range: 0 to max memory

Resolution: 1 sample

syncStopPosition

Variable Type unsigned int

Sets the sync stop position by sample number.

Range: 0 to max memory

Resolution: 1 sample

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_sync_outputs_query

```
ZT_ERROR ztwaveC_sync_outputs_query (ZT_HANDLE *instrumentHandle,  
                                     unsigned short syncBit,  
                                     unsigned short *syncSource,  
                                     unsigned short *syncPolarity,  
                                     float *syncStartTime,  
                                     float *syncStopTime,  
                                     unsigned long *syncStartPosition,  
                                     unsigned long *syncStopPosition);
```

Purpose

Returns the parameters for the selected sync output bits, such as polarity, start/stop time, and sync source state.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

syncBit

Variable Type unsigned short

Selects the sync bit (1-4 or 1-8 for VXI) to set up.

1 - ZTWAVEC_SYNC_BIT1
2 - ZTWAVEC_SYNC_BIT2
3 - ZTWAVEC_SYNC_BIT3
4 - ZTWAVEC_SYNC_BIT4

VXI only

5 - ZTWAVEC_SYNC_BIT5
6 - ZTWAVEC_SYNC_BIT6
7 - ZTWAVEC_SYNC_BIT7
8 - ZTWAVEC_SYNC_BIT8

syncSource

Variable Type unsigned short (passed by reference)

Returns the sync source state of the instrument.

Valid values are:

ZTWAVEC_SYNC_DAC_BIT - DAC bit Sync source
ZTWAVEC_SYNC_USER_DEFINED - user-defined Sync source

syncPolarity

Variable Type unsigned short (passed by reference)

Returns the sync polarity for the selected sync bit.

Valid values are:

ZTWAVEC_POLARITY_NEG - negative polarity
ZTWAVEC_POLARITY_POS - positive polarity

syncStartTime

Variable Type float (passed by reference)

Returns the start time of the sync pulse for the selected sync bit.

Range: 0 to 2,097,152 Sample Intervals
Resolution: 1 Sample Interval


```
float triggerHoldoff,  
unsigned short ARMSource,  
unsigned short armPolarity);
```

Purpose

Sets up the trigger and arm parameters, such as trigger source, trigger slope, trigger delay, trigger holdoff, arm source, and arm polarity.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

triggerSource

Variable Type unsigned short

Sets the source for the trigger event for the instrument. Note that if a PXI trigger is set to output (Output Trigger command) it cannot be used as an input.

Immediate (Ignore Trigger)	- ZTWAVEC_SOURCE_IMM
Software	- ZTWAVEC_SOURCE_SOFTWARE
(see Trigger Immediate command)	
TTL0	- ZTWAVEC_SOURCE_TTL0
TTL1	- ZTWAVEC_SOURCE_TTL1
TTL2	- ZTWAVEC_SOURCE_TTL2
TTL3	- ZTWAVEC_SOURCE_TTL3
TTL4	- ZTWAVEC_SOURCE_TTL4
TTL5	- ZTWAVEC_SOURCE_TTL5
TTL6	- ZTWAVEC_SOURCE_TTL6
TTL7	- ZTWAVEC_SOURCE_TTL7
PXI Star Trigger	- ZTWAVEC_SOURCE_PXI_STAR_TRIG
External Trigger Input	- ZTWAVEC_SOURCE_EXT_TRIG
VXI only	
EXT1	- ZTWAVEC_SOURCE_EXT1
EXT2	- ZTWAVEC_SOURCE_EXT2
ECL0	- ZTWAVEC_SOURCE_ECL0
ECL1	- ZTWAVEC_SOURCE_ECL1
ARM	- ZTWAVEC_SOURCE_ARM

triggerSlope

Variable Type unsigned short

Sets the active edge of the selected trigger for the instrument to rising edge or falling edge.

Rising - ZTWAVEC_TRIG_RISING
Falling - ZTWAVEC_TRIG_FALLING

triggerDelay

Variable Type float

Sets the delay in seconds for the delayed sequence generation mode. The delay may range from 0 to 655 seconds and is represented as a single-precision floating-point number. The 32-bit floating-point number is represented as two 16-bit command parameter words.

