User's
Manual

DL850E/DL850EV FreeRun Application Programming Interface

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This user's manual contains useful information about the precautions, functions, and API specifications of the DL850E/DL850EV series FreeRun Application Programing Interface (ScAPI.dll).
To ensure correct use, please read this manual thoroughly during operation. Keep this manual in a safe place for quick reference.
For information about the handling precautions, functions, and operating procedures of the DL850E/DL850EV series and the handling and operating procedures of Windows, see the relevant manuals.

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functionality. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.

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Contents

1.1 Software Overview

Overview

This software (ScAPI.dll) provides an API (Application Programming Interface) for acquiring data from the DL850E/DL850EV series in FreeRun mode.

Functions

This software can be used to perform the following functions. For details, see "Detailed API Specifications."

- Initializing the API
- Connecting and disconnecting from the measurement instrument
- Setting parameters
- Getting waveform data

Software Structure

This software package contains the following items.

- FreeRun API Library User's Manual (this manual)
- API files (see below)

File Name	Content
ScAPI.dll	FreeRun API Library
ScAPI64.dll	FreeRun API Library 64-bit Version
ScAPI.lib	FreeRun API Import Library for C++
ScAPI.h	Function Declaration Header File for C++
ScAPINet.dll	FreeRun API Library for .NET
tmctl.dll	Communication Library
tmctl64.dll	Communication Library 64-bit Version
YKMUSB.dll	USB Communication Library
YKMUSB64.dll	USB Communication Library 64-bit Version

System Requirements

- PC

  A PC that meets the following conditions is required.

  Operating System

  Microsoft Windows 7 (SP1 or later), Windows 8, Windows 8.1, or Windows 10

  CPU: Core2Duo 2 GHz or better

  Memory: At least 1 GB (at least 2 GB recommended)
- Development Environment

  Visual Studio 2008 or later, .NET Framework 3.5 or later

2.1 Notes on Using the Software

Disclaimer

YOKOGAWA assumes no responsibility for any and all damages that may occur directly or indirectly through the use of this software.

Usage Precautions

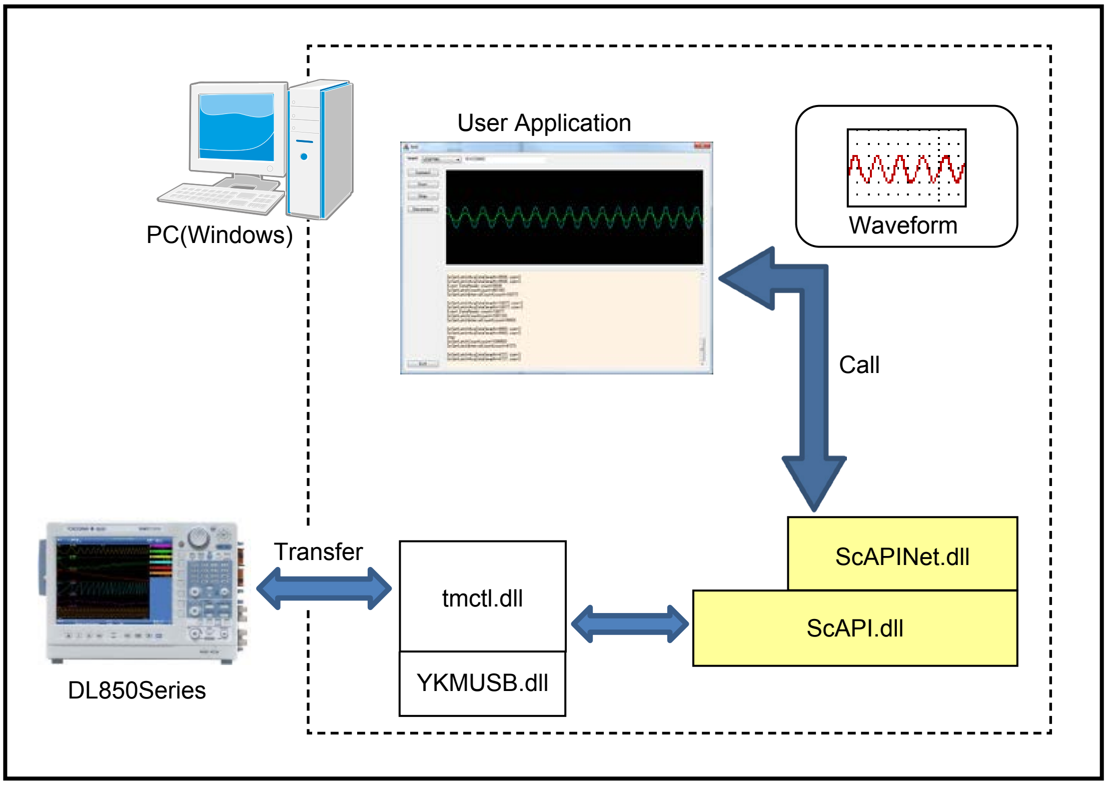
- This software is a library designed exclusively for DL850E/DL850EV series FreeRun mode. It cannot be used with other products.

