

Standard WSA API Library

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Contents

1	Introduction	1
1.1	Limitations in v1.0	1
1.2	How to use the library	1
2	Data Structure Index	1
2.1	Data Structures	1
3	File Index	2
3.1	File List	2
4	Data Structure Documentation	2
4.1	wsa_descriptor Struct Reference	2
4.1.1	Field Documentation	3
4.2	wsa_device Struct Reference	4
4.2.1	Field Documentation	4
4.3	wsa_frame_header Struct Reference	5
4.3.1	Field Documentation	5
4.4	wsa_resp Struct Reference	6
4.5	wsa_socket Struct Reference	6
4.5.1	Field Documentation	6
4.6	wsa_time Struct Reference	6
4.6.1	Field Documentation	7
5	File Documentation	7
5.1	wsa_api.cpp File Reference	7
5.1.1	Define Documentation	8
5.1.2	Function Documentation	8
5.2	wsa_api.h File Reference	18
5.2.1	Enumeration Type Documentation	19
5.2.2	Function Documentation	20
5.3	wsa_error.h File Reference	29
5.3.1	Define Documentation	31
5.3.2	Function Documentation	33
5.4	wsa_lib.txt File Reference	34

5.4.1 Detailed Description	34
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1 Introduction

This documentation, compiled using Doxygen, describes in details the `wsa_api` library. The `wsa_api` provides functions to set/get particular settings or acquire data from the WSA. The `wsa_api` encodes the commands into SCPI syntax scripts, which are sent to a WSA through the `wsa_lib` library. Subsequently, it decodes any responses or packet coming back from the WSA through the `wsa_lib`. Thus, the API helps to abstract away SCPI syntax from the user.

Data frames passing back from the `wsa_lib` are in VRT format. This API will extract the information and the actual data frames within the VRT packet and makes them available in structures and buffers for users.

1.1 Limitations in v1.0

The following features are not yet supported with the CLI:

- DC correction. Need Nikhil to clarify on that.
- IQ correction. Same as above.
- Automatic finding of a WSA box(s) on a network.
- Set sample sizes. 1024 size for now.
- Triggers.
- Gain calibration. TBD with triggers.
- USB interface method - might never be available.

1.2 How to use the library

The `wsa_api` is designed using mixed C/C++ languages. To use the library, you need to include the header file, [wsa_api.h](#), in files that will use any of its functions to access a WSA, and a link to the `wsa_api.lib`.

2 Data Structure Index

2.1 Data Structures

Here are the data structures with brief descriptions:

[wsa_descriptor](#) (This structure stores WSA information) 2

wsa_device (A structure containing the components associate with each WSA device)	4
wsa_frame_header (This structure contains header information related to each frame read by <code>wsa_get_frame()</code>)	5
wsa_resp (This structure contains the response information for each query)	6
wsa_socket (A structure containing the socket parameters used for creating TCP/IP connection for control and data acquisition)	6
wsa_time (This structure contains the time information. It is used for the time stamp in a frame header)	6

3 File Index

3.1 File List

Here is a list of all files with brief descriptions:

wsa_api.cpp	7
wsa_api.h	18
wsa_error.h	29

4 Data Structure Documentation

4.1 `wsa_descriptor` Struct Reference

This structure stores WSA information.

Data Fields

- char [prod_name](#) [50]
- char [prod_serial](#) [20]
- char [prod_version](#) [20]
- char [rfe_name](#) [50]
- char [rfe_version](#) [20]
- char [fw_version](#) [20]
- char [intf_type](#) [20]
- uint64_t [inst_bw](#)
- uint64_t [max_sample_size](#)
- uint64_t [max_tune_freq](#)
- uint64_t [min_tune_freq](#)

- uint64_t [freq_resolution](#)
- float [max_if_gain](#)
- float [min_if_gain](#)
- float [abs_max_amp](#) [NUM_RF_GAINS]

4.1.1 Field Documentation

4.1.1.1 float [abs_max_amp](#)

An array storing the absolute maximum RF input level in dBm for each RF gain setting of the RFE use. Operating a WSA device at these absolute maximums may cause damage to the device.

4.1.1.2 uint64_t [freq_resolution](#)

The frequency resolution in Hz that a WSA's centre frequency can be incremented.

4.1.1.3 char [fw_version](#)

The firmware version currently in the WSA.

4.1.1.4 uint64_t [inst_bw](#)

The WSA instantaneous bandwidth in Hz.

4.1.1.5 char [intf_type](#)

The interface method to a WSA. Available: "TCPIP" ("USB" TBD).

4.1.1.6 float [max_if_gain](#)

The maximum IF gain in dB that a WSA's RFE can be set.

4.1.1.7 uint64_t [max_sample_size](#)

The maximum number of continuous I and Q data samples the WSA can capture per frame.

4.1.1.8 uint64_t [max_tune_freq](#)

The maximum frequency in Hz that a WSA's RFE can be tuned to.

4.1.1.9 float [min_if_gain](#)

The minimum IF gain in dB that a WSA's RFE can be set.

4.1.1.10 uint64_t [min_tune_freq](#)

The minimum frequency in Hz that a WSA's RFE can be tuned to.

4.1.1.11 char prod_name

WSA product name.

4.1.1.12 char prod_serial

WSA product serial number.

4.1.1.13 char prod_version

WSA product version number.

4.1.1.14 char rfe_name

WSA product name.

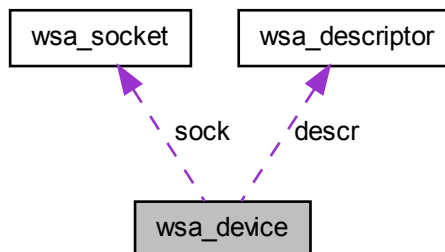
4.1.1.15 char rfe_version

WSA product version number.

4.2 wsa_device Struct Reference

A structure containing the components associate with each WSA device.

Collaboration diagram for wsa_device:



Data Fields

- struct [wsa_descriptor](#) `descr`
- struct [wsa_socket](#) `sock`

4.2.1 Field Documentation

4.2.1.1 struct wsa_descriptor descr

The information component of the WSA, stored in [wsa_descriptor](#).

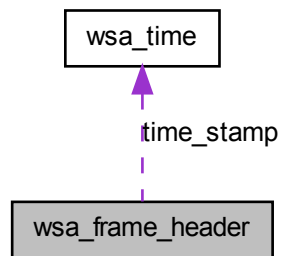
4.2.1.2 struct wsa_socket sock

The socket structure component of the WSA, used for TCPIP connection.

4.3 wsa_frame_header Struct Reference

This structure contains header information related to each frame read by [wsa_get_frame\(\)](#).

Collaboration diagram for [wsa_frame_header](#):



Data Fields

- char [prod_serial](#) [20]
- uint64_t [freq](#)
- char [gain](#) [10]
- uint32_t [sample_size](#)
- struct [wsa_time](#) [time_stamp](#)

4.3.1 Field Documentation

4.3.1.1 uint64_t freq

The center frequency (Hz) to which the RF PLL is tuned.

4.3.1.2 char gain

The amplification in the radio front end at the time a WSA data frame is captured.

4.3.1.3 char prod_serial

WSA product version number.

4.3.1.4 uint32_t sample_size

Number of {I, Q} samples pairs per WSA data frame.

4.3.1.5 struct wsa_time time_stamp

The time when a data frame capture begins, stored in [wsa_time](#) structure.

4.4 wsa_resp Struct Reference

This structure contains the response information for each query.

4.5 wsa_socket Struct Reference

A structure containing the socket parameters used for creating TCP/IP connection for control and data acquisition.

Data Fields

- SOCKET [cmd](#)
- SOCKET [data](#)

4.5.1 Field Documentation

4.5.1.1 SOCKET cmd

The command socket for command controls and queries. The string protocol used for this socket is HISLIP.

