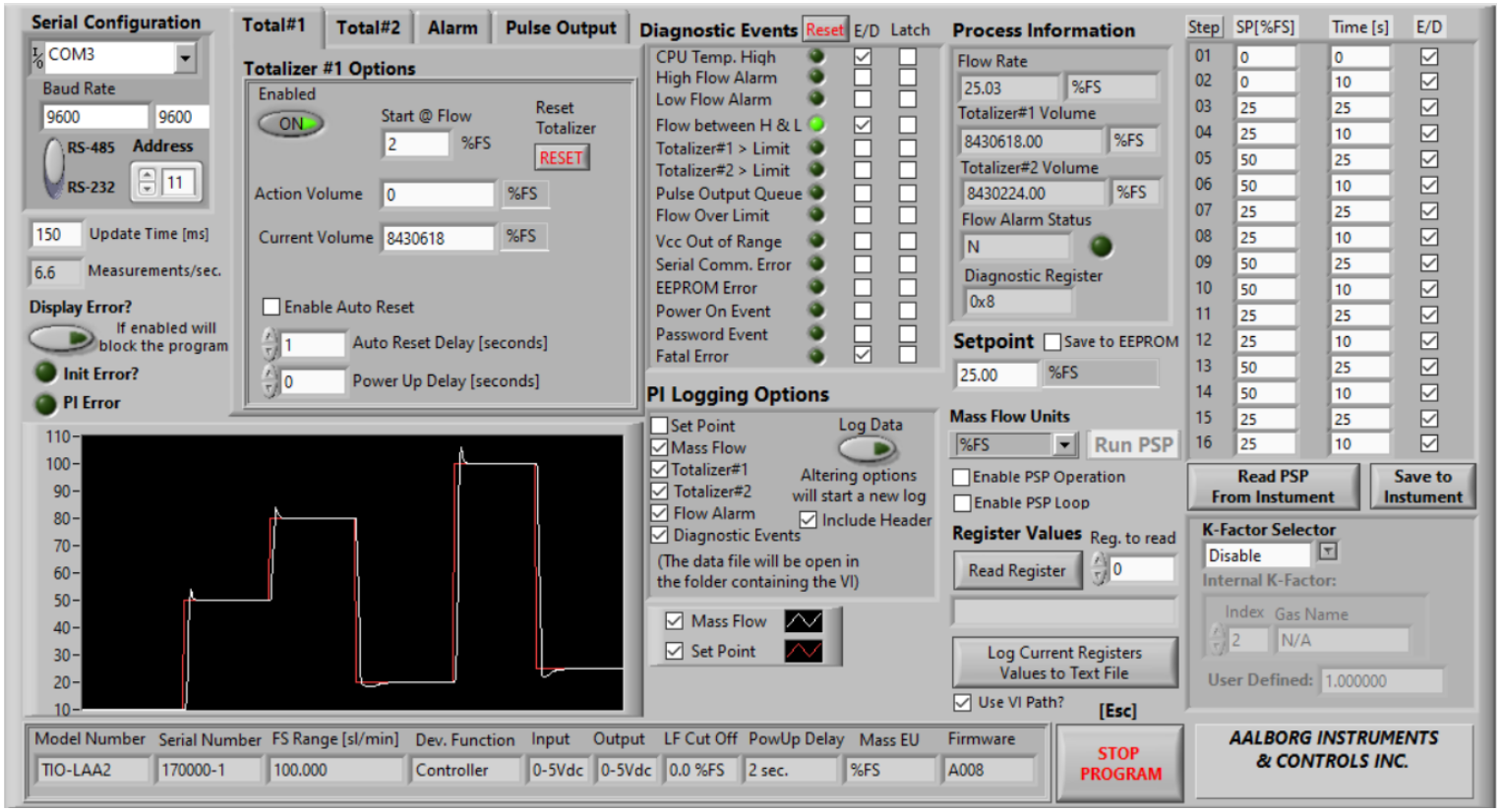
User's Guide to the AALBORG TIO LabVIEW Drivers



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1. Introduction

The AALBORG TIO LabVIEW drivers were designed to make communication with TIO instruments using LabVIEW much easier, and include all supported ASCII commands which are organized as easy to use sub-VI's. These drivers will work on any TIO instrument that is configured for RS-232 or RS-485 interface and connected to the instrument's digital communication interface (pins 3, 6 and 7 on the instrument's 9 pins D-connector).

In the most basic form, the TIO LabVIEW drivers are establishing a VISA session to an active COM port to which TIO devices are connected. Once the communication has been initialized, the sub-VI's can be called which send serial ASCII commands to the TIO instruments over the opened VISA session and parse the ASCII data string that is returned from the device. The initialization should be done with the ***Initialize COM Port*** sub-VI, and the VISA session should be closed using a ***VISA Close*** VI (included in LabVIEW) when ending the program. In the following pages, each of the VI's included in the TIO LabVIEW driver set has a brief description of the function and of the input and output terminals. When operating multiple devices on a single COM port (using RS-485 interface), each serial command or sub-VI must be called sequentially. This can be achieved by ensuring that a VISA session wire on the block diagram always has one source and one sink, and does not branch to multiple sinks. This applies to a single VISA session wire on the block diagram associated with a given COM port, multiple TIO instruments can be operated in parallel through the use of multiple COM ports (and each of those VISA sessions' wires should not branch to multiple sinks).

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2. Known Issues

The string-to-number conversions performed in the data parsing VI's uses the system default decimal format. In some regions, this can cause issues due to LabVIEW expecting a comma for a decimal point instead of the period that will be present in the TIO instrument reply data frame.

To overcome this issue, one can either change the Windows localization settings to use a period for the decimal point or the sub-VI's that are causing the errors can be edited to fix the issue. For the string-to-number sub-VI's, there should be an input for "use system decimal" that can be set to false to force a period to be used; for the "scan from string" sub-VI, changing the format specifier from %f or %.3f to %.;%f or %.;%.3f should work.

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3. AALBORG TIO VI Tree

The AALBORG TIO VI Tree's block diagram contains all of the VI's included in the driver library, visually organized by category. To view these files, simply view the block diagram. When viewing the block diagram, you can hover over the VI's with the context help active to view the description of the VI.

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4. Sub-VI's

4.1 Initialization

These sub-VI's are used to open a VISA session with the configuration settings required by TIO instruments and to initialize key instrument parameters according to data in the instrument's EEPROM memory.

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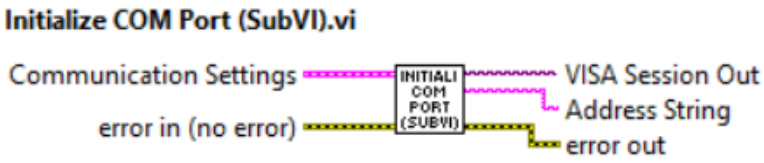
4.1.1 Initialize COM Port



Initializes the serial connection to a selected COM port. Baud rate should match the baud rate of the connected TIO instrument. If multiple instruments are connected to the same COM port, ensure that TIO instruments configured for RS-485 interface and they all have unique RS-485 Addresses.

Inputs:

Communication Settings is a cluster that contains the Instrument Address (string with two hexadecimal characters), Interface Type (boolean TRUE for RS-485) and VISA Session In representing COM Port Number used for establishing communication with device. NOTE: Address is not required when instrument is connected over RS-232 interface (in this case interface type should be set to RS-232 which is boolean "FALSE").

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

Address String is the output string which contains start character and two hexadecimal characters of the device address prefix for RS-485 interface option. If RS-232 interface is selected this string is empty.

VISA Session Out is the opened VISA session reference that needs to be used for all subsequent TIO VI which are using communication commands. Please note: only one sub-VI can execute at a given time referencing a given VISA session. If the VISA session wire is split to several sub-VI's for parallel execution, and error will occur. To operate multiple TIO commands to separate addresses in parallel, separate COM ports need to be used and initialized separately.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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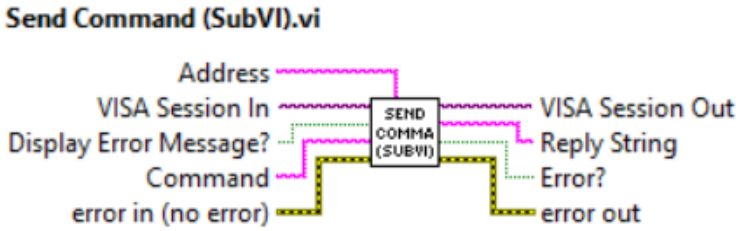
4.1.2 Read Firmware Version



Reads instrument's firmware version and returns unsigned 32 bits integer which represents last to digits of the firmware revision (e.g. 9 for device with firmware version of 1.09). The firmware revision can be used to determine if instrument supports additional ASCII commands which may be added to future versions of the TIO firmware.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port sub-VI.*

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Firmware Version is an unsigned 32 bits integer which represents last to digits of the TIO instrument's firmware revision.
Reply String is a string with TIO instrument's firmware revision.
Error? is the boolean output that is triggered when communication error occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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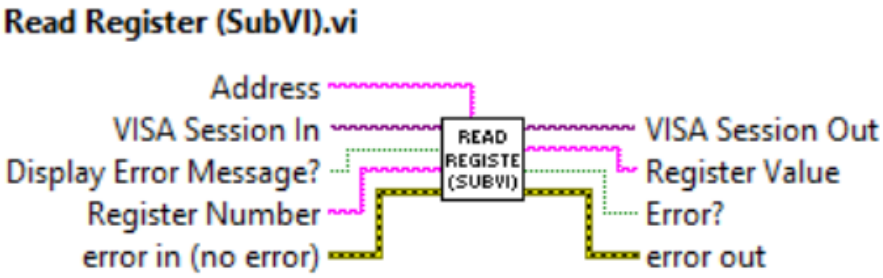
4.1.3 Read Register



Reads single EEPROM register. Valid values for decimal string wired to the "Register Number" terminal are from 0 to 163. Returns response as a string (unedited) which represent EEPROM register value.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Register Number (unsigned 32-bit integer) is a required input and should contain the configuration EEPROM register that is to be read out from the instrument. The valid Register Numbers are from 0 to 163.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Register Value is a returned string which represents the value stored in the specified EEPROM configuration register.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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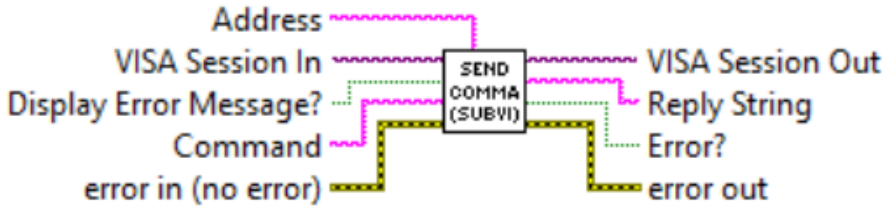
4.1.4 Send Command

Send Command (SubVI).vi



Sends the specified ASCII command to the instrument. Returns response as a string (unedited) which represent instrument's response for particular ASCII command (see APPENDIX C in the TIO operating manual for the list of supported ASCII commands).
WARNING: Use "MW" (EEPROM register write command) carefully, can cause unit to malfunction (Note: Some addresses are write protected).

Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Command is a string with ASCII command to be sent to the TIO instrument (see APPENDIX C in the TIO operating manual for the list of supported ASCII commands).
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.
Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Response String is a string (unedited) which represent instrument's response for submitted ASCII command.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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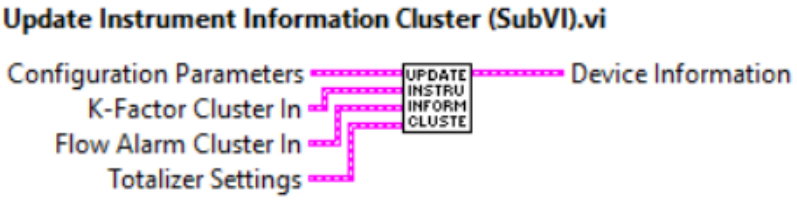
4.1.5 Update Instrument Information Cluster



Takes key instrument configuration parameters from device "*Configuration Parameters*" "*K-Factor", "Flow Alarm" and "Totalizer"* clusters and combines them in to the "*Device Information*" cluster. This sub-VI can be run at the beginning of a program outside the main loop and should be re-run every time the instrument address is changed (for RS-485 interface).

Inputs:

K-Factor is a cluster of strings containing the information regarding instrument's K-Factor parameters.
Flow Alarm is a cluster of strings containing the information regarding instrument's Flow Alarm parameters.
Totalizer Settings is a cluster of strings containing the information regarding instrument's Totalizer parameters.
Configuration Parameters is a cluster of strings containing the information regarding instrument's configuration parameters.

Outputs:

Device Information is a cluster of strings containing the information regarding instrument's information parameters.