- Check the version of this software and the firmware version of the DL850E/DL850EV prior to use.

3.1 FreeRun API Overview

The API is provided as a dynamic link library (DLL). The API can be used by linking user applications with this DLL.

As shown in the following figure, the API provides functions for acquiring waveform data from the DL850E/DL850EV running in FreeRun mode and setting measurement conditions.



3.2 API Overview

This section provides an overview of the API.

Initialization and Termination

The API functions for initialization and termination are as follows.

API Name	Function	Page
ScInit	Initialize the API	4-3
ScExit	End the API	4-3

Connection and Disconnection

The API functions for connecting and disconnecting from the measurement instrument are as follows.

API Name	Function	Page
ScOpenInstrument	Open an instrument and get the API handle	4-4
ScCloseInstrument	Close the instrument	4-4

Getting or Setting Measurement Conditions

The API functions for getting and setting measurement conditions are as follows.

API Name	Function	Page
ScSetControl	Send a command to the instrument	4-5
ScGetControl	Receive a command response from the instrument	4-5
ScQueryMessage	Send a command and receive a response	4-7
ScGetBinaryData	Receive binary data	4-6
ScSetSamplingRate	Set the sampling rate	4-12
ScGetSamplingRate	Get the sampling rate	4-12
ScGetBaseSamplingRate	Get the base sampling rate	4-12
ScGetChannelSamplingRatio	Get the sampling ratio from the base sampling rate	4-13
ScStart	Start measurement	4-8
ScStop	Stop measurement	4-8

Getting FreeRun Information

The API functions for getting FreeRun information are as follows.

API Name	Function	Page
ScGetLatchCount	Get the sample count from the LATCH position	4-9
ScGetLatchIntervalCount	Get the sample count from the previous LATCH position	4-9
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ScGetStartTime	Get the measurement start time and date	4-11
ScChannelBits	Get the data bit count of the channel	4-13
ScGetChannelGain	Get the gain value of the channel (used to convert waveform data into actual data)	4-14
ScGetChannelOffset	Get the offset value of the channel (used to convert waveform data into actual data)	4-14
ScSetDataReadyCount	Set the data count for the DataReady event	4-15
ScGetDataReadyCount	Get the data count for the DataReady event	4-15
ScAddEventListener	Add an event listener (C++ only)	4-16
ScRemoveEventListener	Delete the event listener (C++ only)	4-16
ScAddCallback	Add a call back method (C# only)	4-17
ScRemoveCallback	Delete the call back method (C# only)	4-17