4.5.1.2 SOCKET data

The data socket used for streaming of data

4.6 wsa_time Struct Reference

This structure contains the time information. It is used for the time stamp in a frame header.

Data Fields

- int32_t [sec](#)
- uint32_t [nsec](#)

4.6.1 Field Documentation

4.6.1.1 `int32_t nsec`

Nanoseconds after the second (0 - 999 999 999).

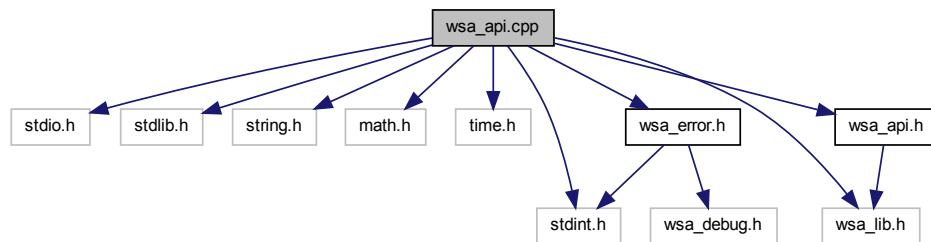
4.6.1.2 `int32_t sec`

The number of seconds elapsed since 00:00 hours, Jan 1, 1970 UTC.

5 File Documentation

5.1 `wsa_api.cpp` File Reference

Include dependency graph for `wsa_api.cpp`:



Defines

- `#define` [MAX_ANT_PORT](#) 2

Functions

- `int16_t` [wsa_verify_freq](#) (struct [wsa_device](#) *dev, `uint64_t` freq)
- `int16_t` [wsa_open](#) (struct [wsa_device](#) *dev, char *intf_method)
- void [wsa_close](#) (struct [wsa_device](#) *dev)
- `int16_t` [wsa_check_addr](#) (char *ip_addr)
- `int16_t` [wsa_list](#) (char **wsa_list)
- `int16_t` [wsa_is_connected](#) (struct [wsa_device](#) *dev)
- `int16_t` [wsa_set_command_file](#) (struct [wsa_device](#) *dev, char *file_name)
- float [wsa_get_abs_max_amp](#) (struct [wsa_device](#) *dev, [wsa_gain](#) gain)
- `int64_t` [wsa_read_pkt](#) (struct [wsa_device](#) *dev, struct [wsa_frame_header](#) *header, `int16_t` *i_buf, `int16_t` *q_buf, const `uint64_t` sample_size)

- `int64_t wsa_get_freq` (struct `wsa_device` *dev)
- `int16_t wsa_set_freq` (struct `wsa_device` *dev, `uint64_t` cfreq)
- `float wsa_get_gain_if` (struct `wsa_device` *dev)
- `int16_t wsa_set_gain_if` (struct `wsa_device` *dev, `float` gain)
- `wsa_gain wsa_get_gain_rf` (struct `wsa_device` *dev)
- `int16_t wsa_set_gain_rf` (struct `wsa_device` *dev, `wsa_gain` gain)
- `int16_t wsa_get_antenna` (struct `wsa_device` *dev)
- `int16_t wsa_set_antenna` (struct `wsa_device` *dev, `uint8_t` port_num)
- `int16_t wsa_get_bpf` (struct `wsa_device` *dev)
- `int16_t wsa_set_bpf` (struct `wsa_device` *dev, `uint8_t` mode)
- `int16_t wsa_get_lpf` (struct `wsa_device` *dev)
- `int16_t wsa_set_lpf` (struct `wsa_device` *dev, `uint8_t` mode)
- `int16_t wsa_query_cal_mode` (struct `wsa_device` *dev)
- `int16_t wsa_run_cal_mode` (struct `wsa_device` *dev, `uint8_t` mode)

5.1.1 Define Documentation

5.1.1.1 #define MAX_ANT_PORT 2

5.1.2 Function Documentation

5.1.2.1 `int16_t wsa_check_addr (char * ip_addr)`

Verify if the IP address or host name given is valid for the WSA.

Parameters

<code>ip_addr</code>	- A char pointer to the IP address or host name to be verified.
----------------------	---

Returns

1 if the IP is valid, or a negative number on error.

Here is the call graph for this function:



5.1.2.2 `void wsa_close (struct wsa_device * dev)`

Closes the device handle if one is opened and stops any existing data capture.

Parameters

<i>dev</i> - A pointer to a WSA device structure to be closed.
--

Returns

none

5.1.2.3 float wsa_get_abs_max_amp (struct wsa_device * dev, wsa_gain gain)

Gets the absolute maximum RF input level (dBm) for the WSA at the given gain setting.
Operating the WSA device at the absolute maximum may cause damage to the device.

Parameters

<i>dev</i> - A pointer to the WSA device structure.
<i>gain</i> - The gain setting of wsa_gain type at which the absolute maximum amplitude input level is to be retrieved.

Returns

The absolute maximum RF input level in dBm or negative error number.

5.1.2.4 int16_t wsa_get_antenna (struct wsa_device * dev)

Gets which antenna port is currently in used with the RFE board.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

The antenna port number on success, or a negative number on error.

5.1.2.5 int16_t wsa_get_bpf (struct wsa_device * dev)

Gets the current mode of the RFE's preselect BPF stage.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

1 (on), 0 (off), or a negative number on error.

5.1.2.6 int64_t wsa_get_freq (struct wsa_device * dev)

Retrieves the center frequency that the WSA is running at.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

The frequency in Hz, or a negative number on error.

5.1.2.7 float wsa_get_gain_if (struct wsa_device * dev)

Gets the current IF gain value of the RFE in dB.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

The gain value in dB, or a large negative number on error.

5.1.2.8 wsa_gain wsa_get_gain_rf (struct wsa_device * dev)

Gets the current quantized RF front end gain setting of the RFE.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

The gain setting of wsa_gain type, or a negative number on error.

5.1.2.9 int16_t wsa_get_lpf (struct wsa_device * dev)

Gets the current mode of the RFE's internal anti-aliasing LPF.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

1 (on), 0 (off), or a negative number on error.

5.1.2.10 int16_t wsa_is_connected (struct wsa_device * dev)

Indicates if the WSA is still connected to the PC.

Parameters

<i>dev</i> - A pointer to the WSA device structure to be verified for the connection.

Returns

1 if it is connected, 0 if not connected, or a negative number if errors.

5.1.2.11 int16_t wsa_list (char ** wsa_list)

Count and print out the IPs of connected WSAs to the network? or the PC??? For now, will list the IPs for any of the connected devices to a PC?

Parameters

<i>wsa_list</i>	- A double char pointer to store (WSA???) IP addresses connected to a network???.
-----------------	---

Returns

Number of connected WSAs (or IPs for now) on success, or a negative number on error.

5.1.2.12 int16_t wsa_open (struct wsa_device * dev, char * intf_method)

Establishes a connection of choice specified by the interface method to the WSA.

At success, the handle remains open for future access by other library methods until [wsa_close\(\)](#) is called. When unsuccessful, the WSA will be closed automatically and an error is returned.

Parameters

<i>dev</i>	- A pointer to the WSA device structure to be opened.
<i>intf_method</i>	- A char pointer to store the interface method to the WSA. Possible methods: <ul style="list-style-type: none"> • With LAN, use: "TCPIP::<ip address="" of="" the="" wsa="">::HISLIP"</ip> • With USB, use: "USB" (check if supported with the WSA version used).

Returns

0 on success, or a negative number on error.

Errors:

Situations that will generate an error are:

- the interface method does not exist for the WSA product version.
- the WSA is not detected (has not been connected or powered up).
-

5.1.2.13 int16_t wsa_query_cal_mode (struct wsa_device * dev)

Checks if the RFE's internal calibration has finished or not.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

1 if the calibration is still running or 0 if completed, or a negative number on error.