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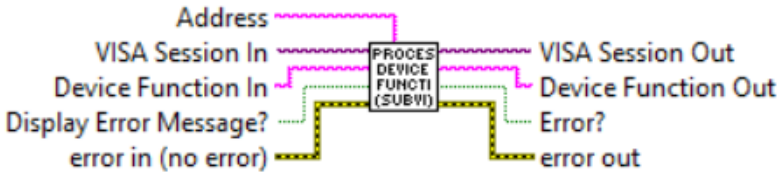
4.2 Device Configuration

These sub-VI's are used for accessing instrument configuration parameters such as: device function, active mass flow engineering units, gas density and optical outputs assignments values. They also provide means to read some information parameters which are stored in the instrument's EEPROM memory: the model number, serial number and instrument's full scale range (in SLPM units of measure).

4.2.1 Process Device Function

Process Device Function (SubVI).vi



Reads/Sets currently selected Device Function value. When *"Device function In"* terminal is empty this Sub-VI performs "Read" function. Valid values for "Device Function In" parameter are one character strings:
"C" - Device Function is "Controller"
"M" - Device Function is "Flow Meter".

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Device Function In is the one character string with Device Function parameter. Valid values are "C" and "M".

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Device Function Out is a one character string that contains instrument's currently selected Device Function ("C" or "M").
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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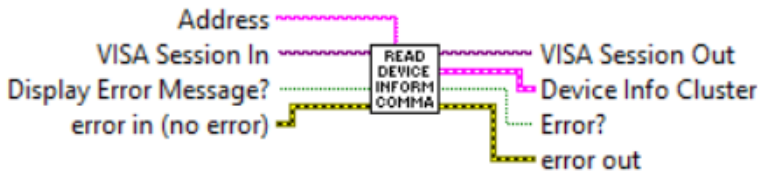
4.2.2 Read Device Information Command

Read Device Information Command (SubVI).vi



Reads instrument configuration (using ASCII DI command) and parsing output data frame in to the Device Information Cluster.
Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Device Info Cluster is a cluster of strings that contains instrument's information parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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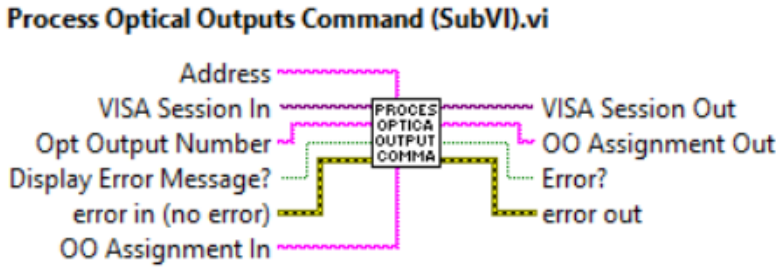
4.2.3 Process Optical Outputs Command



Reads and writes instrument's Optical Outputs assignment parameter. Refer to TIO ASCII commands set (APPENDIX C in the TIO operating manual) to determine valid values for "*Opt Output Number*" and "*OO Assignment In*" input terminals.
"*Opt Output Number*" terminal valid settings: decimal string with 1 or 2 value.
"*OO Assignment In*" terminal valid settings: D, T1, T2, AH, AL, AR, PO, DE, M, S.

Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Opt Output Number is the one character decimal string with desired optical output number value. Valid settings are: 1 or 2.
OO Assignment In is the string with desired optical output assignments value. Valid settings are:

D - No Action (relay disabled);
T1 - Totalizer#1 volume exceeded limit;
T2 - Totalizer#2 volume exceeded limit;
AH - High Flow Alarm;
AL - Low Flow Alarm;
AR - Range between High and Low Alarm settings;
PO - Pulse Output;
DE - Diagnostic Events;
M - Manual Optical Output On override;
S - Read current optical output assignment status.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
OO Assignment Out is a string that contains selected optical output current assignment value: D, T1, T2, AH, AL, AR, PO, DE, M, S.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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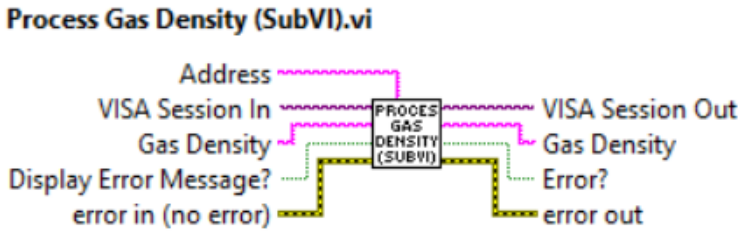
4.2.4 Process Gas Density



Reads/Sets currently selected Gas STD Density. When "Gas Density" terminal is empty this Sub-VI performs "Read" function. Valid values for "Gas Density" parameter are floating point strings from 0.0001 to 1000.0 g/litr.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Gas Density is the input floating point string which represents gas Density value in g/l units of measure.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Gas Density is the instrument's current gas Density value (floating point string) in g/l units of measure.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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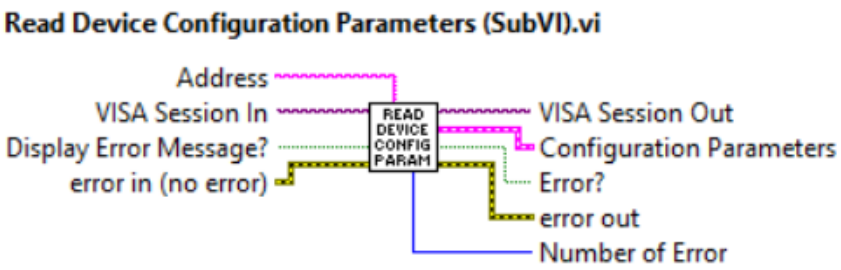
4.2.5 Read Device Configuration Parameters



Reads instrument configuration parameters in to the "*Configuration Parameters*" cluster. This sub-VI can be run at the beginning of a program outside the main loop, and should be re-run every time the instrument address is changed (for RS-485 interface).

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Configuration Parameters is a cluster of strings that contains instrument's configuration parameters retrieved from instrument's EEPROM memory.

Number of Error is unsigned long 32 bit integer representing number of errors which occurred during reading configuration parameters from the instrument.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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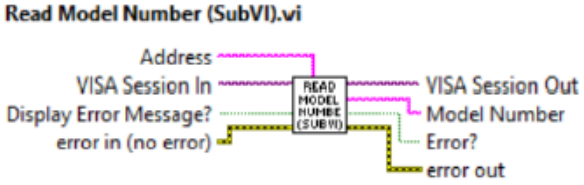
4.2.6 Read Model Number



Reads instrument model number.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Model Number is a string that contains instrument model number.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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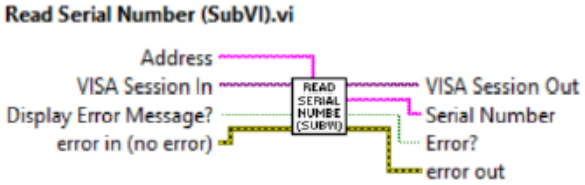
4.2.7 Read Serial Number



Reads instrument serial number.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Serial Number is a string that contains instrument serial number.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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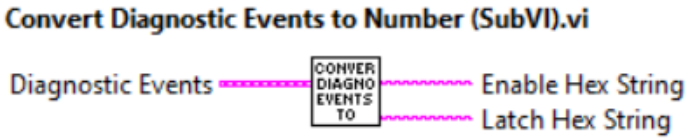
4.3 Diagnostic

These sub-VI's are used for collecting instrument diagnostic alarms stored in instrument's volatile memory (SRAM) registers such as: CPU temperature, flow alarm events, totalizers events, serial communication and EEPROPM errors, instrument overflow event and Vcc power voltage out of the range event.

4.3.1 Convert Diagnostic Event to Number



Converts Diagnostic Events *Mask* and *Latch* controls state of the *Diagnostic Events Cluster* to hex strings.

Inputs:

Diagnostic Events In is a cluster with *Diagnostic Events* parameters to be converted.

Outputs:

Enable Hex String is a 6 characters hex string with Diagnostic Events Mask register value.

Latch Hex String is a 6 characters hex string with Diagnostic Events *Latch* register value.

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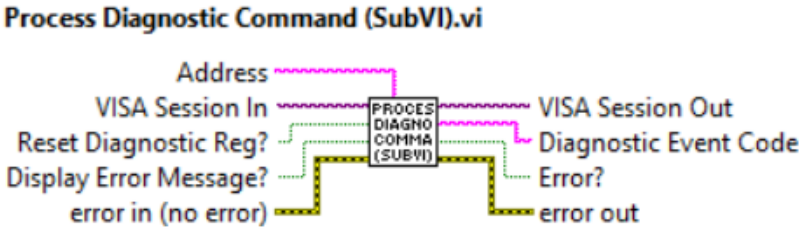
4.3.2 Process Diagnostic Command



Reads *Diagnostic Events* status register. When "R*eset Diagnostic Reg?*" terminal is connected to "FALSE" this Sub-V reads the bitwise *Diagnostic* events code. When "*Reset Diagnostic Reg?*" terminal is connected to "TRUE" the instrument's *Diagnostic Event Register* is reset to 0x0000.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Reset Diagnostic Reg? is a Boolean input stating whether the Diagnostic Status Register should be reset. If set to "*TRUE*" the instrument's *Diagnostic Event Status Register* is reset to 0x0000.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Diagnostic Event Code is a hexadecimal string that contains instrument's *Diagnostic Event Status Register* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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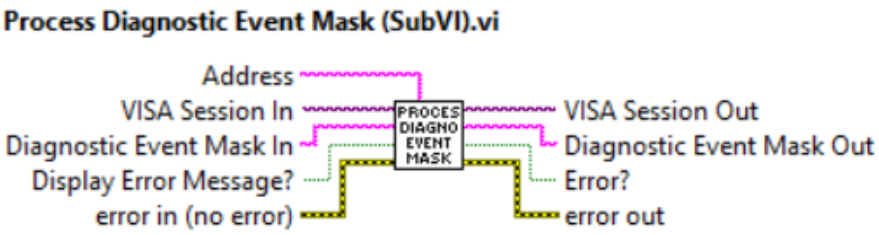
4.3.3 Process Diagnostic Event Mask



Reads/writes instrument's *Diagnostic Event Mask Register Value* parameter. When "*Diagnostic Event Mask In*" terminal is empty his Sub-VI performs "*Read*" function. NOTE: "*Diagnostic Event Mask In*" hexadecimal string value must be between 0x0000 - 0xFFFF. All 6 characters are required. Set bit - Enables corresponding Diagnostic Event. Clear bit - Disables corresponding Diagnostic Event.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Diagnostic Event Mask In is a hexadecimal string that contains instrument's Diagnostic Event Mask Register value.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

ErrorIn is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Diagnostic Event Mask Out is a hexadecimal string that contains instrument's *Diagnostic Event Mask Register* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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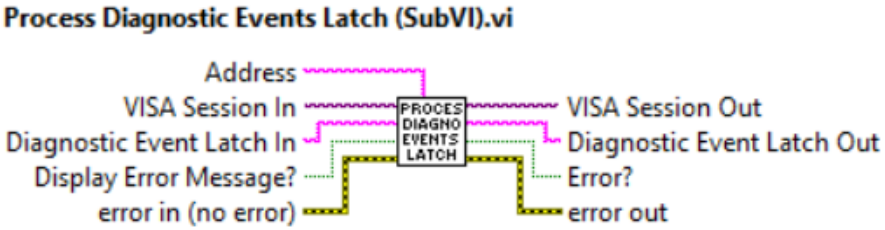
4.3.4 Process Diagnostic Events Latch



Reads/writes instrument's *Diagnostic Event Latch Register Value* parameter. When "*Diagnostic Event Latch In*" terminal is empty his Sub-VI performs "*Read*" function. NOTE: "*Diagnostic Event Latch In*" hexadecimal string value must be between 0x0000 - 0xFFFF. All 6 characters are required. Set bit - Enables latch function for corresponding Diagnostic Event. Clear bit - Disables latch function for corresponding Diagnostic Event.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Diagnostic Event Latch In is a hexadecimal string that contains instrument's Diagnostic Event Latch Register value.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

ErrorIn is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Diagnostic Event Latch Out is a hexadecimal string that contains instrument's *Diagnostic Event Latch Register* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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4.3.5 Read Back Door Status Command

Update Diagnostic Events Indicators (SubVI).vi

Updates Status indicators of the Diagnostic Events cluster base on Diagnostic Events *Status* register value wired to *DE Status String In* terminal.

Inputs:

DE Status String In is a 6 characters hex string with Diagnostic Events *Status* register value.

Diagnostic Events In is a cluster with Diagnostic Events parameters to be updated.

Outputs:

Diagnostic Events Out is a cluster with Diagnostic Events parameters updated according to the input DE *Status* register value.