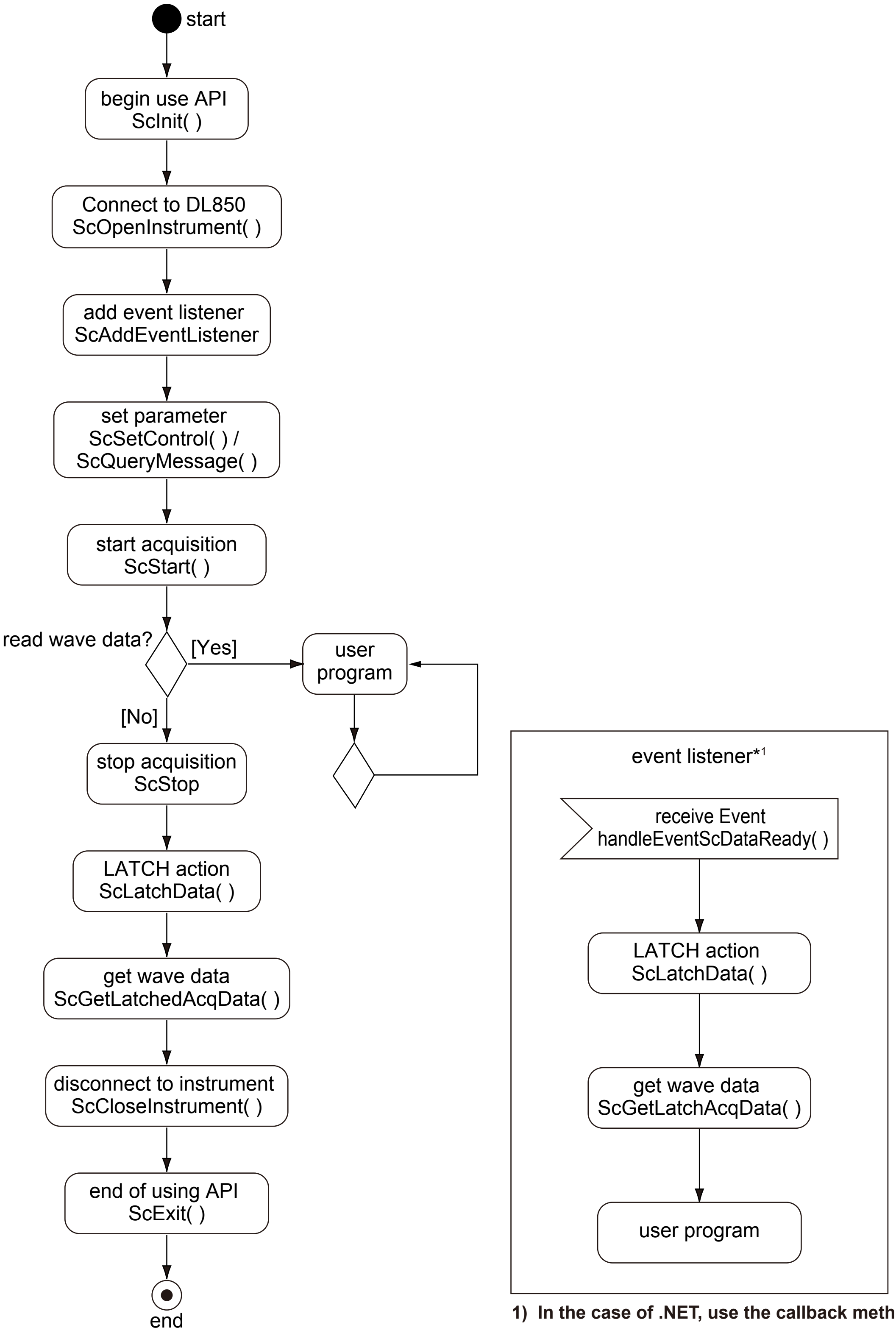
Getting Waveform Data

The API functions for getting FreeRun waveform data are as follows.

API Name	Function	Page
ScLatchData	Latch the measurement position	4-8
ScGetLatchAcqData	Get waveform data after latching	4-10

3.3 Basic Flow of How to Use the API

Each API function is used through a handle. First, a handle is created when an instrument is opened. Then, the target instrument is accessed by passing the handle as a parameter.



1) In the case of .NET, use the callback method.

Unmanaged Application

The basic flow of how to use the API and a sample code for C++ (unmanaged application) are provided below. Error procedures are omitted.

1. Initialize the API (required).

```
#include “ScAPI.h”
. . .
ScInit();
. . .
```

2. Open the instrument (DL850E/DL850EV) and create a handle (required).
   After opening the instrument, use this handle to access the instrument.

```
ScHandle handle;
ScOpenInstrument(SC_WIRE_USB,“91K225903”,&handle);
```

3. Add an event listener.
   To use data ready events, create a class that inherits the ScEventListener class, and register it to the API. Overwriting the handleEventScDataReady() method causes the same method to be called when a data ready event occurs. Creating and adding an event listener is not a requirement. (Waveform acquisition is possible also by periodically calling a waveform acquisition procedure.)

```
class cYourClass : public ScEventListener {
public:
     virtual void handleEventScDataReady(ScHandl handle,
                                         __int64 dataCount);
};
. . .
cYourClass* yourClass = new cYourClass();
ScAddEventListener(handle, yourClass);
```

4. Start measuring

```
ScStart(handle);
```

5. Latch (required to acquire waveforms).
   This marks the acquisition position of the waveform data.

```
ScLatchData(handle);
```

6. Get the waveform.

```
char buff[100000];
ScGetLatchAcqData(handle, 1, 0, buff, sizeof(buff), &count, &dataSize);
. . .
```

7. Disconnect from the instrument (required).
   The handle is invalidated when this API function is called.

```
ScCloseInstrument(handle);
```

8. Close the API (required).

```
ScExit();
```

Managed Application

The basic flow of how to use the API and a sample code for C# (managed application) are provided below. Error procedures are omitted.