5.1.2.14 `int64_t wsa_read_pkt (struct wsa_device * dev, struct wsa_frame_header * header, int16_t * i_buf, int16_t * q_buf, const uint64_t sample_size)`

Reads a frame of data. *Each* frame consists of a header, and I and Q buffers of data of length determine by the **sample_size** parameter.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>header</i>	- A pointer to wsa_frame_header structure to store information for the frame.
<i>i_buf</i>	- A 16-bit signed integer pointer for the unscaled, I data buffer with size specified by the <i>sample_size</i> .
<i>q_buf</i>	- A 16-bit signed integer pointer for the unscaled Q data buffer with size specified by the <i>sample_size</i> .
<i>sample_size</i>	- A 64-bit unsigned integer sample size (i.e. {I, Q} sample pairs) per data frame to be captured. The frame size is limited to a maximum number, max_sample_size , listed in the wsa_descriptor structure.

Returns

The number of data samples read upon success, or a negative number on error.

5.1.2.15 `int16_t wsa_run_cal_mode (struct wsa_device * dev, uint8_t mode)`

Runs the RFE'S internal calibration mode or cancel it.

While the calibration mode is running, no other commands should be running until the calibration is finished by using [wsa_query_cal_mode\(\)](#), or could be cancelled

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 1 - Run, 0 - Cancel.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.1.2.16 int16_t wsa_set_antenna (struct wsa_device * dev, uint8_t port_num)

Sets the antenna port to be used for the RFE board.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>port_num</i>	- An integer port number to used. Available ports: 1, 2. Or see product datasheet for ports availability. Note: When calibration mode is enabled through wsa_run_cal_mode() , these antenna ports will not be available. The selected port will resume when the calibration mode is set to off.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.1.2.17 int16_t wsa_set_bpf (struct wsa_device * dev, uint8_t mode)

Sets the RFE's preselect band pass filter (BPF) stage on or off (bypassing).

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 0 - Off, 1 - On.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.1.2.18 int16_t wsa_set_command_file (struct wsa_device * dev, char * file_name)

Read command line(s) stored in the given **file_name** and set each line to the WSA.

Remarks

- Assuming each command line is for a single function followed by a new line.
- Currently read only SCPI commands. Other types of commands, TBD.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>file_name</i>	- A pointer to the file name

Returns

Number of command lines at success, or a negative error number.

5.1.2.19 int16_t wsa_set_freq (struct wsa_device * dev, uint64_t cfreq)

Sets the WSA to the desired center frequency, **cfreq**.

Remarks

[wsa_set_freq\(\)](#) will return error if trigger mode is already running. See the **descr** component of **wsa_dev** structure for maximum/minimum frequency values.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>cfreq</i>	- The center frequency to set, in Hz

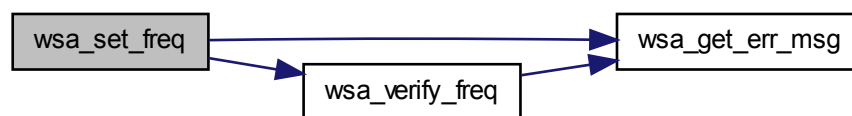
Returns

0 on success, or a negative number on error.

Errors:

- Frequency out of range.
- Set frequency when WSA is in trigger mode.
- Incorrect frequency resolution (check with data sheet).

Here is the call graph for this function:

**5.1.2.20 int16_t wsa_set_gain_if (struct wsa_device * dev, float gain)**

Sets the gain value in dB for the variable IF gain stages of the RFE, which is additive to the primary RF quantized gain stages ([wsa_set_gain_rf\(\)](#)).

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>gain</i>	- The gain level in dB.

Remarks

See the **descr** component of **wsa_dev** structure for maximum/minimum IF gain values. ???

Returns

0 on success, or a negative number on error.

Errors:

- Gain level out of range.

Here is the call graph for this function:



5.1.2.21 `int16_t wsa_set_gain_rf (struct wsa_device * dev, wsa_gain gain)`

Sets the quantized **gain** (sensitivity) level for the RFE of the WSA.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>gain</i>	- The gain setting of type <code>wsa_gain</code> to set for WSA. Valid gain settings are: <ul style="list-style-type: none">• <code>WSA_GAIN_HIGH</code>• <code>WSA_GAIN_MEDIUM</code>• <code>WSA_GAIN_LOW</code>• <code>WSA_GAIN_VLOW</code>

Returns

0 on success, or a negative number on error.

Errors:

- Gain setting not allow.

Here is the call graph for this function:



5.1.2.22 `int16_t wsa_set_lpf (struct wsa_device * dev, uint8_t mode)`

Sets the internal anti-aliasing low pass filter (LPF) on or off (bypassing).

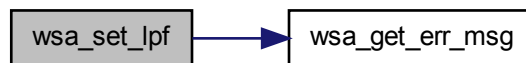
Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 0 - Off, 1 - On.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



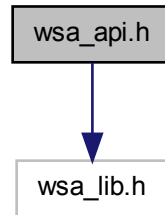
5.1.2.23 `int16_t wsa_verify_freq (struct wsa_device * dev, uint64_t freq)`

Here is the call graph for this function:

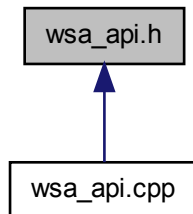


5.2 wsa_api.h File Reference

Include dependency graph for wsa_api.h:



This graph shows which files directly or indirectly include this file:



Data Structures

- struct [wsa_descriptor](#)
This structure stores WSA information.
- struct [wsa_time](#)
This structure contains the time information. It is used for the time stamp in a frame header.
- struct [wsa_frame_header](#)
This structure contains header information related to each frame read by wsa_get_frame().
- struct [wsa_socket](#)

A structure containing the socket parameters used for creating TCP/IP connection for control and data acquisition.

- struct [wsa_device](#)

A structure containing the components associate with each WSA device.

Enumerations

- enum [wsa_gain](#) { [WSA_GAIN_HIGH](#) = 1, [WSA_GAIN_MEDIUM](#), [WSA_GAIN_LOW](#), [WSA_GAIN_VLOW](#) }

Functions

- int16_t [wsa_open](#) (struct [wsa_device](#) *dev, char *intf_method)
- void [wsa_close](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_check_addr](#) (char *intf_method)
- int16_t [wsa_list](#) (char **wsa_list)
- int16_t [wsa_is_connected](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_command_file](#) (struct [wsa_device](#) *dev, char *file_name)
- float [wsa_get_abs_max_amp](#) (struct [wsa_device](#) *dev, [wsa_gain](#) gain)
- int64_t [wsa_read_pkt](#) (struct [wsa_device](#) *dev, struct [wsa_frame_header](#) *header, int16_t *i_buf, int16_t *q_buf, const uint64_t sample_size)
- int64_t [wsa_get_freq](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_freq](#) (struct [wsa_device](#) *dev, uint64_t cfreq)
- float [wsa_get_gain_if](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_gain_if](#) (struct [wsa_device](#) *dev, float gain)
- [wsa_gain](#) [wsa_get_gain_rf](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_gain_rf](#) (struct [wsa_device](#) *dev, [wsa_gain](#) gain)
- int16_t [wsa_get_antenna](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_antenna](#) (struct [wsa_device](#) *dev, uint8_t port_num)
- int16_t [wsa_get_bpf](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_bpf](#) (struct [wsa_device](#) *dev, uint8_t mode)
- int16_t [wsa_get_lpf](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_set_lpf](#) (struct [wsa_device](#) *dev, uint8_t mode)
- int16_t [wsa_query_cal_mode](#) (struct [wsa_device](#) *dev)
- int16_t [wsa_run_cal_mode](#) (struct [wsa_device](#) *dev, uint8_t mode)

5.2.1 Enumeration Type Documentation

5.2.1.1 enum [wsa_gain](#)

Defines the RF quantized gain settings available for the radio front end (RFE) of the WSA.

Enumerator:

WSA_GAIN_HIGH High RF amplification. Value 1.