Range: 0 to 655 s

Resolution: 10 ns for 0 to 655.36 us
100 ns for 655.36 us to 6.5536 ms
1 us for 6.5536 ms to 65.536 ms
10 us for 65.536 ms to 655 ms
100 us for 655.36 ms to 6.5536 s
1 ms for 6.5536 s to 65.536 s
10 ms for 65.536 s to 655 s

triggerHoldoff

Variable Type float

Sets the trigger holdoff value. This is the length of time that the device will ignore subsequent triggers.

Range: 0 to 655 s

Resolution: 10 ns for 0 to 655.36 us
100 ns for 655.36 us to 6.5536 ms
1 us for 6.5536 ms to 65.536 ms
10 us for 65.536 ms to 655 ms
100 us for 655.36 ms to 6.5536 s
1 ms for 6.5536 s to 65.536 s
10 ms for 65.536 s to 655 s

ARMSource

Variable Type unsigned short

Determines the source that will be used to arm the unit. For example, if the arm source is set to PXI Star Trigger, the PXI Star Trigger will be used to arm the unit. If an immediate output is desired regardless of trigger, Arm source can be set to Immediate (Ignore Arm).

Immediate (Ignore Trigger) - ZTWAVEC_SOURCE_IMM
Software - ZTWAVEC_SOURCE_SOFTWARE
(see Trigger Immediate command)
TTL0 - ZTWAVEC_SOURCE_TTL0
TTL1 - ZTWAVEC_SOURCE_TTL1
TTL2 - ZTWAVEC_SOURCE_TTL2
TTL3 - ZTWAVEC_SOURCE_TTL3
TTL4 - ZTWAVEC_SOURCE_TTL4


```
float *triggerDelay,  
float *triggerHoldoff,  
unsigned short *armSource,  
unsigned short *arm_Polarity);
```

Purpose

Returns the trigger and arm parameters, such as trigger source, slope, delay, holdoff, and arm source, and polarity.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

triggerSource

Variable Type unsigned short (passed by reference)

Returns the source of the trigger event for the instrument.

Valid values are:

ZTWAVEC_SOURCE_IMM - Trigger Immediate (Ignore Trigger)
ZTWAVEC_SOURCE_SOFTWARE - Software (see Trigger Immediate command)
ZTWAVEC_SOURCE_TTL0 - TTL0
ZTWAVEC_SOURCE_TTL1 - TTL1
ZTWAVEC_SOURCE_TTL2 - TTL2
ZTWAVEC_SOURCE_TTL3 - TTL3
ZTWAVEC_SOURCE_TTL4 - TTL4
ZTWAVEC_SOURCE_TTL5 - TTL5
ZTWAVEC_SOURCE_TTL6 - TTL6
ZTWAVEC_SOURCE_TTL7 - TTL7
ZTWAVEC_SOURCE_STAR - PXI Star Trigger
ZTWAVEC_SOURCE_EXT - External Trigger Input

VXI only

ZTWAVEC_SOURCE_EXT1 - VXI External 1
ZTWAVEC_SOURCE_EXT2 - VXI External 2
ZTWAVEC_SOURCE_ECL0 - VXI ECL 0
ZTWAVEC_SOURCE_ECL1 - VXI ECL 1
ZTWAVEC_SOURCE_ARM - VXI ARM

triggerSlope

Variable Type unsigned short (passed by reference)

Returns the selected slope of the trigger for the instrument.

Valid values are:

ZTWAVEC_TRIG_RISING - rising edge
ZTWAVEC_TRIG_FALLING - falling edge

triggerDelay

Variable Type float (passed by reference)

Returns the delay in seconds for the delayed sequence generation mode. The delay may range from 0 to 655 seconds.

Range: 0 to 655 s

Resolution: 10 ns for 0 to 655.36 us
100 ns for 655.36 us to 6.5536 ms
1 us for 6.5536 ms to 65.536 ms
10 us for 65.536 ms to 655 ms
100 us for 655.36 ms to 6.5536 s
1 ms for 6.5536 s to 65.536 s
10 ms for 65.536 s to 655 s

triggerHoldoff

Variable Type float (passed by reference)

Returns the trigger holdoff in seconds for the delayed sequence generation mode. The delay may range from 0 to 655 seconds.