1. Initialize the API (required).
   Add ScAPINet.dll to References of the Visual Studio Solution Explorer in advance. The name space is ScAPINet, and the API is defined as methods in the ScAPI class.

```
using ScAPINet;
. . .
ScAPI api = new ScAPINet.ScAPI();
api.ScInit();
```

2. Open the instrument (DL850E/DL850EV) and create a handle (required).
   After opening the instrument, use this handle to access the instrument.

```
int handle;
api.ScOpenInstrument(ScAPI.SC_WIRE_USB,“91K225903”,out handle);
```

3. Add an event callback method.
   To use data ready events, add a callback method to the API. The same method will be called when data ready events occur. Creating and adding a callback method is not a requirement. (Waveform acquisition is possible also by periodically calling a waveform acquisition procedure.)

```
private void dataReadyCallback(int hndl, int type)
{
     . . .
}
api.ScAddCallback(hndl, dataReadyCallback);
```

4. Start measuring

```
api.ScStart(handle);
```

5. Latch (required to acquire waveforms).
   This marks the acquisition position of the waveform data.

```
api.ScLatchData(handle);
```

6. Get the waveform.

```
byte[] buff = new byte[100000];
int count, dataSize;
api.ScGetLatchAcqData<byte>(handle, 1, 0, buff, buff.Length,
                            out count, out dataSize);
```

7. Disconnect from the instrument (required).
   The handle is invalidated when this API function is called.

```
api.ScCloseInstrument(handle);
```

8. Close the API (required).

```
api.ScExit();
```

4.1 Definition of Class

This section explains the API class definitions.

Class ScEventListener

Function:

Event listener class for receiving events (C++ only)

Syntax:

```
class ScEventListener {
  public:
    virtual void handleEventScDataReady(ScHandle handle,
    __int64 dataCount);
};
```

Detail:

To receive data ready events, override the handleEventScDataReady() method. Use ScAddEventListener() to create instances.

4.2 Definition of Constants

SC_SUCCESS

Description:

Success

Syntax:

[C++]	#define SC_SUCCESS 0
[C#]	ScAPI.SC_SUCCESS

Detail:

Definition of a result returned by API functions

SC_ERROR

Description:

Error

Syntax:

[C++]	#define SC_ERROR 1
[C#]	ScAPI.SC_ERROR

Detail:

Definition of a result returned by API functions

SC_WIRE_USB

Description:

USB wire type (USBTMC)

Syntax:

[C++]	#define SC_WIRE_USB 7
[C#]	ScAPI.SC_WIRE_USB

Detail:

Definition of a wire type for connecting to the DL850 series

SC_WIRE_LAN

Description:

LAN wire type (VXI-11)

Syntax:

[C++]	#define SC_WIRE_LAN 8
[C#]	ScAPI.SC_WIRE_LAN

Detail:

Definition of a wire type for connecting to the DL850 series

4.3 Detailed API Specifications

This section provides the details of the API.

ScInit

Description:

Initialize the API

Syntax:

[C++] ScResult ScInit(void);
[C#] int ScInit();

Parameters:

None

Return value:

SC_SUCCESS	Success
SC_ERROR	Initialization error (already initialized)

Detail:

Call once at the start of using the library.

Example [C++]:

```
#include “ScAPI.h”
...
if (ScInit() == SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
using ScAPINet;
...
ScAPINet.ScAPI api = new ScAPINet.ScAPI();
if (api.ScInit() == ScAPI.SC_SUCCESS)
{
    ...
}
```

ScExit

Description:

End using the API

Syntax:

[C++] ScResult ScExit(void);
[C#] int ScExit();

Parameters:

None

Return value:

SC_SUCCESS	Success
SC_ERROR	Error (already terminated or not initialized)

Detail:

Call once at the end of using the API.