WSA_GAIN_MEDIUM Medium RF amplification.

WSA_GAIN_LOW Low RF amplification.

WSA_GAIN_VLOW Very low RF amplification.

5.2.2 Function Documentation

5.2.2.1 int16_t wsa_check_addr (char * ip_addr)

Verify if the IP address or host name given is valid for the WSA.

Parameters

<i>ip_addr</i> - A char pointer to the IP address or host name to be verified.
--

Returns

1 if the IP is valid, or a negative number on error.

Here is the call graph for this function:



5.2.2.2 void wsa_close (struct wsa_device * dev)

Closes the device handle if one is opened and stops any existing data capture.

Parameters

<i>dev</i> - A pointer to a WSA device structure to be closed.
--

Returns

none

5.2.2.3 float wsa_get_abs_max_amp (struct wsa_device * dev, wsa_gain gain)

Gets the absolute maximum RF input level (dBm) for the WSA at the given gain setting.

Operating the WSA device at the absolute maximum may cause damage to the device.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>gain</i>	- The gain setting of wsa_gain type at which the absolute maximum amplitude input level is to be retrieved.

Returns

The absolute maximum RF input level in dBm or negative error number.

5.2.2.4 int16_t wsa_get_antenna (struct wsa_device * dev)

Gets which antenna port is currently in used with the RFE board.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

Returns

The antenna port number on success, or a negative number on error.

5.2.2.5 int16_t wsa_get_bpf (struct wsa_device * dev)

Gets the current mode of the RFE's preselect BPF stage.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

Returns

1 (on), 0 (off), or a negative number on error.

5.2.2.6 int64_t wsa_get_freq (struct wsa_device * dev)

Retrieves the center frequency that the WSA is running at.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

Returns

The frequency in Hz, or a negative number on error.

5.2.2.7 float wsa_get_gain_if (struct wsa_device * dev)

Gets the current IF gain value of the RFE in dB.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

Returns

The gain value in dB, or a large negative number on error.

5.2.2.8 wsa_gain wsa_get_gain_rf (struct wsa_device * dev)

Gets the current quantized RF front end gain setting of the RFE.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

The gain setting of wsa_gain type, or a negative number on error.

5.2.2.9 int16_t wsa_get_lpf (struct wsa_device * dev)

Gets the current mode of the RFE's internal anti-aliasing LPF.

Parameters

<i>dev</i> - A pointer to the WSA device structure.

Returns

1 (on), 0 (off), or a negative number on error.

5.2.2.10 int16_t wsa_is_connected (struct wsa_device * dev)

Indicates if the WSA is still connected to the PC.

Parameters

<i>dev</i> - A pointer to the WSA device structure to be verified for the connection.

Returns

1 if it is connected, 0 if not connected, or a negative number if errors.

5.2.2.11 int16_t wsa_list (char ** wsa_list)

Count and print out the IPs of connected WSAs to the network? or the PC??? For now, will list the IPs for any of the connected devices to a PC?

Parameters

<i>wsa_list</i> - A double char pointer to store (WSA???) IP addresses connected to a network???
--

Returns

Number of connected WSAs (or IPs for now) on success, or a negative number on

error.

5.2.2.12 int16_t wsa_open (struct wsa_device * dev, char * intf_method)

Establishes a connection of choice specified by the interface method to the WSA.

At success, the handle remains open for future access by other library methods until [wsa_close\(\)](#) is called. When unsuccessful, the WSA will be closed automatically and an error is returned.

Parameters

<i>dev</i>	- A pointer to the WSA device structure to be opened.
<i>intf_method</i>	- A char pointer to store the interface method to the WSA. Possible methods: <ul style="list-style-type: none"> • With LAN, use: "TCP/IP::<Ip address of the WSA>::HISLIP" • With USB, use: "USB" (check if supported with the WSA version used).

Returns

0 on success, or a negative number on error.

Errors:

Situations that will generate an error are:

- the interface method does not exist for the WSA product version.
- the WSA is not detected (has not been connected or powered up).
-

5.2.2.13 int16_t wsa_query_cal_mode (struct wsa_device * dev)

Checks if the RFE's internal calibration has finished or not.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

Returns

1 if the calibration is still running or 0 if completed, or a negative number on error.

5.2.2.14 int64_t wsa_read_pkt (struct wsa_device * dev, struct wsa_frame_header * header, int16_t * i_buf, int16_t * q_buf, const uint64_t sample_size)

Reads a frame of data. *Each* frame consists of a header, and I and Q buffers of data of length determine by the **sample_size** parameter.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
------------	--

<i>header</i>	- A pointer to wsa_frame_header structure to store information for the frame.
<i>i_buf</i>	- A 16-bit signed integer pointer for the unscaled, I data buffer with size specified by the <i>sample_size</i> .
<i>q_buf</i>	- A 16-bit signed integer pointer for the unscaled Q data buffer with size specified by the <i>sample_size</i> .
<i>sample_size</i>	- A 64-bit unsigned integer sample size (i.e. {I, Q} sample pairs) per data frame to be captured. The frame size is limited to a maximum number, max_sample_size , listed in the wsa_descriptor structure.

Returns

The number of data samples read upon success, or a negative number on error.

5.2.2.15 `int16_t wsa_run_cal_mode (struct wsa_device * dev, uint8_t mode)`

Runs the RFE'S internal calibration mode or cancel it.

While the calibration mode is running, no other commands should be running until the calibration is finished by using [wsa_query_cal_mode\(\)](#), or could be cancelled

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 1 - Run, 0 - Cancel.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.2.2.16 `int16_t wsa_set_antenna (struct wsa_device * dev, uint8_t port_num)`

Sets the antenna port to be used for the RFE board.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>port_num</i>	- An integer port number to used. Available ports: 1, 2. Or see product datasheet for ports availability. Note: When calibration mode is enabled through wsa_run_cal_mode() , these antenna ports will not be available. The seleted port will resume when the calibration mode is set to off.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.2.2.17 int16_t wsa_set_bpf (struct wsa_device * dev, uint8_t mode)

Sets the RFE's preselect band pass filter (BPF) stage on or off (bypassing).

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 0 - Off, 1 - On.

Returns

0 on success, or a negative number on error.

Here is the call graph for this function:



5.2.2.18 `int16_t wsa_set_command_file (struct wsa_device * dev, char * file_name)`

Read command line(s) stored in the given **file_name** and set each line to the WSA.

Remarks

- Assuming each command line is for a single function followed by a new line.
- Currently read only SCPI commands. Other types of commands, TBD.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>file_name</i>	- A pointer to the file name

Returns

Number of command lines at success, or a negative error number.

5.2.2.19 `int16_t wsa_set_freq (struct wsa_device * dev, uint64_t cfreq)`

Sets the WSA to the desired center frequency, **cfreq**.

Remarks

[wsa_set_freq\(\)](#) will return error if trigger mode is already running. See the **descr** component of **wsa_dev** structure for maximum/minimum frequency values.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>cfreq</i>	- The center frequency to set, in Hz

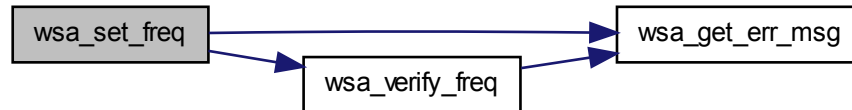
Returns

0 on success, or a negative number on error.

Errors:

- Frequency out of range.
- Set frequency when WSA is in trigger mode.
- Incorrect frequency resolution (check with data sheet).

Here is the call graph for this function:



5.2.2.20 int16_t wsa_set_gain_if (struct wsa_device * dev, float gain)

Sets the gain value in dB for the variable IF gain stages of the RFE, which is additive to the primary RF quantized gain stages ([wsa_set_gain_rf\(\)](#)).

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>gain</i>	- The gain level in dB.

Remarks

See the **descr** component of **wsa_dev** structure for maximum/minimum IF gain values. ???