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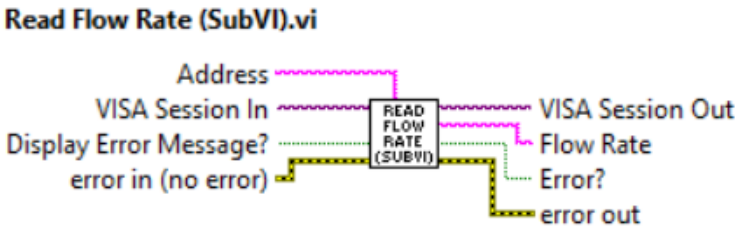
4.4 Process Information

These sub-VI's are used for collecting instrument's process information parameters such as: Mass Flow Rate, Totalizers reading, Flow Alarm status and Diagnostic Events Register value.

4.4.1 Read Flow Rate



Reads the instrument's Mass flow reading value (floating point string) in currently selected mass flow units of measure.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Flow Rate is the instrument's mass flow reading value (floating point string) in currently selected mass flow units of measure.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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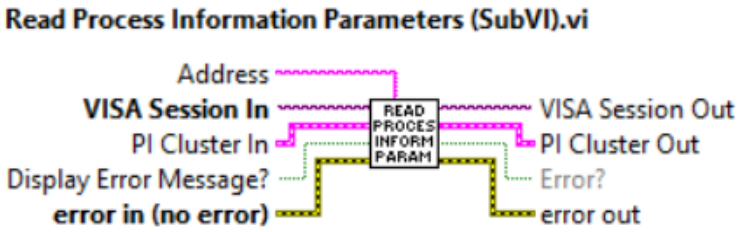
4.4.2 Read Process Information Parameters



Reads Instrument's Process Information [PI] data: Mass Flow Rate, Totalizer#1, Totalizer#2 , Flow Alarm Status, Diagnostic Events Register. Returns cluster of strings: Mass Flow Rate (MEU), Totalizer#1 value (MEU), Totalizer#2 value (MEU), Flow Alarm Status [D,N,H,L], Diagnostic Events Register (bitwize hexadecimal string: 0X0000 - 0X2FFF).
Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.
PI Cluster In is a cluster containing the instrument's current process information parameters.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
PI Cluster Out is a cluster of strings with instrument's updated process information parameters values.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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4.5 Engineering Units

4.5.1 Convert Mass Flow EU to Totalizer EU

Converts time based mass flow units of measure name to the corresponding volumetric/mass (not time based) units of measure name used in Totalizer reading.

Inputs:

Mass Flow EU is a string which represents mass flow units of measure name (time based).

Outputs:

Totalizer EU is a string which represents volumetric/mass (not time based) units of measure name.

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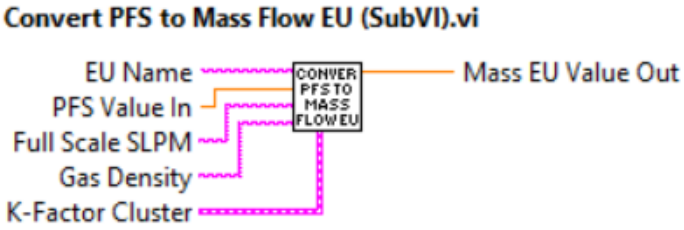
4.5.2 Convert PFS to Mass Flow EU



Converts mass flow PFS @ Factory STD conditions ([0.0-100.0%] notation) to the engineering units (STP conditions) which are wired to the "EU Name" terminal. This VI has to be run in the beginning of the instrument initialization and each time the instrument selected gas table or mass flow EU are changed.

Inputs:

EU Name is string with mass flow units of measure name which represents mass flow units of measure to which you want to convert "*PFS Value In*" (required input).

Full Scale SLPM is a floating point string with instrument's full scale range value expressed in SLPM units of measure (required input). Instrument full scale range parameter can be obtained with "Read Device Information" sub-VI.

Gas Density is a floating point string input which provides the density (in g/l units at STD conditions) of the gas.

K-Factor Cluster is a cluster with currently selected K-Factor value.
PFS Value In is the value (double) expressed in the percent of full scale (%FS) mass flow units of measure to be converted to value expressed in the mass flow units of measure wired to the "*EU Name*" terminal (required input).

Outputs:

Mass EU Value Out is mass flow value (double) converted to value expressed in the mass flow units of measure wired to the "*EU Name*" terminal.

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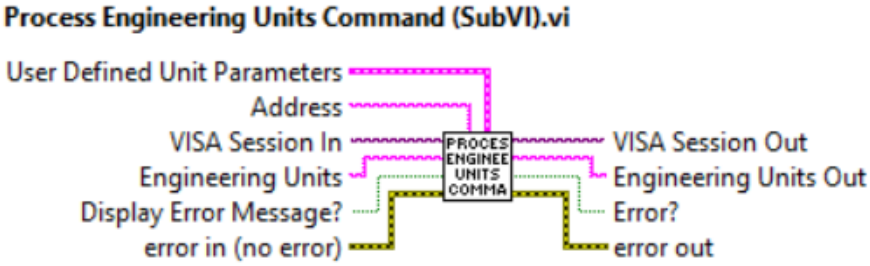
4.5.3 Process Engineering Units Command



Sets/Reads currently selected mass flow units of measure. When "*Engineering Units*" terminal is empty this Sub-VI performs "*Read*" function. "*User Defined Unit Parameters*" cluster only required to set "USER" mass flow units. See TIO user manual APPENDIX C for the list of supported mass flow units of measure.

Inputs:

User Defined Unit Parameters is a cluster of strings with current "*User Defined Unit*" parameters.
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Engineering Units is string with mass flow units of measure name which represents mass flow units of measure you want to select.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Engineering Units Out is a string that contains instrument's currently selected mass flow units of measure.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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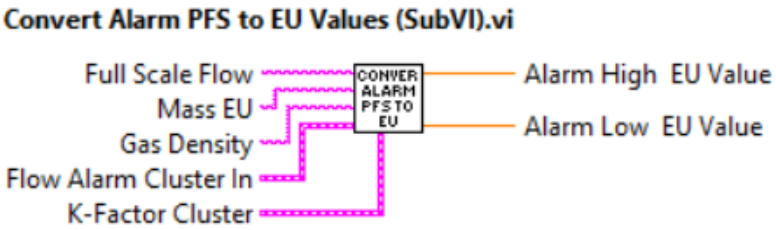
4.5.4 Convert Alarm PFS to EU Values



Converts High and Low Alarms PFS values to the currently selected mass flow units of measure values.

Inputs:
Full Scale Flow is a floating point string with instrument's full scale range value expressed in SLPM units of measure (required input). Instrument full scale range parameter can be obtained with "Read Device Information" sub-VI.
Mass EU is string with mass flow units of measure name which represents currently selected mass flow units of measure (required input).
Gas Density is a floating point string input which provides the density (in g/l units at STD conditions) of the gas.

Flow Alarm Cluster In is a cluster of 6 elements containing the instrument's Flow Alarm parameters (required input).
K-Factor Cluster is a cluster with currently selected K-Factor value (required input).

Outputs:

Alarm High EU Value is High Flow Alarm value (double) converted to value expressed in the mass flow units of measure wired to the "Mass EU" terminal.
Alarm Low EU Value is Low Flow Alarm value (double) converted to value expressed in the mass flow units of measure wired to the "Mass EU" terminal.

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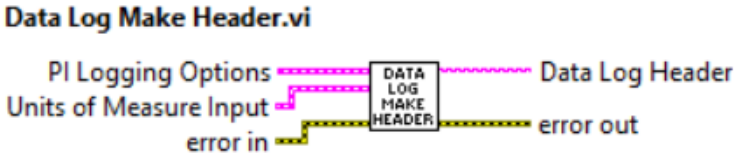
4.6 Data Logging

4.6.1 Data Log Make Header



Generates a header string for use with data logging. Output will be a comma delimited string containing labels of the variables (and the units of measure, if selected) for the data logging options selected. This is for use with AALBORG LabVIEW's examples which utilize Data Log feature.

Inputs:

PI Logging Options is a required input cluster that represents the desired data logging options.
Units of Measure Input is a cluster containing the currently selected units of measure strings for each PI variable supported by the instrument.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

Data Log Header is a comma delimited string containing the data column headers for each PI variable selected with the "*PI Logging Options*" input.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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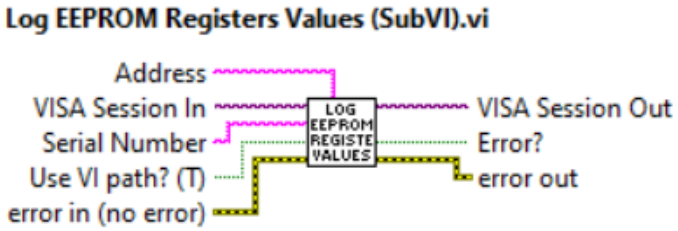
4.6.2 Log EEPROM Registers Values



Reads the values of EEPROM configuration [0-163] registers. Stores the values in a text file. Generates file name as a time-stamp (by default saves it to the current working directory).

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Serial Number is a string with instrument's serial number to be included in the auto-generated file name. If left open then only time stamp will be included in the auto-generated file name.

Use VI path? (T) is a Boolean control that determines if the sub-VI will use an auto-generated file name (with the serial number and a time stamp) and save it in the folder from which it was run (TRUE), or if user action is needed to specify a file name and path (FALSE).

Outputs:

VISA Session Out is the output VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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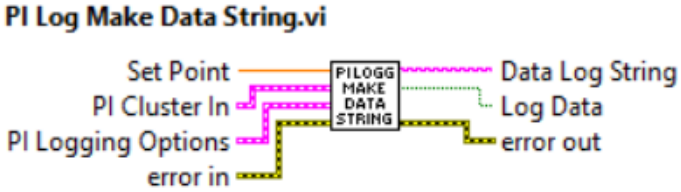
4.6.3 PI Log Make Data String



Generates a comma delimited string from the data based on the logging options selected. This is for use with AALBORG LabVIEW's examples which utilize *Data Log* feature.

Inputs:

PI Logging Options is a required input cluster that represents the desired data logging options.

PI Cluster In is a required input cluster containing all of the measurement data that is output from the "*Read PI Data*" sub-VI.

Set Point is the instrument's current set point value (double) expressed in the currently selected mass flow units of measure (required input for instruments configured as controller).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

Data Log String is a comma delimited data string containing the variables selected with the "*PI Logging Options*" input.

Log Data returns the boolean value located in the "*PI Logging Options*" input for ease of use (to avoid needing to unbundle the cluster) and can be used to determine whether or not to log the output *Data Log String* string to a data file.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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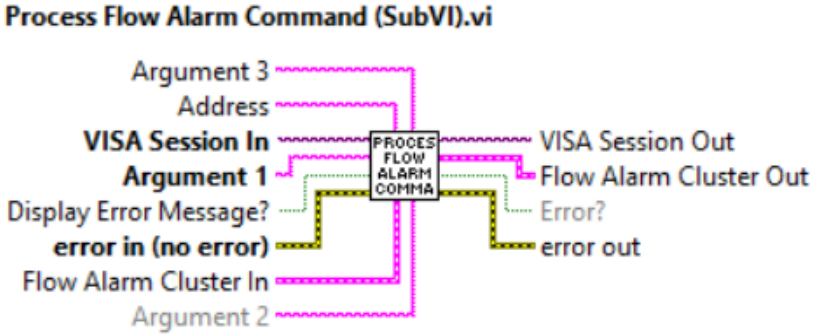
4.7 Flow Alarm

4.7.1 Process Flow Alarm Command



Reads and writes Flow Alarm parameters. Refer to ASCII commands set in the TIO operating manual for proper values of the strings wired to the Argument#1, Argument#2, and Argument#3 inputs. This SubVI parsing output data frame and updates corresponding parameters of the Flow Alarm cluster. Argument 1 terminal values must be:
"C" - Set High and Low Flow Alarm Value (%FS), "D" - Disable Flow Alarm, "E" - Enable Flow Alarm, "R" - Read current Flow Alarm status [H, L, N], "A" - Set Action Delay (0 to 3600 sec.), "L" - Set Latch Mode (0-1), "S" - Read current Flow Alarm settings
When "Argument 1" is wired to string "C", if device is configured for "Flow Meter" function the High Alarm value (Argument 2) must be more than Low Alarm Value (Argument 3).

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Flow Alarm Cluster In is a cluster of 6 elements containing the information regarding instrument's Flow Alarm parameters.
Argument#1 is the (string with one ASCII character) specifying the Flow Alarm parameter that you would like for the instrument to read or to change to.
Argument#2 is the (string) specifying the value for particular Flow Alarm parameter that you would like for the instrument to change to.
Argument#3 is the (string) specifying the value for particular Flow Alarm parameter that you would like for the instrument to change to.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the output VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Flow Alarm Cluster Out is a cluster of 6 elements containing the updated information regarding instrument's Flow Alarm parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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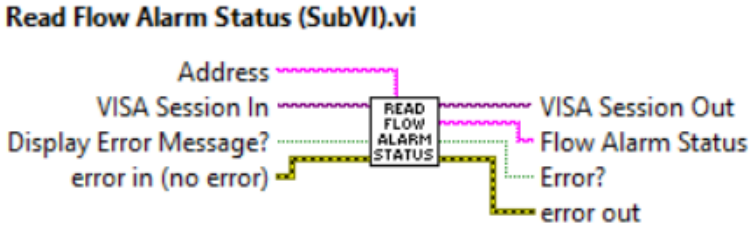
4.7.2 Read Flow Alarm Status



Reads instrument Flow Alarm Status. Returns one character string:
"H" - High Flow Alarm,
"L" - Low Flow Alarm,
"N" - No Flow Alarm.

Iputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:
VISA Session Out is the output VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Flow Alarm Status is a one character strings with current Flow Alarm status [H,L,N].
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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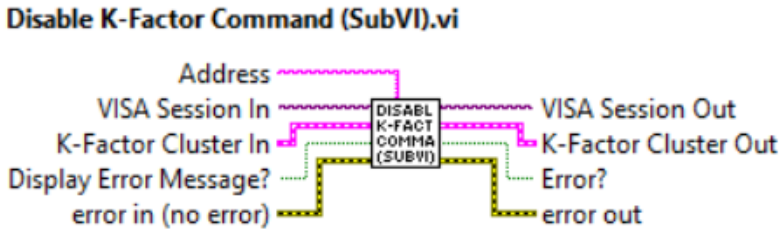
4.8 K-Factors

4.8.1 Disable K-Factor Command



Disables K-Factor applied to currently selected Gas Table. If successful changes "*K-Factor Cluster*" parameters "*K-Factor Mode*" to "Disable" and "*K-Factor Value*" to 1.0

Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
K-Factor Cluster In is a cluster of 4 elements which represents K-Factor parameters to be updated.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
K-Factor Cluster Out is a cluster of 4 elements which represents updated K-Factor parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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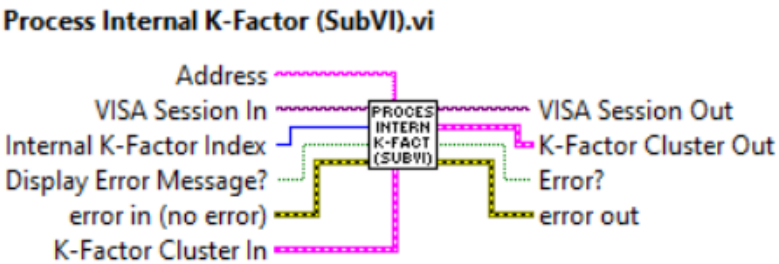
4.8.2 Process Internal K-Factor



Applies Internal K-Factor to currently selected Gas Table. If successful returns "*K-Factor Index*", "*Gas Name*" and floating point number with "*K-Factor Value*" in the K-Factor cluster. K-Factor does not work with %FS engineering unit. Valid Internal K-Factor Indexes are from 1 to 22 To apply currently selected Internal K-Factor Index set "*Internal K-Factor Index*" terminal value to 0.

Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Internal K-Factor Index is a required (unsigned 32-bit integer) input and should contain the Internal K-Factor index that is to be written to the instrument's nonvolatile memory. The valid values are from 1 to 22.
K-Factor Cluster In is a cluster of 4 elements which represents K-Factor parameters to be updated.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
K-Factor Cluster Out is a cluster of 4 elements which represents updated K-Factor parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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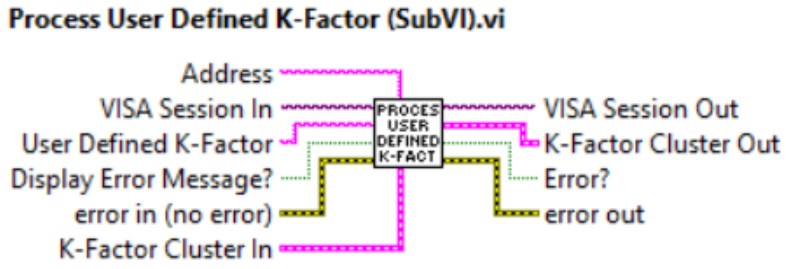
4.8.3 Process User Defined K-Factor



Applies *User Defined K-Factor* to currently selected Gas Table. If successful returns K-Factor Index, floating-point number with K-Factor value in the K-Factor cluster. K-Factor does not work with %FS engineering unit. Changes take effect after next set point command. Valid *User Defined K-Factor* Values are from 0.1 to 999.9. To apply currently selected User Defined K-Factor Value leave "*User Defined K-Factor*" terminal empty.

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String"* output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

User Defined K-Factor is a required (floating point string) input and should contain the *"User Defined K-Factor*" value that is to be written to the instrument's nonvolatile memory.

K-Factor Cluster In is a cluster of 4 elements which represents K-Factor parameters to be updated.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

K-Factor Cluster Out is a cluster of 4 elements which represents updated K-Factor parameters.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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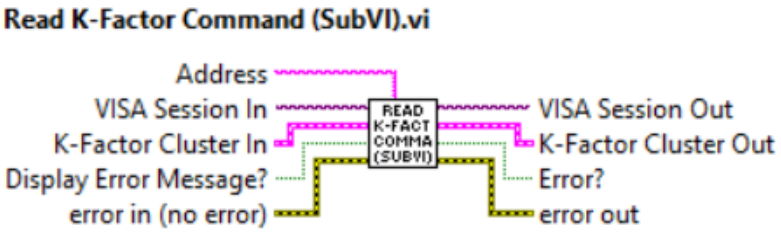
4.8.4 Read K-Factor Command



Reads currently selected K-Factor Mode and Value. If Internal K-Factor is selected "K-Factor Out" cluster also updated with Internal K-Factor index and Gas Name.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

K-Factor Cluster In is a cluster of 4 elements which represents K-Factor parameters to be updated.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

K-Factor Cluster Out is a cluster of 4 elements which represents updated K-Factor parameters.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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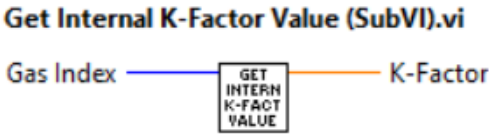
4.8.5 Get Internal K-Factor Value



Returns floating point *K-Factor* value for corresponding *Internal K-Factor* Index.

Inputs:
Gas Index is a required input, which represents desired *Internal K-Factor Index* (unsigned integer). Valid values for *Gas Index parameter are from 1 to 22.*
Outputs:
K-Factor is double K-Factor value corresponding to the *K-Factor Index* specified in the "*Gas Index*" terminal.

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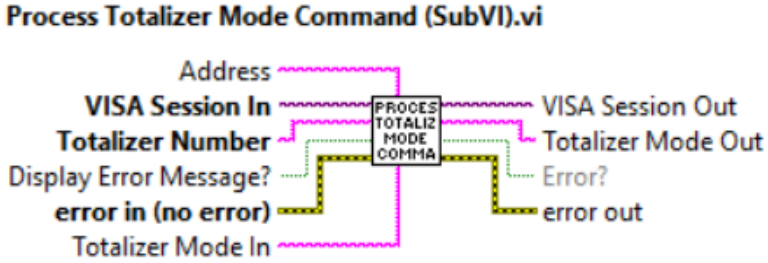
4.9 Totalizer

4.9.1 Process Totalizer Mode Command



Sets Totalizer mode parameter to "*Enabled*" or "*Disabled*". Wire decimal string with 1 or 2 value to "*Totalizer Number*" input terminal to select desired Totalizer. *Totalizer Mode* terminal values must be single character strings: "E" or "D".

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Totalizer Mode In is an one character string which represents desired "*Totalizer Mode*". Valid values: E or D.

Totalizer Number is a decimal string with Totalizer number you want to read from or write to "Mode" parameter value (1 or 2).

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Totalizer Mode Out is a string with instrument's *Totalizer Mode* value ("E" or "D").

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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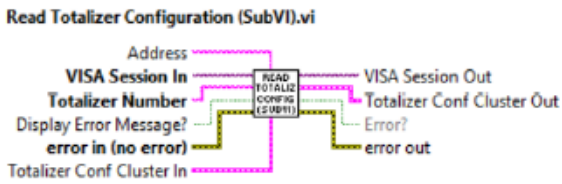
4.9.2 Read Totalizer Configuration



Queries instrument's Totalizer parameters, parses data frame received from the instrument and populates data in to the Totalizer Configuration cluster. Wire decimal string with 1 or 2 value to "Totalizer Number" input terminal to select desired Totalizer. This sub-VI can be run at the beginning of a program outside the main loop, and should be re-run every time the instrument address is changed (for RS-485 interface).

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Totalizer Number is a decimal string with Totalizer number you want to read configuration parameters from. Accepted values: 1 or 2.

Totalizer Conf Cluster In is a cluster of 6 elements containing information regarding instrument's Totalizer parameters.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to “TRUE” and communication error or time out occur the “Communication Error Message” will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI’s.

Totalizer Conf Cluster Out is a cluster of 6 elements containing updated information regarding instrument's Totalizer parameters.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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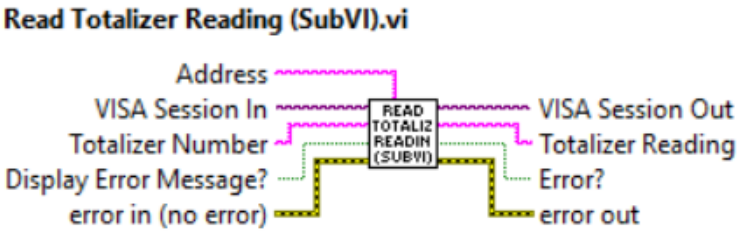
4.9.3 Read Totalizer Reading



Reads current Totalizer Volume value. Returns floating point string which represents Totalizer reading in currently selected units of measurement. Valid values for "Totalizer Number" input are decimal strings: "1" or "2".

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Totalizer Number is a decimal string with Totalizer number you want to read current volume value from. Accepted values: 1 or 2.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Totalizer Reading is a floating point string with instrument's current Totalizer volume reading in currently selected (not time based) mass flow units of measure.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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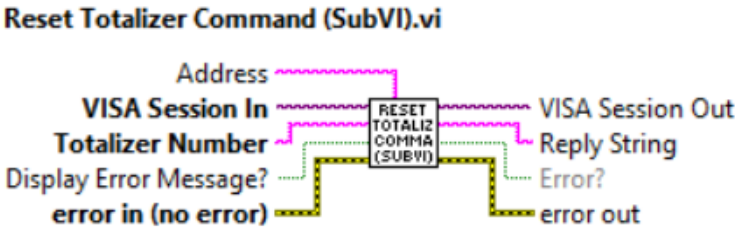
4.9.4 Reset Totalizer Command



Resets accumulated Totalizer volume to zero. Wire decimal string with 1 or 2 value to "Totalizer Number" input terminal to select desired Totalizer. Returns string with single character "Z" if successful.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Totalizer Number is a decimal string with Totalizer number you want to read current volume value from. Accepted values: 1 or 2.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Reply String is a string with instrument's reply message to be evaluated.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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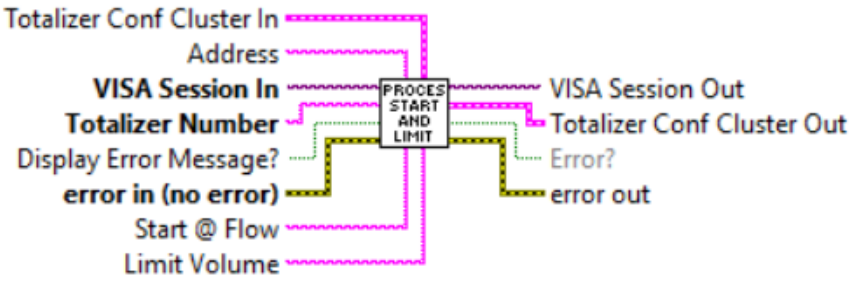
4.9.5 Process Start and Limit Conditions

Process Start and Limit Conditions (SubVI).vi



Writes Totalizer "Start @ Flow" and "Limit Volume" parameters for selected Totalizer. Wire decimal string with 1 or 2 value to "Totalizer Number" input terminal to select desired Totalizer. Refer to TIO ASCII commands set (APPENDIX C in the TIO operating manual) to determine valid values for "Start @ Flow" and "Limit Volume" input terminals. If Totalizer hit limit event is not required, set "Limit Volume" value to zero. NOTE: "Start @ Flow" value must be entered as floating point strings in %FS units (valid values: 0.0 to 100.0%). "Limit Volume" value must be entered as floating point strings in currently selected EU.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Totalizer Conf Cluster In is a cluster of 6 elements containing information regarding instrument's Totalizer parameters.

Totalizer Number is a decimal string with Totalizer number you want to rset new parameters to. Accepted values: 1 or 2.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to “TRUE” and communication error or time out occur the “Communication Error Message” will block program execution.