ScOpenInstrument

Description:

Open the instrument

Syntax:

[C++] ScResult ScOpenInstrument(int wire, char* address, ScHandle* rHndl);

[C#] int ScOpenInstrument(int wire, string address, out int rHndl);

Parameters:

[IN] wire	Wire type	
	SC_WIRE_USB	USBTMC connection
	SC_WIRE_LAN	VXI-11
[IN] address	Connection destination address (instrument serial number for USB)	
[OUT] rHndl	Instrument handle	

Return value:

SC_SUCCESS	Connection successful
SC_ERROR	Connection error

Detail:

Connects to the instrument and returns the instrument handle.
Each API passes this handle to communicate with the instrument.
When a connection is established, the instrument is automatically set to FreeRun mode.

Note:

Multiple connections to a single instrument is not possible.

Example [C++]:

```
ScHandle hndl;
if (ScOpenInstrument(SC_WIRE_USB, “91K225895”, &hndl)
    == SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
int hndl;
if (api.ScOpenInstrument(ScAPI.SC_WIRE_USB, “91K225895”,
    out hndl) == ScAPI.SC_SUCCESS)
{
    ...
}
```

ScCloseInstrument

Description:

Close the instrument

Syntax:

[C++] ScResult ScCloseInstrument(ScHandle hndl);

[C#] int ScCloseInstrument(int hndl);

Parameters:

[IN] handle	Instrument handle

Return value:

SC_SUCCESS	Success
SC_ERROR	Error (not connected or already disconnected)

Detail:

Disconnects from the instrument connected using ScOpenInsturument().
When disconnecting, the instrument is automatically changed from FreeRun mode back to trigger mode.

Note:

The handle is invalidated when this API method is called.

ScSetControl

Description:

Send a command

Syntax:

[C++] ScResult ScSetControl(ScHandle hndl, char* command);

[C#] int ScSetControl(int hndl, string command);

Parameters:

[IN] hndl	Instrument handle
[IN] command	Communication command string

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Send a command to the instrument

Note:

The return value cannot be used to determine communication command errors. It only indicates whether the command was sent successfully.

ScGetControl

Description:

Receive a response to a communication command

Syntax:

[C++] ScResult ScGetControl(ScHandle hndl, char* buff, int buffLen, int* receiveLen);

[C#] int ScGetControl<DT>(int hndl, ref DT[] buff, int buffLen, out int receiveLen);

Parameters:

[IN] hndl	Instrument handle
[OUT] buff	Receive buffer
[IN] buffLen	Buffer size
[OUT] receiveLen	Length of the received response

Return value:

SC_SUCCESS	Success
SC_ERROR	Error (no data to be received)

Detail:

Receives a response to a communication command sent in advance from the instrument.

Note:

An error occurs if a communication command has not been sent in advance.

Example [C++]:

```
char buff[BUFSIZ];
int receiveLen;
if (ScGetControl(hndl, buff, sizeof(buff), &receiveLen)
    == SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
byte[] buff = new byte[256];
int receiveLen;
if (api.ScGetControl<byte>(hndl, ref buff, buff.Length,
    out receiveLen) == ScAPI.SC_SUCCESS)
{
    string msg = System.Text.Encoding.ASCII.GetString(buff);
    printMessage(msg);
}
```

ScGetBinaryData

Description:

Receive binary data

Syntax:

[C++] ScResult ScGetBinaryData(ScHandle hndl, char* command, char* buff, int buffLen, int* receiveLen);

[C#] int ScGetBinaryData<DT>(int hndl, string command, DT[] buff, int buffLen, out int receiveLen);

Parameters:

[IN] hndl	Instrument handle
[IN] command	Communication command for requesting binary data
[IN] buff	Buffer for receiving binary data
[IN] buffLen	Size of the buffer for receiving binary data (bytes)
[OUT] receiveLen	Size of the received binary data (bytes)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Sends a command for querying binary data and receives the response.

Note:

The behavior when a command that does not send binary data is specified is undefined.

Example [C++]:

```
char buff[1024];
int receiveLen;
if (ScGetBinaryData(hndl, “:MONitor:SEND:ALL?”,
    buff, sizeof(buff), &receiveLen)== SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
byte[] buff = new byte[1024];
int receiveLen;
if (api.ScGetBinaryData<byte>(hndl, “:MONitor:SEND:ALL?”,
    ref buff, buff.Length, out receiveLen) == ScAPI.SC_SUCCESS)
{
    ...
}
```

ScQueryMessage

Description:

Send a command and receive its response

Syntax:

[C++] ScResult ScQueryMessage(ScHandle hndl, char* command, char* buff, int bufflen, int* receiveLen);

[C#] int ScQueryMessage(int hndl, string command, out string buff, int getLen, out int receiveLen);

Parameters:

[IN] hndl	Instrument handle
[IN] command	Communication Commands
[OUT] buff	Receive buffer
[IN] buffLen	Length of receive buffer (bytes). The length of data to receive in the case of the .NET version.
[OUT] receiveLen	Length of the received response

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

You can perform communication command transmission and response reception with this single API method.