Range: 0 to 655 s

Resolution: 10 ns for 0 to 655.36 us
100 ns for 655.36 us to 6.5536 ms
1 us for 6.5536 ms to 65.536 ms
10 us for 65.536 ms to 655 ms
100 us for 655.36 ms to 6.5536 s
1 ms for 6.5536 s to 65.536 s
10 ms for 65.536 s to 655 s

armSource

Variable Type unsigned short (passed by reference)

Returns the source of the arm event for the instrument.

Valid values are:

Valid values are:

ZTWAVEC_SOURCE_IMM - Trigger Immediate (Ignore Trigger)
ZTWAVEC_SOURCE_SOFTWARE - Software (see Trigger Immediate command)
ZTWAVEC_SOURCE_TTL0 - TTL0
ZTWAVEC_SOURCE_TTL1 - TTL1

ZTWAVEC_SOURCE_TTL2 - TTL2
ZTWAVEC_SOURCE_TTL3 - TTL3
ZTWAVEC_SOURCE_TTL4 - TTL4
ZTWAVEC_SOURCE_TTL5 - TTL5
ZTWAVEC_SOURCE_TTL6 - TTL6
ZTWAVEC_SOURCE_TTL7 - TTL7
ZTWAVEC_SOURCE_STAR - PXI Star Trigger
ZTWAVEC_SOURCE_EXT - External Trigger Input

VXI only

ZTWAVEC_SOURCE_EXT1 - VXI External 1
ZTWAVEC_SOURCE_EXT2 - VXI External 2
ZTWAVEC_SOURCE_ECL0 - VXI ECL 0
ZTWAVEC_SOURCE_ECL1 - VXI ECL 1
ZTWAVEC_SOURCE_ARM - VXI ARM

arm_Polarity

Variable Type unsigned short (passed by reference)

Returns the arm polarity state of the unit.

Valid values are:

ZTWAVEC_POLARITY_NEG - negative polarity
ZTWAVEC_POLARITY_POS - positive polarity

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp
or check winerror.h or call FormatMessage(...) for a text description of the error code
http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_vertical

ZT_ERROR ztwaveC_vertical (ZT_HANDLE *instrumentHandle, u16 channel, unsigned short differential, float amplitude, float offset, float idleVoltage, unsigned short lowpassFilter, float loadImpedance);

Purpose

Sets the selected output channel's state

It is good practice to inactivate channels that are not in use.

Please note that some frequency/clock rate settings might be incompatible. These incompatibilities typically arise in the following scenarios:

- 1) Using a very high clock rate on one channel and a low clock rate on the other. Example: Channel 1 set to 1 MHz and channel 2 set to 1 Hz.
- 2) A single channel set to a high frequency a high frequency resolution. Example: 1.000001 MHz.
- 3) AM, FM, and tone that have insatiabile carrier and modulation frequency settings.

If these incompatibilities exist, the instrument will coerce the frequencies to the nearest compatible value. To check for incompatible settings, you should use the Horizontal Query function to read back the clock rate settings.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

differential

Variable Type unsigned short

The differential control selects the output mode.

In single-ended mode, the two pattern/waveform channels are independently loaded with unique data. In differential analog waveform mode, a complimentary analog waveform is automatically loaded into channel 2(2 or 4 in VXI) when loading channel 1(1 or 3 in VXI), creating complimentary signals on the 2 (2 or 4 in VXI) analog outputs. Note that this overwrites any waveform previously loaded into channel 2(2 or 4 in VXI). In differential digital pattern mode,

a complimentary digital pattern is automatically loaded into every other binary output when loading channel 1(1 or 3 in VXI), creating complimentary neighboring pairs on the 32 (64 in VXI) digital outputs.

Single - ZTWAVEC_DIFF_SINGLE_ENDED
Differential - ZTWAVEC_DIFF_ANALOG

amplitude

Variable Type float

Selects the output voltage range in volts. Note this setting is affected by load impedance.

50 ohms:

Range: 0Vp-p to 10.0 Vp-p
Resolution: 10e-3

High Impedance (1M ohm)

Range: 0Vp-p to 20.0 Vp-p
Resolution 20e-3

offset

Variable Type float

Sets the output voltage offset for the selected channel. Note that this is affected by load impedance.