Returns

0 on success, or a negative number on error.

Errors:

- Gain level out of range.

Here is the call graph for this function:



5.2.2.21 int16_t wsa_set_gain_rf (struct wsa_device * dev, wsa_gain gain)

Sets the quantized **gain** (sensitivity) level for the RFE of the WSA.

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>gain</i>	- The gain setting of type <code>wsa_gain</code> to set for WSA. Valid gain settings are: <ul style="list-style-type: none">• <code>WSA_GAIN_HIGH</code>• <code>WSA_GAIN_MEDIUM</code>• <code>WSA_GAIN_LOW</code>• <code>WSA_GAIN_VLOW</code>

Returns

0 on success, or a negative number on error.

Errors:

- Gain setting not allow.

Here is the call graph for this function:



5.2.2.22 int16_t wsa_set_lpf (struct wsa_device * dev, uint8_t mode)

Sets the internal anti-aliasing low pass filter (LPF) on or off (bypassing).

Parameters

<i>dev</i>	- A pointer to the WSA device structure.
<i>mode</i>	- An integer mode of selection: 0 - Off, 1 - On.

Returns

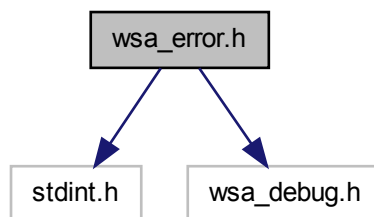
0 on success, or a negative number on error.

Here is the call graph for this function:

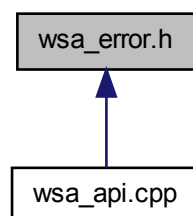


5.3 wsa_error.h File Reference

Include dependency graph for `wsa_error.h`:



This graph shows which files directly or indirectly include this file:



Defines

- `#define LNEG_NUM` (-10000)
- `#define WSA_ERR_NOWSA` (LNEG_NUM - 1)
- `#define WSA_ERR_INVIPADDRESS` (LNEG_NUM - 2)
- `#define WSA_ERR_NOCTRLPIPE` (LNEG_NUM - 3)
- `#define WSA_ERR_UNKNOWNPRODSE` (LNEG_NUM - 4)
- `#define WSA_ERR_UNKNOWNPRODSN` (LNEG_NUM - 5)
- `#define WSA_ERR_UNKNOWNFWRVSN` (LNEG_NUM - 6)
- `#define WSA_ERR_UNKNOWNRFEVSN` (LNEG_NUM - 7)
- `#define WSA_ERR_PRODOBSOLETE` (LNEG_NUM - 8)
- `#define WSA_ERR_WSANOTRDY` (LNEG_NUM - 101)
- `#define WSA_ERR_WSAINUSE` (LNEG_NUM - 102)
- `#define WSA_ERR_SETFAILED` (LNEG_NUM - 103)
- `#define WSA_ERR_OPENFAILED` (LNEG_NUM - 104)
- `#define WSA_ERR_INITFAILED` (LNEG_NUM - 105)
- `#define WSA_ERR_INVADCCORRVALUE` (LNEG_NUM - 106)
- `#define WSA_ERR_INVINTFMETHOD` (LNEG_NUM - 201)
- `#define WSA_ERR_INVIPHOSADDRESS` (LNEG_NUM - 202)
- `#define WSA_ERR_USBNOTAVBL` (LNEG_NUM - 203)
- `#define WSA_ERR_USBOPENFAILED` (LNEG_NUM - 204)
- `#define WSA_ERR_USBINITFAILED` (LNEG_NUM - 205)
- `#define WSA_ERR_ETHERNETNOTAVBL` (LNEG_NUM - 206)
- `#define WSA_ERR_ETHERNETCONNECTFAILED` (LNEG_NUM - 207)
- `#define WSA_ERR_ETHERNETINITFAILED` (LNEG_NUM - 209)
- `#define WSA_ERR_WINSOCKSTARTUPFAILED` (LNEG_NUM - 210)
- `#define WSA_ERR_SOCKETSETFUPFAILED` (LNEG_NUM - 211)
- `#define WSA_ERR_INVAMP` (LNEG_NUM - 301)
- `#define WSA_ERR_NODATABUS` (LNEG_NUM - 401)
- `#define WSA_ERR_READFRAMEFAILED` (LNEG_NUM - 402)
- `#define WSA_ERR_INVSAMPLESIZE` (LNEG_NUM - 403)
- `#define WSA_ERR_FREQOUTOFBOUND` (LNEG_NUM - 601)
- `#define WSA_ERR_INVFREQRES` (LNEG_NUM - 602)
- `#define WSA_ERR_FREQSETFAILED` (LNEG_NUM - 603)
- `#define WSA_ERR_PLLLOCKFAILED` (LNEG_NUM - 604)
- `#define WSA_ERR_INVRFGAIN` (LNEG_NUM - 801)
- `#define WSA_ERR_INVIFGAIN` (LNEG_NUM - 802)
- `#define WSA_ERR_IFGAINSETFAILED` (LNEG_NUM - 803)
- `#define WSA_ERR_RFGAINSETFAILED` (LNEG_NUM - 804)
- `#define WSA_ERR_INVRUNMODE` (LNEG_NUM - 1001)
- `#define WSA_ERR_INVTRIGID` (LNEG_NUM - 1201)
- `#define WSA_ERR_INVSTOPFREQ` (LNEG_NUM - 1202)
- `#define WSA_ERR_STARTOOB` (LNEG_NUM - 1203)
- `#define WSA_ERR_STOPOOB` (LNEG_NUM - 1204)
- `#define WSA_ERR_INVSTARTRES` (LNEG_NUM - 1205)
- `#define WSA_ERR_INVSTOPRES` (LNEG_NUM - 1206)
- `#define WSA_ERR_INVTRIGRANGE` (LNEG_NUM - 1207)

- `#define WSA_ERR_INVDWELL` (LNEG_NUM - 1208)
- `#define WSA_ERR_INVNUMFRAMES` (LNEG_NUM - 1209)
- `#define WSA_ERR_CMDSENDFAILED` (LNEG_NUM - 1501)
- `#define WSA_ERR_CMDINVALID` (LNEG_NUM - 1502)
- `#define WSA_ERR_INVANTENNAPORT` (LNEG_NUM - 1601)
- `#define WSA_ERR_ANTENNASETFAILED` (LNEG_NUM - 1602)
- `#define WSA_ERR_INVFILTERMODE` (LNEG_NUM - 1603)
- `#define WSA_ERR_FILTERSETFAILED` (LNEG_NUM - 1604)
- `#define WSA_ERR_INVCALIBRATEMODE` (LNEG_NUM - 1605)
- `#define WSA_ERR_CALIBRATESETFAILED` (LNEG_NUM - 1606)
- `#define WSA_ERR_FILECREATEFAILED` (LNEG_NUM - 1900)
- `#define WSA_ERR_FILEOPENFAILED` (LNEG_NUM - 1901)
- `#define WSA_ERR_FILEREADFAILED` (LNEG_NUM - 1902)
- `#define WSA_ERR_FILEWRITEFAILED` (LNEG_NUM - 1903)
- `#define WSA_ERR_INVNUMBER` (LNEG_NUM - 2000)
- `#define WSA_ERR_INVREGADDR` (LNEG_NUM - 2001)
- `#define WSA_ERR_MALLOCFAILED` (LNEG_NUM - 2002)
- `#define WSA_ERR_UNKNOWN_ERROR` (LNEG_NUM - 2003)

Functions

- `const char * wsa_get_err_msg` (`int16_t err_id`)

5.3.1 Define Documentation

5.3.1.1 `#define LNEG_NUM` (-10000)

5.3.1.2 `#define WSA_ERR_ANTENNASETFAILED` (LNEG_NUM - 1602)

5.3.1.3 `#define WSA_ERR_CALIBRATESETFAILED` (LNEG_NUM - 1606)