Note:

You cannot use this API method for commands that do not return responses.

In the case of C# (.NET version), specify the number of bytes to receive, not the receive buffer size, in the fourth parameter.

Example [C#]:

```
char buff[256];
int receiveLen;
if (ScQueryMessage(hndl, "*idn?", buff, sizeof(buff), &receiveLen)
    == SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
string buff;
int receiveLen;
if (api.ScQueryMessage(hndl, "*idn?", out buff, 256,
    out receiveLen) == ScAPI.SC_SUCCESS)
{
    ...
}
```

ScStart

Description:

Start measurement

Syntax:

[C++] ScResult ScStart(ScHandle hndl)

[C#] int ScStart(int hndl)

Parameters:

[IN] hndl	Instrument handle

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Starts measurement. (Sends a Start command.)

ScStop

Description:

Stop measurement

Syntax:

[C++] ScResult ScStop(ScHandle hndl)

[C#] int ScStop(int hndl)

Parameters:

[IN] hndl	Instrument handle

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Stops measurement. (Sends a Stop command.)

ScLatchData

Description:

Latch FreeRun data

Syntax:

[C++] ScResult ScLatchData(ScHandle hndl)

[C#] int ScLatchData(int hndl)

Parameters:

[OUT] hndl	Instrument handle

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Marks the present measurement position of the FreeRun measurement data in the instrument.

This position is used as a reference for getting measured data.

ScGetLatchCount

Description:

Get the sample count from the LATCH position

Syntax:

```
[C++]   ScResult ScGetLatchCount(ScHandle hndl, __int64* count)
[C#]    int ScGetLatchCount(int hndl, out long count)
```

Parameters:

[IN] hndl	Instrument handle
[OUT] count	Latch position (sample count)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the latch position.

The latch position is the sample count from when a measurement is started to the position where latching is executed with ScLatchData().

Note:

The sample count is the number of data points acquired using a 2-channel module, regardless of whether a 2-channel module is actually used.

ScGetLatchIntervalCount

Description:

Get the sample count between latches

Syntax:

```
[C++]   ScResult ScGetLatchIntervalCount(ScHandle hndl, __int64* count)
[C#]    int ScGetLatchIntervalCount(int hndl, out long count)
```

Parameters:

[IN] hndl	Instrument handle
[OUT] count	Sample count between latches

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Get the sample count from the previous LATCH position

Note:

The sample count between latches is the number of data points acquired using a 2-channel module, regardless of whether a 2-channel module is actually used.

ScGetLatchAcqData

Description:

Get latched measurement data

Syntax:

[C++] ScResult ScGetLatchAcqData(ScHandle hndl, int chNo, int subChNo, char* buff,int buffLen, int* dataCount, int* dataSize);

[C#] int ScGetLatchAcqData<DT>(int hndl, int chNo, int subChNo, DT[] buff, int buffLen, out int dataCount, out int dataSize)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number
[IN] subChNo	Sub channel number (specify 0 if there are none)
[OUT] buff	Save buffer
[IN] buffLen	Length of save buffer
[OUT] dataCount	Length of saved data (sample count)
[OUT] dataSize	Size of a point of data saved (bytes)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets latched measurement data.

Note:

The returned measurement data is an AD value.

To convert this into a physical value, multiply the returned value by the gain obtained by ScGetChannelGain() and add the offset obtained by ScGetChannelOffset().

Example [C++]:

```
char buff[100000];
int count;
int size;
if (ScGetLatchAcqData(hndl, 1, 0, buff, sizeof(buff),
    &count, &size) == SC_SUCCESS) {
    ...
}
```

Example [C#]:

```
byte[] buff = new byte[100000];
int count;
int size;
if (api.ScGetLatchAcqData<byte>(hndl, 1, 0, buff, buff.Length,
    out count, out size)== ScAPI.SC_SUCCESS)
{
    ...
}
```

ScGetChannelDelay

Description:

Get the phase difference of the channel

Syntax:

[C++]	ScResult ScGetChannelDelay(ScHandle hndl, int chNo, int* delay)
[C#]	int ScGetChannelDelay(int hndl, int chNo, out int delay)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number
[OUT] delay	Phase difference

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the phase difference of the channel.
If the target channel has sub channels, phase difference may occur according to the sample rate ratio.
This API method returns the phase difference sample count.