Start @Flow is a floating point string representing flow rate value (in % of full scale flow units) at which Totalizer will start.

Limimt Volume is a floating point string representing Totalizer "*Limit Volume*" value (in currently selected not time based mass flow units) at which Totalizer will stop and Totalizer event will be activated.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI’s.

Totalizer Conf Cluster Out is a cluster of 6 elements containing updated information regarding instrument's Totalizer parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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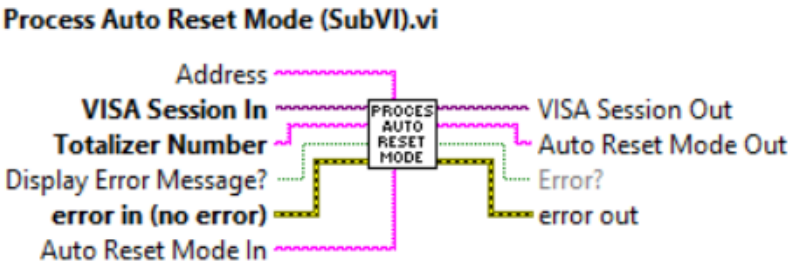
4.9.6 Process Auto Reset Mode



Writes Totalizer "*Auto Reset Mode" par*ameter for selected Totalizer. Wire decimal string with 1 or 2 value to "*Totalizer Number*" input terminal to select desired Totalizer. Wire to "*Auto Reset Mode In*" input terminal one character string to set desired value. Allowable values are:
0 - Auto Reset Mode is "Disabled"
1 - Auto Reset Mode is "Enabled"

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Totalizer Number is a decimal string with Totalizer number you want to update "*Auto Reset Mode*" parameter value to.
Auto Reset Mode In is an one character string representing desired Totalizer "*Auto Reset Mode*" value you want to activate.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.

Auto Reset Mode Out is an one character string representing updated Totalizer "Auto Reset Mode" value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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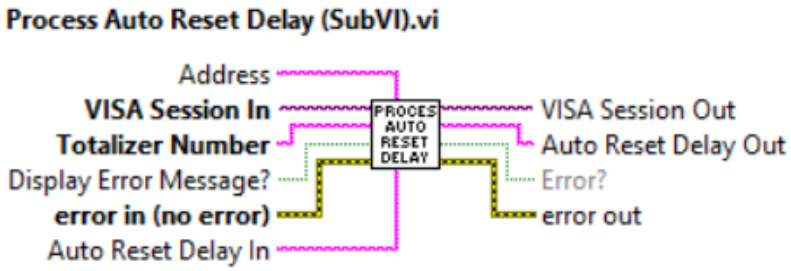
4.9.7 Process Auto Reset Delay



Writes Totalizer "*Auto Reset Delay*" parameter for selected Totalizer. Wire decimal string with 1 or 2 value to "*Totalizer Number*" input terminal to select desired Totalizer. Wire to "*Auto Reset Delay In*" input terminal decimal string to set desired value (allowable range from 0 to 3600 seconds).

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to “TRUE” and communication error or time out occur the “Communication Error Message” will block program execution.
Totalizer Number is a decimal string with Totalizer number you want to update "*Auto Reset Mode*" parameter value to.
Auto Reset Delay In is a decimal string specifying the Totalizer "*Auto Reset Delay*" value that you would like for the instrument to change to (allowable range from 0 to 3600 seconds).
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI’s.
Auto Reset Delay Out is decimal string with instrument's current Totalizer "*Auto Reset Delay*" parameter value.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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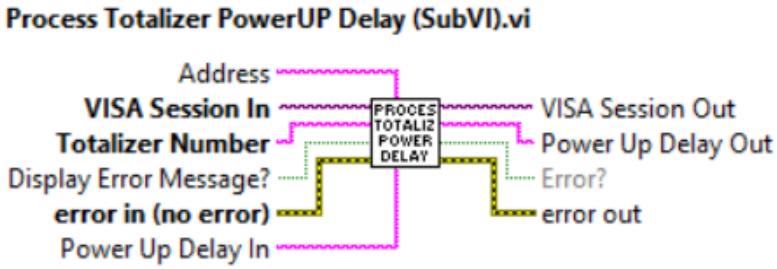
4.9.8 Process Totalizer PowerUp Delay



Writes Totalizer "*Power On Delay*" parameter for selected Totalizer. Wire decimal string with 1 or 2 value to "*Totalizer Number*" input terminal to select desired Totalizer. Wire to "*Power On Delay In*" input terminal decimal string to set desired value (allowable range from 0 to 3600 seconds).

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Totalizer Number is a decimal string with Totalizer number you want to update "*Auto Reset Mode*" parameter value to.

Power Up Delay In is a decimal string specifying the Totalizer "*Power Up Delay*" value that you would like for the instrument to change to (allowable range from 0 to 3600 seconds).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.

Power Up Delay Out is decimal string with instrument's current Totalizer "*Auto Reset Delay*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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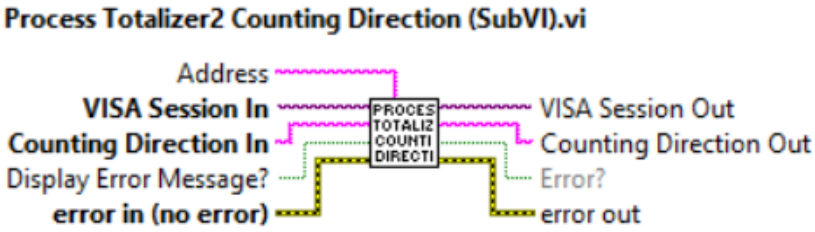
4.9.9 Process Totalizer2 Counting Direction



Sets *Totalizer#2* counting direction. Only supported by *Totalizer#2*. Valid values for "*Counting Direction In*" terminal are decimal string:
"0" - Count Up
"1" - Count Down
Not supported by T*otalizer#1*.

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Counting Direction In is an one character decimal string specifying the Totalizer#2 "*Counting Direction*" value that you would like for the instrument to change to (allowable values are: 0 or 1).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.

Counting Direction Out is an one character decimal string specifying the current Totalizer#2 "*Counting Direction*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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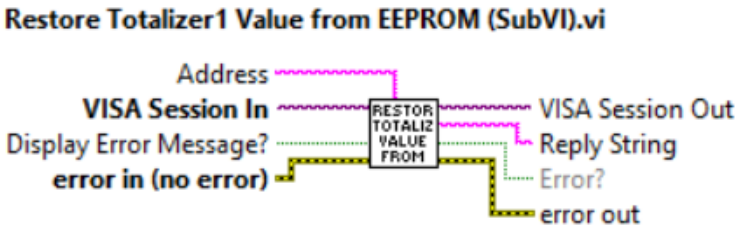
4.9.10 Restore Totalizer1 Value from EEPROM



This Sub-VI will restore only *Totalizer#1* accumulated volume. Returns string "*T1B*" if successful. If *Totalizer#1* is locked will return string "*LOCKED*".
Not supported by T*otalizer#2*.

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.

Reply String is a string with instrument reply message. Returns string "T1B" if successful.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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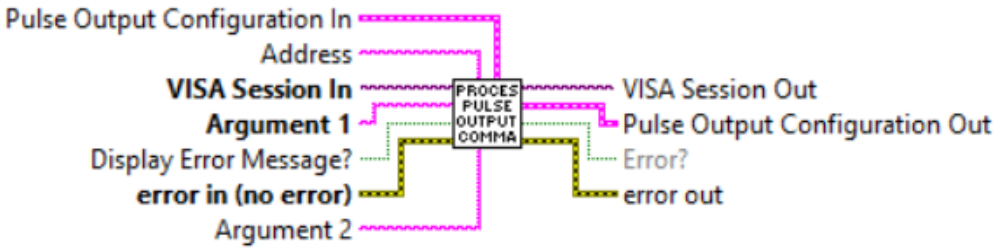
4.9.11 Process Pulse Output Command

Process Pulse Output Command (SubVI).vi



Writes/Reads instrument's Pulse Output parameters (*PO Mode, Start @ Flow, Unit per Pulse, Pulse Active Time Interval*). Refer to TIO ASCII commands set (APPENDIX C in the TIO operating manual) to determine valid values for *Argument#1* and *Argument#2* input terminals. This SubVI parsing output data frame and updates corresponding parameters of the *Pulse Output Configuration* cluster. *Argument 1* terminal values must be:
"U" - Set Unit per Pulse Value (in currently selected units of measure)
"D" - Disable Pulse Output
"E" - Enable Pulse Output
"F" - Set Start @ Flow parameter value (in %FS units of measure)
"T" - Set Pulse Active Time Interval (10 to 6553 ms)
"S" - Read current Pulse Output settings

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Init COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Argument#1 is the (string with one ASCII character) specifying the *Pulse Output* parameter that you would like for the instrument to read or to change to.
Argument#2 is the (string) specifying the value for particular *Pulse Output* parameter that you would like for the instrument to change to. Leave this input open to read current value of the parameter specified in the *Argument#1*.
Display Error Message? is a Boolean input stating whether the *Error Message* should be displayed when communication error arises. If set to "*TRUE*" and communication error or time out occur the "*Communication Error Message*" will block program execution.
Pulse Output Configuration In is the input cluster with 4 elements which represents "P*ulse Output*" parameters.

Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.
Pulse Outpuit Configuration Out is a cluster of 64elements containing updated information regarding instrument's *Pulse Output* parameters.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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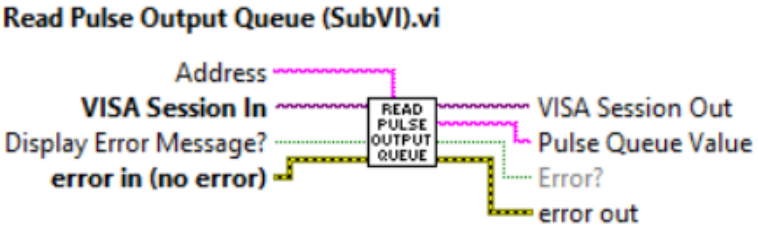
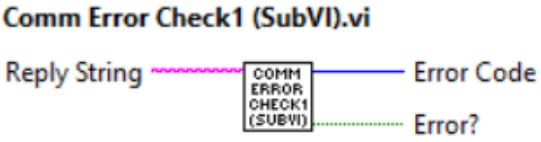
4.9.12 Process Pulse Output Queue



Reads current Pulse Output Queue value.
Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.
Outputs:
VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Pulse Queue Value is a string with current value of the *Pulse Output Queue*.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

4.10 Utilities

4.10.1 Comm Error Check1



Checks instrument reply message (must be wired to the "Reply string" input terminal) and looking for "ERROR#" string. If error is found set "Error?" boolean output to "TRUE" and provides Error Code (32 bit integer number).

Inputs:

Reply string is a string with instrument's reply message to be evaluated.

Outputs:

Error Code is a 32 bit integer with communication error code number.

Error? is the boolean output that is triggered when communication error occurred during communication with the instrument.

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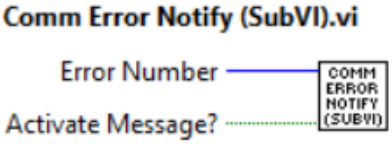
4.10.2 Comm Error Notify



Displays Communication Error Message based on input Error code number generated by "Comm Error Check1" Sub-VI.

NOTE:This Sub-VI will block program execution if instrument replies with error message and "*Activate Message?*" input is connected to "TRUE". If your application should not be interrupted connect "*Activate Message?*" input to "FALSE".

Inputs:

Error Number is a 32 bit integer with communication error code number generated by *"Comm Error Check1"* Sub-VI.

Activate Message? is the boolean input stating whether the message with description of the "Communication Error" must be activated.

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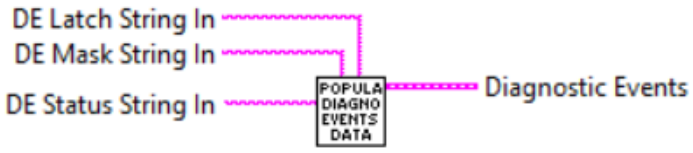
4.10.3 Populate Diagnostic Events Data

Populate Diagnostic Events Data (SubVI).vi



Converts hex strings from *Diagnostic Events* registers to Arrays and updates *Diagnostic Events* cluster.

Inputs:

DE Latch String In is a 6 characters hex string with *Diagnostic Events Latch* register value.
DE Mask String In is a 6 characters hex string with *Diagnostic Events Mask* register value.
DE Status String In is a 6 characters hex string with *Diagnostic Events Status* register value.

Outputs:

Diagnostic Events is a cluster with *Diagnostic Events* parameters updated according to the input DE registers values.