50 ohm

Range: -5.0V to +5.0V
Resolution: 1e-3

High Impedance

Range: -10V to +10V
Resolution: 2e-3

idleVoltage

Variable Type float

Sets the output voltage (in volts) for the selected channel when the instrument is in the idle state. Note this is affected by the load impedance.

50 ohm

Range: -5.0V to +5.0V
Resolution: 1e-3

High Impedance

Range: -10V to +10V
Resolution: 2e-3

lowpassFilter

Variable Type unsigned short

The lowpass filter control sets the output filter on the selected channel. The user can decide whether to use the 10 MHz filter, bypass the filter, or let the unit decide (automatic filter select mode).

Auto - ZTWAVEC_FILT_AUTO
Filter - ZTWAVEC_FILT_10MHZ
Bypass - ZTWAVEC_FILT_BYPASS

loadImpedance

Variable Type float

Selects the output load impedance in Ohms.

Range: 40 to 100e6 Ohms

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS
ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp

ztwaveC_vertical_query

```
ZT_ERROR ztwaveC_vertical_query (ZT_HANDLE *instrumentHandle,  
                                u16 channel,  
                                unsigned short *differential,  
                                float *amplitude, float *offset,  
                                float *idleVoltage,  
                                unsigned short *lowpassFilter,  
                                float *loadImpedance);
```

Purpose

Return the vertical parameters for the selected channel, such as output state, filter state, differential, amplitude, offset, idle voltage, and load impedance.

Parameter List

instrumentHandle

Variable Type ZT_HANDLE *

This control returns an Instrument Handle that is used in all subsequent function calls to differentiate between different sessions of this instrument driver. Each time this function is invoked a Unique Session is opened. It is possible to have more than one session open for the same resource.

channel

Variable Type u16

The channel control selects the channel whose state is changed

Channel 1 - ZTWAVEC_CH1
Channel 2 - ZTWAVEC_CH2
Channel 3 - ZTWAVEC_CH3
Channel 4 - ZTWAVEC_CH4

differential

Variable Type unsigned short (passed by reference)

Returns the selected output mode. In single-ended mode, the two pattern/waveform channels are independently loaded with unique data. In differential analog waveform mode, a complimentary analog waveform is automatically loaded into channel 2 when loading channel 1, creating complimentary signals on the 2 analog outputs. Note that this overwrites any waveform previously loaded into channel 2. In differential digital pattern mode, a complimentary digital pattern is automatically loaded into every other binary output when loading channel 1, creating complimentary neighboring pairs on the 32 digital outputs.

Valid return values are:

ZTWAVEC_DIFF_SINGLE_ENDED - normal single-ended mode
ZTWAVEC_DIFF_ANALOG - differential analog mode

amplitude

Variable Type float (passed by reference)

Returns the amplitude setting of the selected channel. This is affected by load impedance.

50 ohms:

Range: 0Vp-p to 10.0 Vp-p
Resolution: 10e-3

High Impedance (1M ohm)

Range: 0Vp-p to 20.0 Vp-p
Resolution 20e-3

offset

Variable Type float (passed by reference)

Returns the offset setting of the selected channel. Note that this is affected by load impedance.

50 ohm

Range: -5.0V to +5.0V

Resolution: 1e-3

High Impedance

Range: -10V to +10V

Resolution: 2e-3

idleVoltage

Variable Type float (passed by reference)

Returns the idle voltage setting of the selected channel. Note this is affected by the load impedance.

50 ohm

Range: -5.0V to +5.0V

Resolution: 1e-3

High Impedance

Range: -10V to +10V

Resolution: 2e-3

lowpassFilter

Variable Type unsigned short (passed by reference)

Returns the output filter state for the selected channel.

Valid return values are:

ZTWAVEC_FILT_BYPASS - off (bypass filter)

ZTWAVEC_FILT_10MHZ - on (10 MHz filter)

loadImpedance

Variable Type float (passed by reference)

Returns the output load impedance in Ohms.

Range: 40 to 100e6 Ohms

Return Value

This control contains the status code returned by the function call.

Return success or failure:

ZT_SUCCESS

ZT_FAILURE

If failure, run GetLastError() to determine error code.

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/system_error_codes.asp

or check winerror.h or call FormatMessage(...) for a text description of the error code

http://msdn.microsoft.com/library/default.asp?url=/library/en-us/debug/base/retrieving_the_last_error_code.asp