Note:

The phase difference between sub channels of a multi-channel module is the same.

ScGetStartTime

Description:

Get the measurement start time and date

Syntax:

[C++]	ScResult ScGetStartTime(ScHandle hndl, char* buff);
[C#]	int ScGetStartTime(int hndl, out string buff)

Parameters:

[IN] hndl	Instrument handle
[OUT] buff	Measurement start time string

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the measurement start time as a character string.
The time is returned as a comma separated character string.
Year (2007 or later), month (1 to 12), day (1 to 32), hour (0 to 23), minute (0 to 59), second (0 to 59), microsecond (0 to 999999), nanosecond (10 to 990)

Note:

If this method is called when measurement is stopped, the time the previous measurement was started is returned.

ScSetSamplingRate

Description:

Set the sampling frequency

Syntax:

[C++]	ScResult ScSetSamplingRate(ScHandle hndl, double srate);
[C#]	int ScSetSamplingRate(int hndl, double srate)

Parameters:

[IN] hndl	Instrument handle
[IN] srate	Sampling frequency (Hz)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Sets the sampling frequency.

Note:

This cannot be set while measurement is in progress.

ScGetSamplingRate

Description:

Get the sampling frequency

Syntax:

[C++]	ScResult ScGetSamplingRate(ScHandle hndl, double* srate)
[C#]	int ScGetSamplingRate(int hndl, out double srate)

Parameters:

[IN] hndl	Instrument handle
[OUT] srate	Sampling frequency

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the sampling frequency.

ScGetBaseSamplingRate

Description:

Get the base sampling frequency

Syntax:

[C++]	ScResult ScGetBaseSamplingRate(ScHandle hndl, double* srate)
[C#]	int ScGetBaseSamplingRate(int hndl, out double srate)

Parameters:

[IN] hndl	Instrument handle
[OUT] srate	Sampling frequency

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the base sampling frequency (sampling frequency of a 2-channel module).

ScGetChannelSamplingRatio

Description:

Get the ratio of the base sampling frequency to the channel’s sampling frequency.

Syntax:

[C++]	ScResult ScGetChannelSamplingRatio(ScHandle hndl, int chNo, int* ratio)
[C#]	int ScGetChannelSamplingRatio(int hndl, int chNo, out int ratio)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number (1 to 16)
[OUT] ratio	Sampling frequency ratio (1 to 1000)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Get the ratio of the base sampling frequency to the channel’s sampling frequency.
If the channel’s sampling frequency is the same as the base sampling frequency, the ratio is 1. If it is half, the ratio is 2.
For a channel with sub channels, the sampling frequency may be lower than the base sampling frequency (sampling frequency of a 2-channel model). Likewise, the sample count is lower according to the ratio.

ScGetChannelBits

Description:

Get the channel’s data bit length.

Syntax:

[C++]	ScResult ScGetChannelBits(ScHandle hndl, int chNo, int subChNo, int* bits);
[C#]	int ScGetChannelBits(int hndl, int chNo, int subChNo, out int bits)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number (1 to 16)
[IN] subChNo	Sub channel number (1 to 64)
[OUT] bits	Data bit length (1 to 32)

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the bit length of the channel data to be acquired.

Note:

For CAN modules and the like, the returned value may not necessarily be the same as the number of bits specified with Bit Cnt.

ScGetChannelGain

Description:

Get the channel gain

Syntax:

[C++] ScResult ScGetChannelGain(ScHandle hndl, int chNo, int subChNo, double* gain);

[C#] int ScGetChannelGain(int hndl, int chNo, int subChNo, out double gain)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number (1 to 16)
[IN] subChNo	Sub channel number (1 to 64; specify 0 if there are none)
[OUT] gain	Gain

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the gain used to convert acquired measurement data into physical values.

ScGetChannelOffset

Description:

Get the channel’s data offset.

Syntax:

[C++] ScResult ScGetChannelOffset(ScHandle hndl, int chNo, int subChNo, double* offset);

[C#] int ScGetChannelOffset(int hndl, int chNo, int subChNo, out double offset)

Parameters:

[IN] hndl	Instrument handle
[IN] chNo	Channel number (1 to 16)
[IN] subChNo	Sub channel number (1 to 64; specify 0 if there are none)
[OUT] offset	Offset

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the offset used to convert acquired measurement data into physical values.