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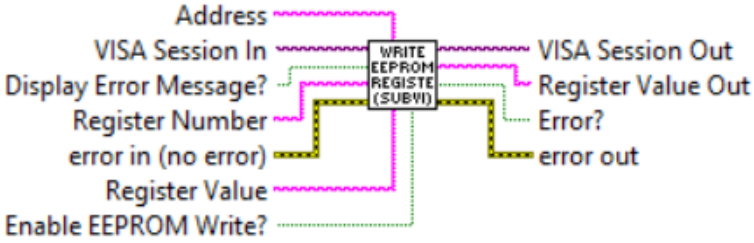
4.10.4 Write EEPROM Register

Write EEPROM Register (SubVI).vi



Writes specified value to the to the instruments corresponding EEPROM register .
Returns response as a string (unedited) which represent EEPROM register value.

WARNING: Use MW (EEPROM register write command) carefully, can cause unit to malfunction (Note: Some addresses are write protected).

The instrument EEPROM parameters were set on the factory to keep best performance. Do not change EEPROM parameters unless instructed by factory technical support representative.

WARNING: To prevent EEPROM burning, avoid writing the same EEPROM register number more often than one time per 5 minutes.

Register writes can be disabled by wiring boolean FALSE constant to the "*Enable EEPROM Write?*" terminal, and can be enabled by wiring a boolean TRUE constant to the "*Enable EEPROM Write?"* terminal.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* Sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "*TRUE*" and communication error or time out occur the "*Communication Error Message*" will block program execution.

Register Number (decimal string) is a required input and should contain the configuration EEPROM register that is to be written in to the instrument. The valid Register Numbers are from 21 to 163.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Register Value is a string with register value to be written to the instrument EEPROM.

Enable EEPROM Write? is a boolean input which allows to Enable or Disable writing to the EEPROM registers. Connect this terminal to TRUE constant to enable EEPROM writing.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Register Value Out is a returned string which represents the value stored in the specified EEPROM configuration register.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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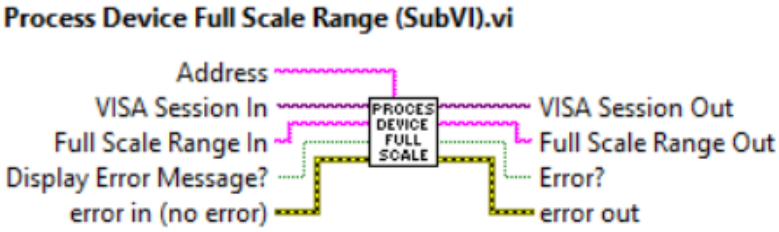
4.11 Calibration Functions

4.11.1 Process Device Full Scale Range



Reads/Sets currently selected *Device Full Scale Range* value (in **sl/min** flow units of measure). When "*Full Scale Range In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*Full Scale Range In*" parameter are floating point strings from 0.00001 to 9999999.9 sl/min.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Full Scale Range In is a floating point string that contains instrument full scale range in sl/min units.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Full Scale Range Out is a string that contains instrument full scale range in sl/min units.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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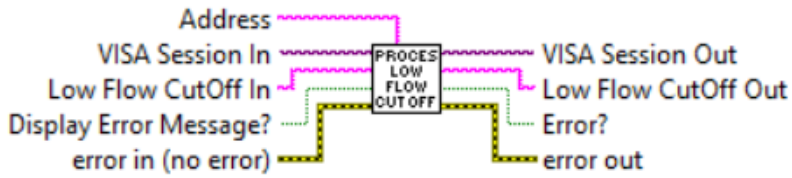
4.11.2 Process Low Flow Cut Off

Process Low Flow Cut Off (SubVI).vi



Reads/Sets currently selected *Device Low Flow Cut Off* value (in **%FS** flow units of measure). When "*Low Flow CutOff In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*Low Flow CutOff In*" parameter are floating point strings from 0.0 to 10.0 %FS.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Low Flow CutOff In is a floating point string that contains instrument *Low Flow Cut Off* value in %FS units.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Low Flow CutOff Out is a string that contains instrument current *Low Flow Cut Off* parameter value in %FS units.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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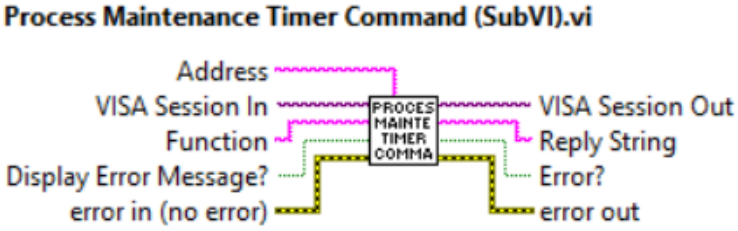
4.11.3 Process Maintenance Timer Command



Reads/Resets instrument's maintenance timer. When "T" string is wired to the "*Function*" input terminal the instrument replies with floating point string representing current maintenance timer value in hours. When "Z" string is wired to the "*Function*" input terminal the maintenance timer is set to zero and instrument replies with "CT:Z" string.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Function is the string with one ASCII character specifying the Maintenance Timer command you would like to execute. Refer to TIO ASCII commands set (APPENDIX C in the TIO operating manual) to determine valid values for "*Function*" input terminal.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Reply String is a string with instrument's reply message to be evaluated. Refer to TIO ASCII commands set (APPENDIX C in the TIO operating manual) to determine valid values for "*Reply String*" output terminal.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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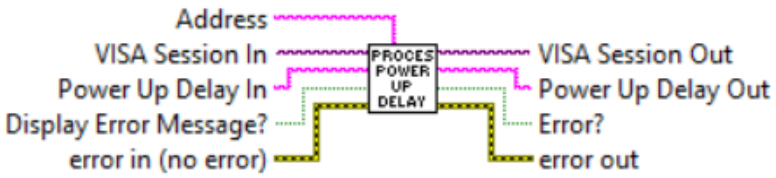
4.11.4 Process Power Up Delay

Process Power Up Delay (SubVI).vi



Reads/Sets currently selected device *Flow Power Up Delay* parameter value (in seconds). When "*Power Up Delay In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*Power Up Delay In*" parameter are decimal strings from 0 to 1200 seconds.

Inputs:

VISA Session In is a required input, and is initially generated from the Initialize COM Port sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Power Up Delay In is a decimal string specifying the device "*Power Up Delay*" parameter value that you would like for the instrument to change to (allowable range from 0 to 1200 seconds).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the VISA Session In terminals of subsequent AALBORG sub-VI's.

Power Up Delay Out is decimal string with instrument's current "*Power Up Delay*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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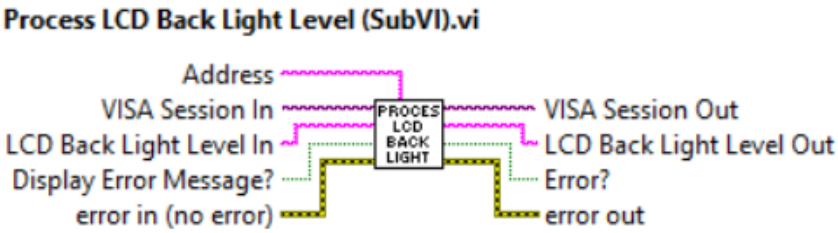
4.12 LCD and Process Screens

4.12.1 Process LCD Back Light Level



Reads/Sets currently selected *LCD Back Light Level* value (1 to 19). When "*LCD Back Light Level In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*LCD Back Light Level In*" parameter are decimal strings: 1 to 19.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

LCD Back Light Level In is the decimal string with desired LCD Back Light level (0 - 19).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

LCD Back Light Level Out is a string with instrument's updated *LCD Back Light level* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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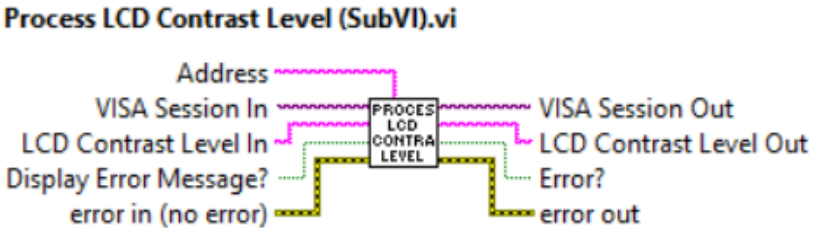
4.12.2 Process LCD Contrast Level



Reads/Sets currently selected *LCD Contrast Level* value (1 to 16). When "*LCD Contrast Level In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*LCD Contrast Level In*" parameter are decimal strings: 1 to 16.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

LCD Contrast Level In is the decimal string with desired LCD Contrast level (0 - 16).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

LCD Contrast Level Out is a string with instrument's updated *LCD Contrast level* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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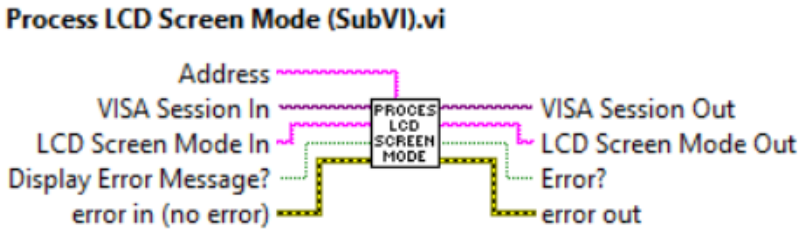
4.12.3 Process LCD Screen Mode



Reads/Sets currently selected *LCD Screen Mode* value (S, D). When "*LCD Screen Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*LCD Screen Mode In*" parameter are single character strings:

"S" - Static (default)

"D" - Dynamic

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

LCD Screen Mode In is the single character string with desired *LCD Screen Mode*.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

LCD Screen Mode Out is a single character string with instrument's updated *LCD Screen Model* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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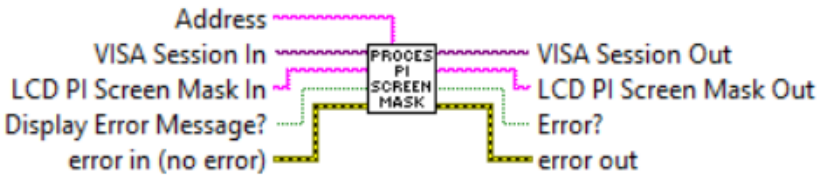
4.12.4 Process PI Screen Mask

Process PI Screen Mask (SubVI).vi



Reads/Sets currently selected *LCD PI Screen Mask* value. When "*LCD PI Screen Mask In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*LCD PI Screen Mask In*" parameter are hexadecimal strings: 0X0000 to 0X0010. NOTE: all 6 characters are required regardless the actual value. Set corresponding bit to enable desired PI screen. Clear corresponding bit to disable particular PI screen.
See list and description of the bitwise Process Screens values below:
0x01 - Flow Rate/Set Point, Totalizer#1
0x02 - Flow Rate, Totalizer#2
0x04 - Flow Alarm / K-Factor Status, Totalizer#1, Totalizer#2
0x08 - Flow Rate, SP, and details for Program mode state machine
0x10 - Flow Rate, Flow Alarm / K-Factor Status, Pulse Output, Digital Outputs

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
LCD PI Screen Mask In is the hexadecimal string with desired *LCD PI Screen Mask*.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
LCD PI Screen Mask Out is a single character string with instrument's updated *LCD PI Screen Mask* value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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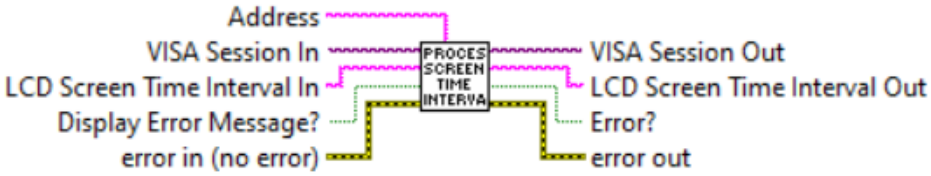
4.12.5 Process Screen Time Interval

Process Screen Time Interval (SubVI).vi



Reads/Sets currently selected *LCD Dynamic Mode Screen Time Interval* value (1 to 3600). When "*LCD Screen Time Interval In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*LCD Screen Time Interval In*" parameter are decimal strings: 1 to 3600 seconds.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
LCD Screen Time Interval In is the decimal string with desired *LCD Screen Time Interval* parameter value.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
LCD Screen Time Interval Out is a decimal string with instrument's updated *LCD Screen Time Interval* parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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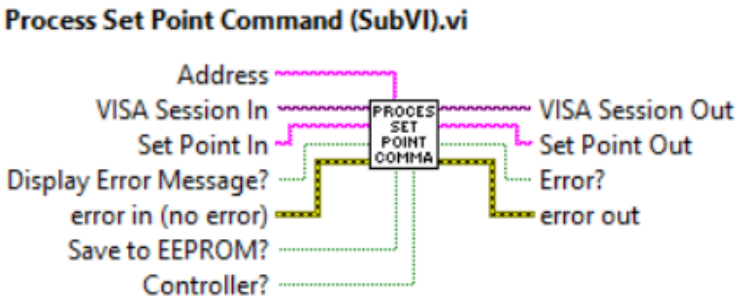
4.13 Set Point

4.13.1 Process Set Point Command



Reads/writes instrument's *Setpoint* value parameters. When "*Set Point In*" terminal is empty this Sub-VI performs "*Read*" function. The "*Controller?*" terminal must be wired to "*TRUE*" to Read or Write set point value. When "*Save to EEPROM?*" terminal is wired to "*TRUE*" the *Setpoint* value also saved in the instrument's nonvolatile memory.
WARNING: To prevent EEPROM burning, avoid writing *Setpoint* value to EEPROM (using "*Save to EEPROM?*" terminal wired to "*TRUE*") more often than one time per minute.
Inputs:
VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "*Communication Error Message*" will block program execution.
Set Point In is the floating point string with desired *Set Point* parameter value.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Save to EEPROM? is a Boolean input stating whether the *Set Point* value should be saved in to the instrument's nonvolatile memory.
Controller? is a Boolean input stating whether the TIO instrument is configured as controller. This terminal must be wired to "*TRUE*" to be able to *Read* or *Write* set point value to the instrument.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
Set Point Out is a floating point string with instrument's updated *Set Point* value.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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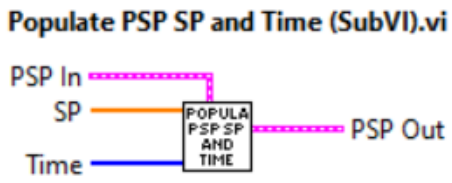
4.13.2 Populate PSP SP and Time



Populates PSP cluster with set point and time data for all 16 steps based on values of the SP and Time arrays.