5.3.1.4 `#define WSA_ERR_CMDINVALID` (LNEG_NUM - 1502)

5.3.1.5 `#define WSA_ERR_CMDSENDFAILED` (LNEG_NUM - 1501)

5.3.1.6 `#define WSA_ERR_ETHERNETCONNECTFAILED` (LNEG_NUM - 207)

5.3.1.7 `#define WSA_ERR_ETHERNETINITFAILED` (LNEG_NUM - 209)

5.3.1.8 `#define WSA_ERR_ETHERNETNOTAVBL` (LNEG_NUM - 206)

5.3.1.9 `#define WSA_ERR_FILECREATEFAILED` (LNEG_NUM - 1900)

5.3.1.10 `#define WSA_ERR_FILEOPENFAILED` (LNEG_NUM - 1901)

5.3.1.11 `#define WSA_ERR_FILEREADFAILED` (LNEG_NUM - 1902)

5.3.1.12 `#define WSA_ERR_FILEWRITEFAILED` (LNEG_NUM - 1903)

- 5.3.1.13 #define WSA_ERR_FILTERSETFAILED (LNEG_NUM - 1604)
- 5.3.1.14 #define WSA_ERR_FREQOUTOFBOUND (LNEG_NUM - 601)
- 5.3.1.15 #define WSA_ERR_FREQSETFAILED (LNEG_NUM - 603)
- 5.3.1.16 #define WSA_ERR_IFGAINSETFAILED (LNEG_NUM - 803)
- 5.3.1.17 #define WSA_ERR_INITFAILED (LNEG_NUM - 105)
- 5.3.1.18 #define WSA_ERR_INVADCCORRVALUE (LNEG_NUM - 106)
- 5.3.1.19 #define WSA_ERR_INVAMP (LNEG_NUM - 301)
- 5.3.1.20 #define WSA_ERR_INVANTENNAPORT (LNEG_NUM - 1601)
- 5.3.1.21 #define WSA_ERR_INVCALIBRATEMODE (LNEG_NUM - 1605)
- 5.3.1.22 #define WSA_ERR_INVDWELL (LNEG_NUM - 1208)
- 5.3.1.23 #define WSA_ERR_INVFILTERMODE (LNEG_NUM - 1603)
- 5.3.1.24 #define WSA_ERR_INVFREQRES (LNEG_NUM - 602)
- 5.3.1.25 #define WSA_ERR_INVIFGAIN (LNEG_NUM - 802)
- 5.3.1.26 #define WSA_ERR_INVINTFMETHOD (LNEG_NUM - 201)
- 5.3.1.27 #define WSA_ERR_INVIPADDRESS (LNEG_NUM - 2)
- 5.3.1.28 #define WSA_ERR_INVIPHOSTADDRESS (LNEG_NUM - 202)
- 5.3.1.29 #define WSA_ERR_INVNUMBER (LNEG_NUM - 2000)
- 5.3.1.30 #define WSA_ERR_INVNUMFRAMES (LNEG_NUM - 1209)
- 5.3.1.31 #define WSA_ERR_INVREGADDR (LNEG_NUM - 2001)
- 5.3.1.32 #define WSA_ERR_INVRFGAIN (LNEG_NUM - 801)
- 5.3.1.33 #define WSA_ERR_INVRUNMODE (LNEG_NUM - 1001)
- 5.3.1.34 #define WSA_ERR_INVSAMPLESIZE (LNEG_NUM - 403)
- 5.3.1.35 #define WSA_ERR_INVSTARTRES (LNEG_NUM - 1205)
- 5.3.1.36 #define WSA_ERR_INVSTOPFREQ (LNEG_NUM - 1202)
- 5.3.1.37 #define WSA_ERR_INVSTOPRES (LNEG_NUM - 1206)
- 5.3.1.38 #define WSA_ERR_INVTRIGID (LNEG_NUM - 1201)

- 5.3.1.39 `#define WSA_ERR_INVTRIGRANGE` (LNEG_NUM - 1207)
- 5.3.1.40 `#define WSA_ERR_MALLOCFFAILED` (LNEG_NUM - 2002)
- 5.3.1.41 `#define WSA_ERR_NOCTRLPIPE` (LNEG_NUM - 3)
- 5.3.1.42 `#define WSA_ERR_NODATABUS` (LNEG_NUM - 401)
- 5.3.1.43 `#define WSA_ERR_NOWSA` (LNEG_NUM - 1)
- 5.3.1.44 `#define WSA_ERR_OPENFAILED` (LNEG_NUM - 104)
- 5.3.1.45 `#define WSA_ERR_PLLOCKFAILED` (LNEG_NUM - 604)
- 5.3.1.46 `#define WSA_ERR_PRODOBSOLETE` (LNEG_NUM - 8)
- 5.3.1.47 `#define WSA_ERR_READFRAMEFAILED` (LNEG_NUM - 402)
- 5.3.1.48 `#define WSA_ERR_RFGAINSETFAILED` (LNEG_NUM - 804)
- 5.3.1.49 `#define WSA_ERR_SETFAILED` (LNEG_NUM - 103)
- 5.3.1.50 `#define WSA_ERR_SOCKETSETFUPFAILED` (LNEG_NUM - 211)
- 5.3.1.51 `#define WSA_ERR_STARTOOB` (LNEG_NUM - 1203)
- 5.3.1.52 `#define WSA_ERR_STOPOOB` (LNEG_NUM - 1204)
- 5.3.1.53 `#define WSA_ERR_UNKNOWN_ERROR` (LNEG_NUM - 2003)
- 5.3.1.54 `#define WSA_ERR_UNKNOWNFWRVSN` (LNEG_NUM - 6)
- 5.3.1.55 `#define WSA_ERR_UNKNOWNPRODSE` (LNEG_NUM - 4)
- 5.3.1.56 `#define WSA_ERR_UNKNOWNPRODVSN` (LNEG_NUM - 5)
- 5.3.1.57 `#define WSA_ERR_UNKNOWNRFEVSN` (LNEG_NUM - 7)
- 5.3.1.58 `#define WSA_ERR_USBINITFAILED` (LNEG_NUM - 205)
- 5.3.1.59 `#define WSA_ERR_USBNOTAVBL` (LNEG_NUM - 203)
- 5.3.1.60 `#define WSA_ERR_USBOPENFAILED` (LNEG_NUM - 204)
- 5.3.1.61 `#define WSA_ERR_WINSOCKSTARTUPFAILED` (LNEG_NUM - 210)
- 5.3.1.62 `#define WSA_ERR_WSAINUSE` (LNEG_NUM - 102)
- 5.3.1.63 `#define WSA_ERR_WSANOTRDY` (LNEG_NUM - 101)

5.3.2 Function Documentation

5.3.2.1 `const char* wsa_get_err_msg (int16_t err_id)`

5.4 wsa_lib.txt File Reference

Contain some code documents for wsa_lib.h.