ScSetDataReadyCount

Description:

Set the measurement count used to raise a DataReady event.

Syntax:

```
[C++]    ScResult ScSetDataReadyCount(ScHandle hndl, int sampleCount)
[C#]     int ScSetDataReadyCount(int hndl, int sampleCount)
```

Parameters:

[IN] hndl	Instrument handle
[IN] sampleCount	Sample count

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

During FreeRun measurement, it is possible to raise a data ready event every time a given number of points is measured.

Set the measurement count used to raise DataReady events.

If the count is set to the same value as the sampling frequency (100,000 if the sampling frequency is 100 kHz), an event occurs every second.

ScGetDataReadyCount

Description:

Get the measurement count used to raise a DataReady event.

Syntax:

```
[C++]    ScResult ScGetDataReadyCount(ScHandle hndl, int* sampleCount)
[C#]     int ScGetDataReadyCount(int hndl, out int sampleCount)
```

Parameters:

[IN] hndl	Instrument handle
[OUT] sampleCount	Sample count

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Gets the measurement count used to raise DataReady events.

ScAddEventListener

Description:

Add an event listener

Syntax:

[C++] ScResult ScAddEventListener(ScHandle hndl, ScEventListener* listener)

Parameters:

[IN] hndl	Instrument handle
[IN] listener	Pointer to the event listener class

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

A class that inherits the ScEventListener can be added as an event listener class.
Overwriting handleEventScDataReady() causes the same method to be called automatically when a data ready event occurs.

Note:

Currently the only event that can be acquired is the data ready event.
The dataCount parameter that is passed when handleEventScDataReady() is called is the previous value.
This cannot be used with the .NET version (C#).

Example:

```
class cMyEvent : public ScEventListener {
public:
    virtual void handleEventScDataReady(ScHandle hndl,
    __int64 dataCount);
};

cMyEvent* ep = new cMyEvent();
ScAddEventListener(hndl, ep);
```

ScRemoveEventListener

Description:

Delete the event listener

Syntax:

[C++] ScResult ScRemoveEventListener(ScHandle hndl, ScEventListener* listener);

Parameters:

[IN] hndl	Instrument handle
[IN] listener	Pointer to the event listener class

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Deletes a registered event listener.

Note:

An error will occur if you specify an event listener that has not been added.
This cannot be used with the .NET version (C#).

ScAddCallback

Description:

Add a call back method (C# only)

Syntax:

```
[C#]    public delegate void ScCallback(int hndl, int type)
        int ScAddCallback(int hndl, ScCallback func)
```

Parameters:

[IN] hndl	Instrument handle
[IN] func	Callback method

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Adds a callback method that is called when data ready events occur.

Note:

Currently the only event that can be acquired is the data ready event.

This cannot be used with C++.

The event type is passed through the type parameter of the callback method, but it is currently not used.

Example:

```
private void dataReadyCallback(int hndl, int type)
{
    ....
}
if (api.ScAddCallback(hndl, dataReadyCallback) != ScAPI.SC_SUCCESS)
{
    // error
}
```

ScRemoveCallback

Description:

Delete the call back method (C# only)

Syntax:

```
[C#]    int ScRemoveCallback(int hndl, ScCallback func)
```

Parameters:

[IN] hndl	Instrument handle
[IN] func	Callback method

Return value:

SC_SUCCESS	Success
SC_ERROR	Error

Detail:

Adds a callback method that is called when data ready events occur.

Note:

This cannot be used with C++.

4.4 DLL Linking Method

For C++, only implicit linking is currently assumed for DLL linking.
To use the API through implicit linking, specify and link to the import library (.lib file), and call the API in the same manner as calling normal functions.

In addition, place the following DLLs in the same folder as the application (exe) that you create.

Project	C++ (Unmanaged Application)		C# (Managed Application)		
Architecture	**32 bit**	**64 bit**	**32 bit**	**64 bit**	**Any CPU**
ScAPI.dll	✓		✓		✓
ScAPI64.dll		✓		✓	✓
ScAPINet.dll			✓	✓	✓
tmctl.dll	✓		✓		✓
tmctl64.dll		✓		✓	✓
YKMUSB.dll	✓		✓		✓
YKMUSB64.dll		✓		✓	✓