Inputs:

PSP In is a cluster with PSP parameter representing Set Point value (double) in %FS units of measure, Time (unsigned long 32 bit integer) value representing the PSP step time interval in seconds (0 to 86400) and boolean step status (Enable or Disable) for all 16 steps to be updated with new values.
SP is array of set point values (double) expressed in % of full scale units of measure representing set points for all 16 steps of the PSP program.
Time is array of time interval values (unsigned long 32 bit integer) representing the PSP step time interval in seconds (0 to 86400) for all 16 steps of the PSP program.

Outputs:

PSP Out is a cluster with updated PSP parameters.

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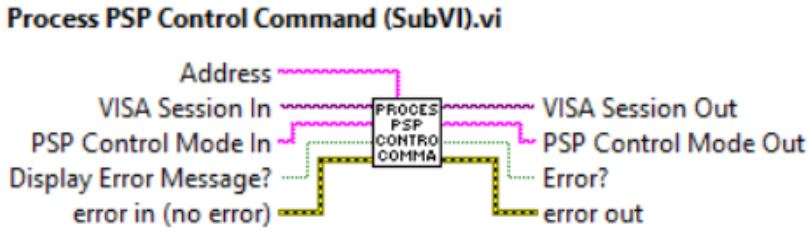
4.13.3 Process PSP Control Command



Reads/Sets currently selected *Device Program Set Point Control Mode* parameter value (R, S). When "*PSP Control Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*PSP Control Mode In*" parameter are single character strings:
"R" - Run PSP Program (Continue PSP program execution).
"S" - Stop PSP Program (Pause PSP program execution).

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

PSP Control Mode In is an one character string which represents desired "*PSP Control Mode*". Valid values: R or S.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

PSP Control Mode Out is a string with instrument's *PSP Control Mode* value ("R" or "S").

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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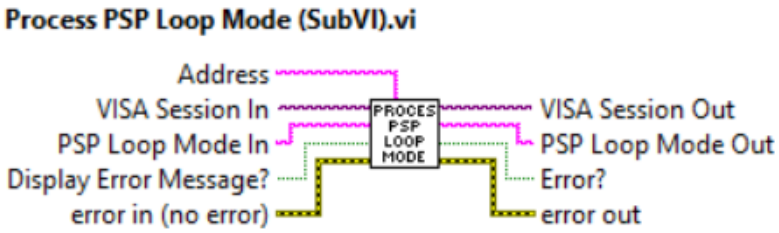
4.13.4 Process PSP Loop Mode



Reads/Sets currently selected Device Program Set Point Loop Mode parameter value (E, D). When "*PSP Loop Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*PSP Loop Mode In*" parameter are single character strings:

"E" - PSP Loop Enabled

"D" - PSP Loop Disabled

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

PSP Loop Mode In is an one character string which represents desired "*PSP Loop Mode*". Valid values: E or D.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

PSP Loop Mode Out is a string with instrument's *PSP Loop Mode* value ("E" or "D").

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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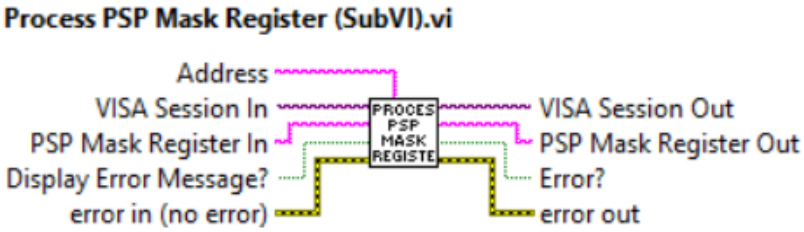
4.13.5 Process PSP Mask Register



Reads/Sets currently selected *PSP Mask Register* value. When "*PSP Mask Register In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*PSP Mask Register In*" parameter are hexadecimal strings: 0X0000 to 0XFFFF. NOTE: all 6 characters are required regardless the actual value.
Each bit of the 16 bits *PSP Mask Register* represents corresponding step in PSP program. Set bit to *Enable* the corresponding Step of the program. Clear bit *Disable* the corresponding Step of the PSP program.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
PSP Mask Register In is a 6 characters hexadecimal strings which represents desired "*PSP Mask Register*" value.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
PSP Mask Register Out is a hexadecimal strings with instrument's *PSP Mask Register* value.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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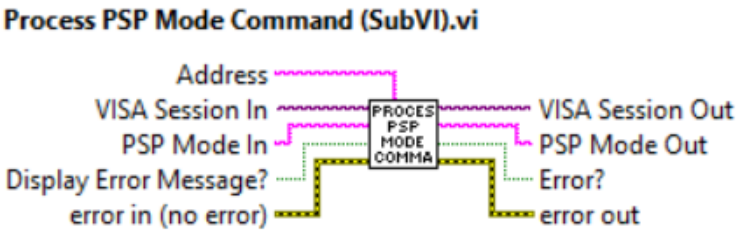
4.13.6 Process PSP Mode Command



Reads/Sets currently selected *Device Program Set Point Mode* parameter value (E, D). When "*PSP Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*PSP Mode In*" parameter are single character strings:

"E" - PSP Enabled

"D" - PSP Disabled

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

PSP Mode In is an one character string which represents desired "*PSP Mode*". Valid values: E or D.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

PSP Mode Out is a string with instrument's *PSP Mode* value ("E" or "D").

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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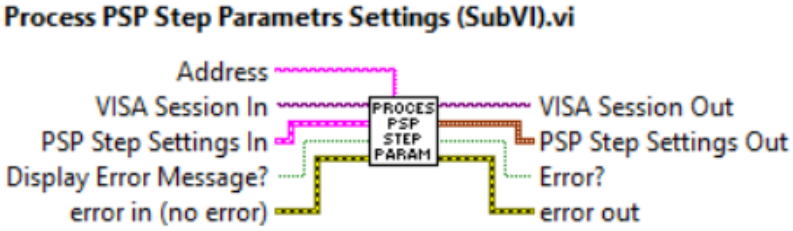
4.13.7 Process PSP Step Parameters Settings



Reads/Sets currently selected *Device PSP Step Parameters Settings* values. When "*Set Point*" and "*Time*" parameter of the "*PSP Step Settings In*" cluster are empty this Sub-VI performs "*Read*" function. Valid values for "*PSP Step Settings In*" cluster parameters are:
Step Number: decimal strings 1 to 16.
Set Point: floating point strings 0 to 100%FS.
Time: decimal strings 0 to 86400 seconds.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

PSP Step Settings In is a cluster with 3 elements which represents desired "*PSP Step Settings"* parameters values.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

PSP Step Settings Out is a string with instrument's *PSP Step Settings* values.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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4.13.8 Update PSP Mask Register

Updates *Program Setpoint Mask* check box array of the PSP cluster base on *Program Setpoint Mask* register (hex string) value.

Inputs:

Mask String In is hexadecimal string (16 bit wide) representing status for all 16 program set point steps: 1 - Enabled, 0 - Disabled. Allowable range from 0x000 to 0xFFFF. NOTE: all 6 characters are required.

PSP In is the cluster with PSP parameter representing *Set Point* value (double) in %FS units of measure, *Time* (unsigned long 32 bit integer) value representing the PSP step time interval in seconds (0 to 86400) and boolean step status (Enable or Disable) for all 16 steps.

Outputs:

PSP Out is the cluster with PSP parameter representing *Set Point* value (double) in % FS units of measure, *Time* (unsigned long 32 bit integer) value representing the PSP step time interval in seconds (0 to 86400) and boolean step status (Enable or Disable) updated for all 16 steps based on input value of the *Mask String In* parameter.

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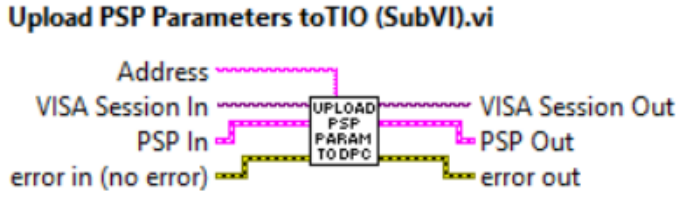
4.13.9 Upload PSP Parameters to TIO



This SubVI is using "*Process PSP Step Parameters (SubVI)*" to upload all 16 steps of the PSP data from PSP cluster in to the instrument's EEPROM memory.

WARNING: The PSP parameter are saved in the instrument's EEPROM memory. To prevent EEPROM burning avoid calling program more often than one time per one minute.

Inputs:

VISA Session In is a required input, and is initially generated from the *Init COM Port* sub-VI.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Address is input string which represents instrument address. When wired to the "*Address String"* output terminal of the *Init COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

PSP In is the cluster with PSP parameter representing Set Point value (double) in %FS units of measure, Time (unsigned long 32 bit integer) value representing the PSP step time interval in seconds (0 to 86400) and boolean step status (Enable or Disable) for all 16 steps to be uploaded to the DPC.

Outputs:

PSP Out is the cluster with PSP parameter representing Set Point value (double) in % FS units of measure, Time (unsigned long 32 bit integer) value representing the PSP step time interval in seconds (0 to 86400) and boolean step status (Enable or Disable) updated for all 16 steps based on input values in the *PSP In* cluster.

VISA Session Out is the output VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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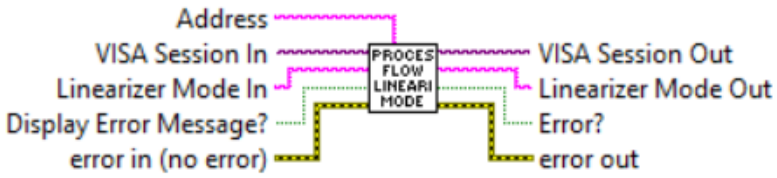
4.14 Signal Conditioner

4.14.1 Process Flow Linearizer Mode

Process Flow Linearizer Mode (SubVI).vi



Reads/Sets currently selected *Device Flow Linearizer Mode* value (E, D). When "*Linearizer Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*Linearizer Mode In*" parameter are single character strings:

"E" - Linearizer is Enabled.

"D" - Linearizer is Disabled.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Linearizer Mode In is an one character string which represents desired "*Linearizer Mode*" parameter value.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Linearizer Mode Out is an one character string which represents updated "*Linearizer Mode*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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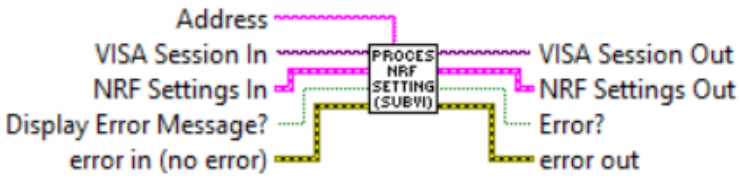
4.14.2 Process NRF Settings

Process NRF Settings (SubVI).vi



Reads/Sets currently selected *Device NRF Settings* values. When "*Number of Samples*" parameter of the "*NRF Settings In*" cluster is empty this Sub-VI performs "*Read*" function.
Valid values for "*NRF Settings In*" cluster parameter are:
Number of Samples: decimal strings 1 to 32.
Time Limit: decimal strings 0 to 199 ms.
Error Limit: floating point strings 0.0 to 10.0%FS

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.
Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.
NRF Settings In is a cluster of 3 strings which represents desired "*NRF Settings"* parameters values.
Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.
Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.
NRF Settings Out is a cluster of 3 strings which represents instrument's current "*NRF Settings*" parameters values.
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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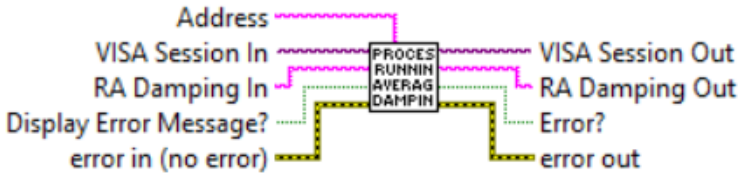
4.14.3 Process Running Average Damping

Process Running Average Damping (SubVI).vi



Reads/Sets currently selected *Device Running Average Filter Damping* value. When "*RA Damping In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*RA Damping In*" parameter are decimal strings 0-500 ms. When set to zero the *Running Average Filter* is Disabled.