5.4.1 Detailed Description

Index

- abs_max_amp
 - wsa_descriptor, [3](#)
- cmd
 - wsa_socket, [6](#)
- data
 - wsa_socket, [6](#)
- descr
 - wsa_device, [4](#)
- freq
 - wsa_frame_header, [5](#)
- freq_resolution
 - wsa_descriptor, [3](#)
- fw_version
 - wsa_descriptor, [3](#)
- gain
 - wsa_frame_header, [5](#)
- inst_bw
 - wsa_descriptor, [3](#)
- intf_type
 - wsa_descriptor, [3](#)
- LNEG_NUM
 - wsa_error.h, [31](#)
- MAX_ANT_PORT
 - wsa_api.cpp, [8](#)
- max_if_gain
 - wsa_descriptor, [3](#)
- max_sample_size
 - wsa_descriptor, [3](#)
- max_tune_freq
 - wsa_descriptor, [3](#)
- min_if_gain
 - wsa_descriptor, [3](#)
- min_tune_freq
 - wsa_descriptor, [3](#)
- nsec
 - wsa_time, [7](#)
- prod_name
 - wsa_descriptor, [3](#)
- prod_serial
 - wsa_descriptor, [4](#)
 - wsa_frame_header, [5](#)
- prod_version
 - wsa_descriptor, [4](#)
- rfe_name
 - wsa_descriptor, [4](#)
- rfe_version
 - wsa_descriptor, [4](#)
- sample_size
 - wsa_frame_header, [6](#)
- sec
 - wsa_time, [7](#)
- sock
 - wsa_device, [5](#)
- time_stamp
 - wsa_frame_header, [6](#)
- wsa_api.h
 - WSA_GAIN_HIGH, [19](#)
 - WSA_GAIN_LOW, [20](#)
 - WSA_GAIN_MEDIUM, [19](#)
 - WSA_GAIN_VLOW, [20](#)
- WSA_GAIN_HIGH
 - wsa_api.h, [19](#)
- WSA_GAIN_LOW
 - wsa_api.h, [20](#)
- WSA_GAIN_MEDIUM
 - wsa_api.h, [19](#)
- WSA_GAIN_VLOW
 - wsa_api.h, [20](#)
- wsa_api.cpp, [7](#)
 - MAX_ANT_PORT, [8](#)
 - wsa_check_addr, [8](#)
 - wsa_close, [8](#)
 - wsa_get_abs_max_amp, [9](#)
 - wsa_get_antenna, [9](#)
 - wsa_get_bpf, [9](#)
 - wsa_get_freq, [9](#)
 - wsa_get_gain_if, [10](#)
 - wsa_get_gain_rf, [10](#)
 - wsa_get_lpf, [10](#)
 - wsa_is_connected, [10](#)
 - wsa_list, [11](#)
 - wsa_open, [11](#)

- wsa_query_cal_mode, 11
- wsa_read_pkt, 12
- wsa_run_cal_mode, 12
- wsa_set_antenna, 13
- wsa_set_bpf, 13
- wsa_set_command_file, 14
- wsa_set_freq, 14
- wsa_set_gain_if, 15
- wsa_set_gain_rf, 16
- wsa_set_lpf, 16
- wsa_verify_freq, 17
- wsa_api.h, 18
 - wsa_check_addr, 20
 - wsa_close, 20
 - wsa_gain, 19
 - wsa_get_abs_max_amp, 20
 - wsa_get_antenna, 21
 - wsa_get_bpf, 21
 - wsa_get_freq, 21
 - wsa_get_gain_if, 21
 - wsa_get_gain_rf, 22
 - wsa_get_lpf, 22
 - wsa_is_connected, 22
 - wsa_list, 22
 - wsa_open, 23
 - wsa_query_cal_mode, 23
 - wsa_read_pkt, 23
 - wsa_run_cal_mode, 24
 - wsa_set_antenna, 24
 - wsa_set_bpf, 25
 - wsa_set_command_file, 25
 - wsa_set_freq, 26
 - wsa_set_gain_if, 27
 - wsa_set_gain_rf, 27
 - wsa_set_lpf, 28
- wsa_check_addr
 - wsa_api.cpp, 8
 - wsa_api.h, 20
- wsa_close
 - wsa_api.cpp, 8
 - wsa_api.h, 20
- wsa_descriptor, 2
 - abs_max_amp, 3
 - freq_resolution, 3
 - fw_version, 3
 - inst_bw, 3
 - intf_type, 3
 - max_if_gain, 3
 - max_sample_size, 3
 - max_tune_freq, 3
 - min_if_gain, 3
 - min_tune_freq, 3
 - prod_name, 3
 - prod_serial, 4
 - prod_version, 4
 - rfe_name, 4
 - rfe_version, 4
- wsa_device, 4
 - descr, 4
 - sock, 5
- WSA_ERR_ANTENNASETFAILED
 - wsa_error.h, 31
- WSA_ERR_CALIBRATESETFAILED
 - wsa_error.h, 31
- WSA_ERR_CMDINVALID
 - wsa_error.h, 31
- WSA_ERR_CMDSENDFAILED
 - wsa_error.h, 31
- WSA_ERR_ETHERNETCONNECTFAILED
 - wsa_error.h, 31
- WSA_ERR_ETHERNETINITFAILED
 - wsa_error.h, 31
- WSA_ERR_ETHERNETNOTAVBL
 - wsa_error.h, 31
- WSA_ERR_FILECREATEFAILED
 - wsa_error.h, 31
- WSA_ERR_FILEOPENFAILED
 - wsa_error.h, 31
- WSA_ERR_FILEREADFAILED
 - wsa_error.h, 31
- WSA_ERR_FILEWRITEFAILED
 - wsa_error.h, 31
- WSA_ERR_FILTERSETFAILED
 - wsa_error.h, 31
- WSA_ERR_FREQOUTOFBOUND
 - wsa_error.h, 32
- WSA_ERR_FREQSETFAILED
 - wsa_error.h, 32
- WSA_ERR_IFGAINSETFAILED
 - wsa_error.h, 32
- WSA_ERR_INITFAILED
 - wsa_error.h, 32
- WSA_ERR_INVADCCORRVALUE
 - wsa_error.h, 32
- WSA_ERR_INVAMP
 - wsa_error.h, 32
- WSA_ERR_INVANTENNAPORT
 - wsa_error.h, 32
- WSA_ERR_INVCALIBRATEMODE
 - wsa_error.h, 32

- WSA_ERR_INVDWELL
 - [wsa_error.h, 32](#)
- WSA_ERR_INVFILTERMODE
 - [wsa_error.h, 32](#)
- WSA_ERR_INVFREQRES
 - [wsa_error.h, 32](#)
- WSA_ERR_INVIFGAIN
 - [wsa_error.h, 32](#)
- WSA_ERR_INVINTFMETHOD
 - [wsa_error.h, 32](#)
- WSA_ERR_INVIPADDRESS
 - [wsa_error.h, 32](#)
- WSA_ERR_INVIPHOSTADDRESS
 - [wsa_error.h, 32](#)
- WSA_ERR_INVNUMBER
 - [wsa_error.h, 32](#)
- WSA_ERR_INVNUMFRAMES
 - [wsa_error.h, 32](#)
- WSA_ERR_INVREGADDR
 - [wsa_error.h, 32](#)
- WSA_ERR_INVRFGAIN
 - [wsa_error.h, 32](#)
- WSA_ERR_INVRUNMODE
 - [wsa_error.h, 32](#)
- WSA_ERR_INVSAMPLESIZE
 - [wsa_error.h, 32](#)
- WSA_ERR_INVSTARTRES
 - [wsa_error.h, 32](#)
- WSA_ERR_INVSTOPFREQ
 - [wsa_error.h, 32](#)
- WSA_ERR_INVSTOPRES
 - [wsa_error.h, 32](#)
- WSA_ERR_INVTRIGID
 - [wsa_error.h, 32](#)
- WSA_ERR_INVTRIGRANGE
 - [wsa_error.h, 32](#)
- WSA_ERR_MALLOCFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_NOCTRLPIPE
 - [wsa_error.h, 33](#)
- WSA_ERR_NODATABUS
 - [wsa_error.h, 33](#)
- WSA_ERR_NOWSA
 - [wsa_error.h, 33](#)
- WSA_ERR_OPENFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_PLLOCKFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_PRODOBSOLETE
 - [wsa_error.h, 33](#)
- WSA_ERR_READFRAMEFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_RFGAINSETFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_SETFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_SOCKETSETFUPFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_STARTOOB
 - [wsa_error.h, 33](#)
- WSA_ERR_STOPOOB
 - [wsa_error.h, 33](#)
- WSA_ERR_UNKNOWN_ERROR
 - [wsa_error.h, 33](#)
- WSA_ERR_UNKNOWNFWRVSN
 - [wsa_error.h, 33](#)
- WSA_ERR_UNKNOWNPRODSEER
 - [wsa_error.h, 33](#)
- WSA_ERR_UNKNOWNPRODVSN
 - [wsa_error.h, 33](#)
- WSA_ERR_UNKNOWNRFEVSN
 - [wsa_error.h, 33](#)
- WSA_ERR_USBINITFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_USBNOTAVBL
 - [wsa_error.h, 33](#)
- WSA_ERR_USBOPENFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_WINSOCKSTARTUPFAILED
 - [wsa_error.h, 33](#)
- WSA_ERR_WSAINUSE
 - [wsa_error.h, 33](#)
- WSA_ERR_WSANOTRDY
 - [wsa_error.h, 33](#)
- [wsa_error.h, 29](#)
 - [LNEG_NUM, 31](#)
 - [WSA_ERR_ANTENNASETFAILED, 31](#)
 - [WSA_ERR_CALIBRATESETFAILED, 31](#)
 - [WSA_ERR_CMDINVALID, 31](#)
 - [WSA_ERR_CMDSENDFAILED, 31](#)
 - [WSA_ERR_ETHERNETCONNECTFAILED, 31](#)
 - [WSA_ERR_ETHERNETINITFAILED, 31](#)
 - [WSA_ERR_ETHERNETNOTAVBL, 31](#)
 - [WSA_ERR_FILECREATEFAILED, 31](#)
 - [WSA_ERR_FILEOPENFAILED, 31](#)
 - [WSA_ERR_FILEREADFAILED, 31](#)
 - [WSA_ERR_FILEWRITEFAILED, 31](#)

WSA_ERR_FILTERSETFAILED, [31](#)
 WSA_ERR_FREQOUTOFBOUND, [32](#)
 WSA_ERR_FREQSETFAILED, [32](#)
 WSA_ERR_IFGAINSETFAILED, [32](#)
 WSA_ERR_INITFAILED, [32](#)
 WSA_ERR_INVADCCORRVALUE, [32](#)
 WSA_ERR_INVAMP, [32](#)
 WSA_ERR_INVANTENNAPORT, [32](#)
 WSA_ERR_INVCALIBRATEMODE, [32](#)
 WSA_ERR_INVDWELL, [32](#)
 WSA_ERR_INVFILTERMODE, [32](#)
 WSA_ERR_INVFREQRES, [32](#)
 WSA_ERR_INVIFGAIN, [32](#)
 WSA_ERR_INVINTFMETHOD, [32](#)
 WSA_ERR_INVIPADDRESS, [32](#)
 WSA_ERR_INVIPHOSTADDRESS, [32](#)
 WSA_ERR_INVNUMBER, [32](#)
 WSA_ERR_INVNUMFRAMES, [32](#)
 WSA_ERR_INVREGADDR, [32](#)
 WSA_ERR_INVRFGAIN, [32](#)
 WSA_ERR_INVRUNMODE, [32](#)
 WSA_ERR_INVSAMPLESIZE, [32](#)
 WSA_ERR_INVSTARTRES, [32](#)
 WSA_ERR_INVSTOPFREQ, [32](#)
 WSA_ERR_INVSTOPRES, [32](#)
 WSA_ERR_INVTRIGID, [32](#)
 WSA_ERR_INVTRIGRANGE, [32](#)
 WSA_ERR_MALLOCFFAILED, [33](#)
 WSA_ERR_NOCTRLPIPE, [33](#)
 WSA_ERR_NODATABUS, [33](#)
 WSA_ERR_NOWSA, [33](#)
 WSA_ERR_OPENFAILED, [33](#)
 WSA_ERR_PLLOCKFAILED, [33](#)
 WSA_ERR_PRODOBSOLETE, [33](#)
 WSA_ERR_READFRAMEFAILED, [33](#)
 WSA_ERR_RFGAINSETFAILED, [33](#)
 WSA_ERR_SETFAILED, [33](#)
 WSA_ERR_SOCKETSETFUPFAILED, [33](#)
 WSA_ERR_STARTOOB, [33](#)
 WSA_ERR_STOPOOB, [33](#)
 WSA_ERR_UNKNOWN_ERROR, [33](#)
 WSA_ERR_UNKNOWNFWRVSN, [33](#)
 WSA_ERR_UNKNOWNPRODSE, [33](#)
 WSA_ERR_UNKNOWNPRODVS, [33](#)
 WSA_ERR_UNKNOWNRFEVSN, [33](#)
 WSA_ERR_USBINITFAILED, [33](#)
 WSA_ERR_USBNOTAVBL, [33](#)
 WSA_ERR_USBOPENFAILED, [33](#)
 WSA_ERR_WINSOCKSTARTUPFAILED, [33](#)
 WSA_ERR_WSAINUSE, [33](#)
 WSA_ERR_WSANOTRDY, [33](#)
 wsa_get_err_msg, [33](#)
 wsa_frame_header, [5](#)
 freq, [5](#)
 gain, [5](#)
 prod_serial, [5](#)
 sample_size, [6](#)
 time_stamp, [6](#)
 wsa_gain
 wsa_api.h, [19](#)
 wsa_get_abs_max_amp
 wsa_api.cpp, [9](#)
 wsa_api.h, [20](#)
 wsa_get_antenna
 wsa_api.cpp, [9](#)
 wsa_api.h, [21](#)
 wsa_get_bpf
 wsa_api.cpp, [9](#)
 wsa_api.h, [21](#)
 wsa_get_err_msg
 wsa_error.h, [33](#)
 wsa_get_freq
 wsa_api.cpp, [9](#)
 wsa_api.h, [21](#)
 wsa_get_gain_if
 wsa_api.cpp, [10](#)
 wsa_api.h, [21](#)
 wsa_get_gain_rf
 wsa_api.cpp, [10](#)
 wsa_api.h, [22](#)
 wsa_get_lpf
 wsa_api.cpp, [10](#)
 wsa_api.h, [22](#)
 wsa_is_connected
 wsa_api.cpp, [10](#)
 wsa_api.h, [22](#)
 wsa_lib.txt, [34](#)
 wsa_list
 wsa_api.cpp, [11](#)
 wsa_api.h, [22](#)
 wsa_open
 wsa_api.cpp, [11](#)
 wsa_api.h, [23](#)
 wsa_query_cal_mode
 wsa_api.cpp, [11](#)
 wsa_api.h, [23](#)
 wsa_read_pkt

- [wsa_api.cpp](#), [12](#)
 - [wsa_api.h](#), [23](#)
- [wsa_resp](#), [6](#)
- [wsa_run_cal_mode](#)
 - [wsa_api.cpp](#), [12](#)
 - [wsa_api.h](#), [24](#)
- [wsa_set_antenna](#)
 - [wsa_api.cpp](#), [13](#)
 - [wsa_api.h](#), [24](#)
- [wsa_set_bpf](#)
 - [wsa_api.cpp](#), [13](#)
 - [wsa_api.h](#), [25](#)
- [wsa_set_command_file](#)
 - [wsa_api.cpp](#), [14](#)
 - [wsa_api.h](#), [25](#)
- [wsa_set_freq](#)
 - [wsa_api.cpp](#), [14](#)
 - [wsa_api.h](#), [26](#)
- [wsa_set_gain_if](#)
 - [wsa_api.cpp](#), [15](#)
 - [wsa_api.h](#), [27](#)
- [wsa_set_gain_rf](#)
 - [wsa_api.cpp](#), [16](#)
 - [wsa_api.h](#), [27](#)
- [wsa_set_lpf](#)
 - [wsa_api.cpp](#), [16](#)
 - [wsa_api.h](#), [28](#)
- [wsa_socket](#), [6](#)
 - [cmd](#), [6](#)
 - [data](#), [6](#)
- [wsa_time](#), [6](#)
 - [nsec](#), [7](#)
 - [sec](#), [7](#)
- [wsa_verify_freq](#)
 - [wsa_api.cpp](#), [17](#)