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

RA Damping In is a decimal string which represents desired "*RA Damping"* parameter value.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

RA Damping Out is a decimal string which represents instrument's current "*RA Damping*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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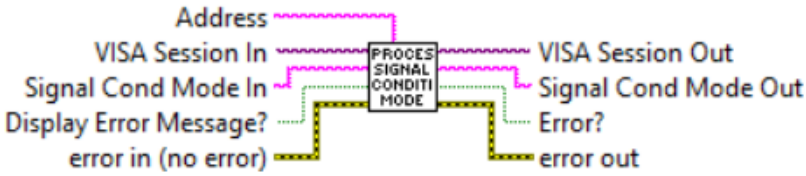
4.14.4 Process Signal Conditioner Mode

Process Signal Conditioner Mode (SubVI).vi



Reads/Sets currently selected *Device Signal Conditioner Mode* value (N,F,A). When "*Signal Cond Mode In*" terminal is empty this Sub-VI performs "*Read*" function. Valid values for "*Signal Cond Mode In*" parameter are single character strings:

"N" - No Conditioning

"F" - NRF Filter

"A" - Running Average

Inputs:

VISA Session In is a required input, and is initially generated from the *Initialize COM Port* sub-VI.

Address is input string which represents instrument address. When wired to the "*Address String*" output terminal of the *Initialize COM Port* sub-VI the address prefix will be automatically created based on values of the *Interface Type* and *Address* controls.

Signal Cond In is an one character string which represents desired "*Signal Conditioner Mode"* parameter value.

Display Error Message? is a Boolean input stating whether the Error Message should be displayed when communication error arises. If set to "TRUE" and communication error or time out occur the "Communication Error Message" will block program execution.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI.

Outputs:

VISA Session Out is the opened VISA session reference which should be wired to the *VISA Session In* terminals of subsequent AALBORG sub-VI's.

Signal Cond Out is an one character string which represents instrument's current "*Signal Conditioner Mode*" parameter value.

Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

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5. Example Programs

5.1 TIO Simple Read PI Driver Example

Simple example program which allow user to select interface type, instrument address (only applicable for TIO instruments with RS485 interface), initialize COM port and continuously read instrument Process Information data. Once COM port is initialized the program reads instrument configuration information in to "Device Information" cluster and then it continuously reads PI data and displays the waveform chart for *Mass flow rate*, *High* and *Low flow Alarms* values.

NOTE: The Interface Type (RS232 or RS485), RS485 Address and COM port parameters must be selected before start of the program. Changes made to these parameters during run time will not have any effect.

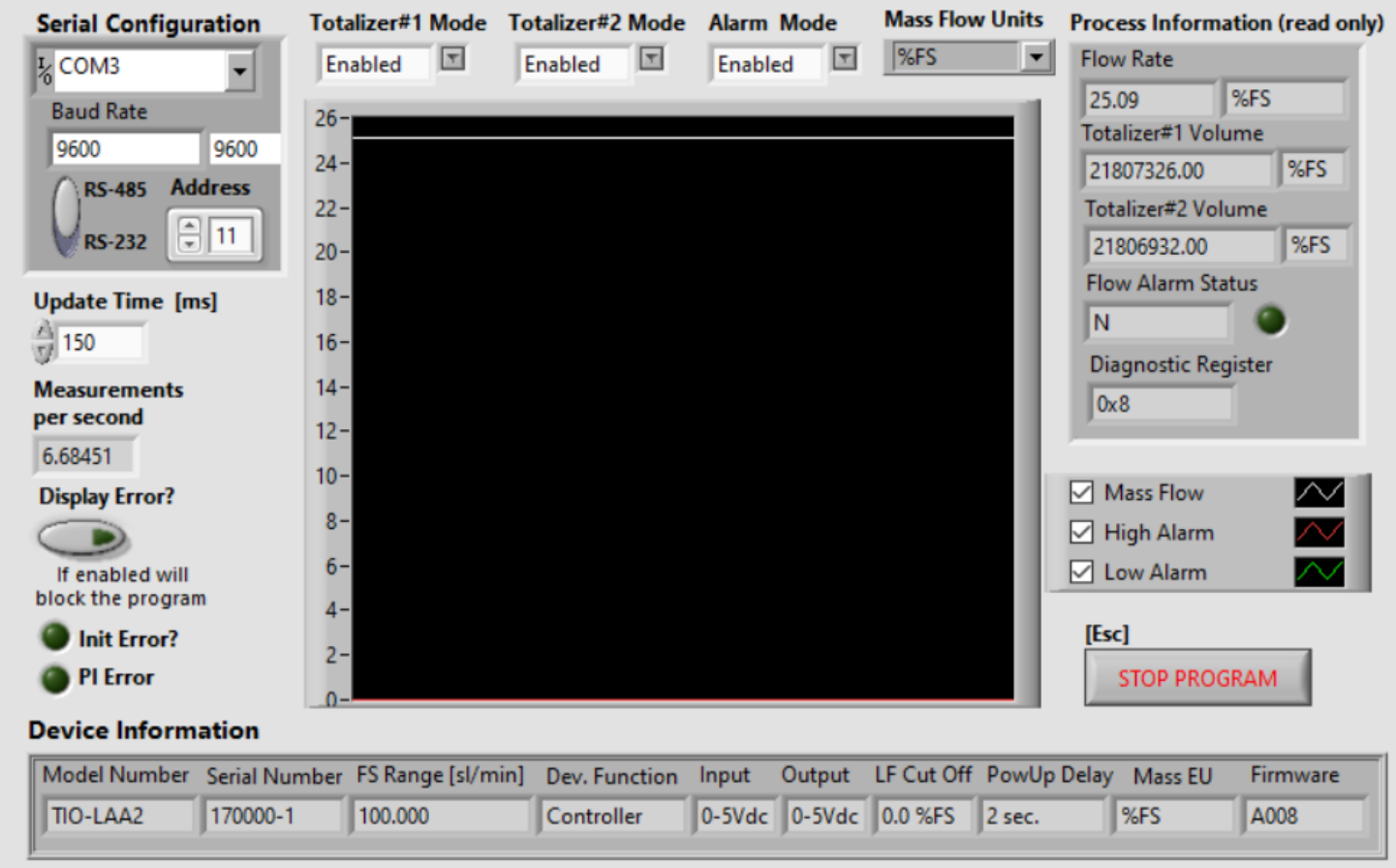
This example is a good starting point for creating ether new program or integrating TIO instruments in to the existing program.

To connect to TIO instrument, simply select the appropriate COM port that the instrument is connected to and ensure that the *Interface Type* (*RS-232 or RS-485*), *Baud Rate* and *Address* controls are set to match the values on the TIO instrument that you would like to talk to.

During program execution user may make changes to Totalizer#1 and Totalizer#2 mode, Flow Alarm mode and select desired mass flow units of measure.

Possible Issues:

- When communicating with instruments over RS-485 interface and "*9600*" or below baud rate is selected some times it is possible to get "*Communication Error*" message when low "*Baud Rate*" settings are selected. In this case use 19200 or higher "*Baud Rate*" settings to be able to faster transfer long data frames to and from the instrument.
- Do not use "*Update Time*" settings with values below **50 ms**. Doing so especially with low "**Baud Rate**" settings may result in communication error.



NOTE: For stable operation do not decrease "*Update Time*" parameter below 150 ms.

If "*Display Error?*" control is enabled (set to TRUE), any error during program execution will block the program with message which describes the source of the error. If your program should not be interrupted make sure you disable "*Display Error?*" control.

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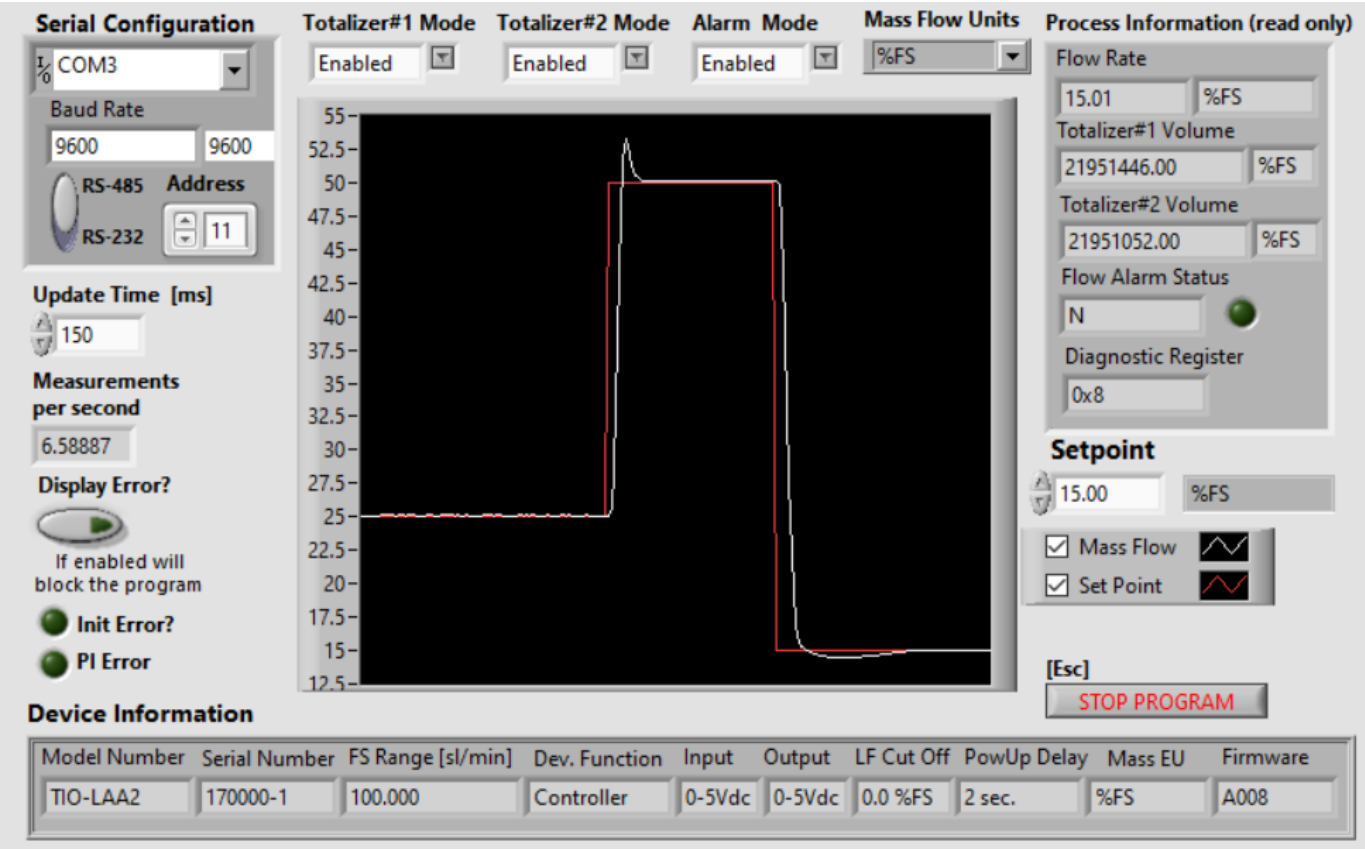
5.2 TIO Simple Read PI Driver Example with Set Point

Simple example program which allow user to select interface type, instrument address (only applicable for TIO devices with RS485 interface), initialize COM port, continuously read instrument Process Information data and write set point value to the mated controller. Once COM port is initialized the program reads instrument configuration information in to "*Device Information*" cluster and then it continuously reads *PI* data and displays the waveform chart for *Mass flow* rate and *Set Point* values. In addition to "*Read only simple VI example*" this program allows user to change "*Set Point*" value parameter during VI run time (this control only enabled for TIO instruments configured as "*Controller*").

NOTE: This VI example does not check set point value entered in currently selected mass flow engineering units on the subject of validity. User must make sure that set point value do not exceed 110% of instrument full scale flow.

NOTE: The Interface Type (RS232 or RS485), RS485 Address and COM port parameters must be selected before start of the program. Changes made to these parameters during run time will not have any effect.

This example is a good starting point for creating ether new program or integrating TIO instruments in to the existing user program.



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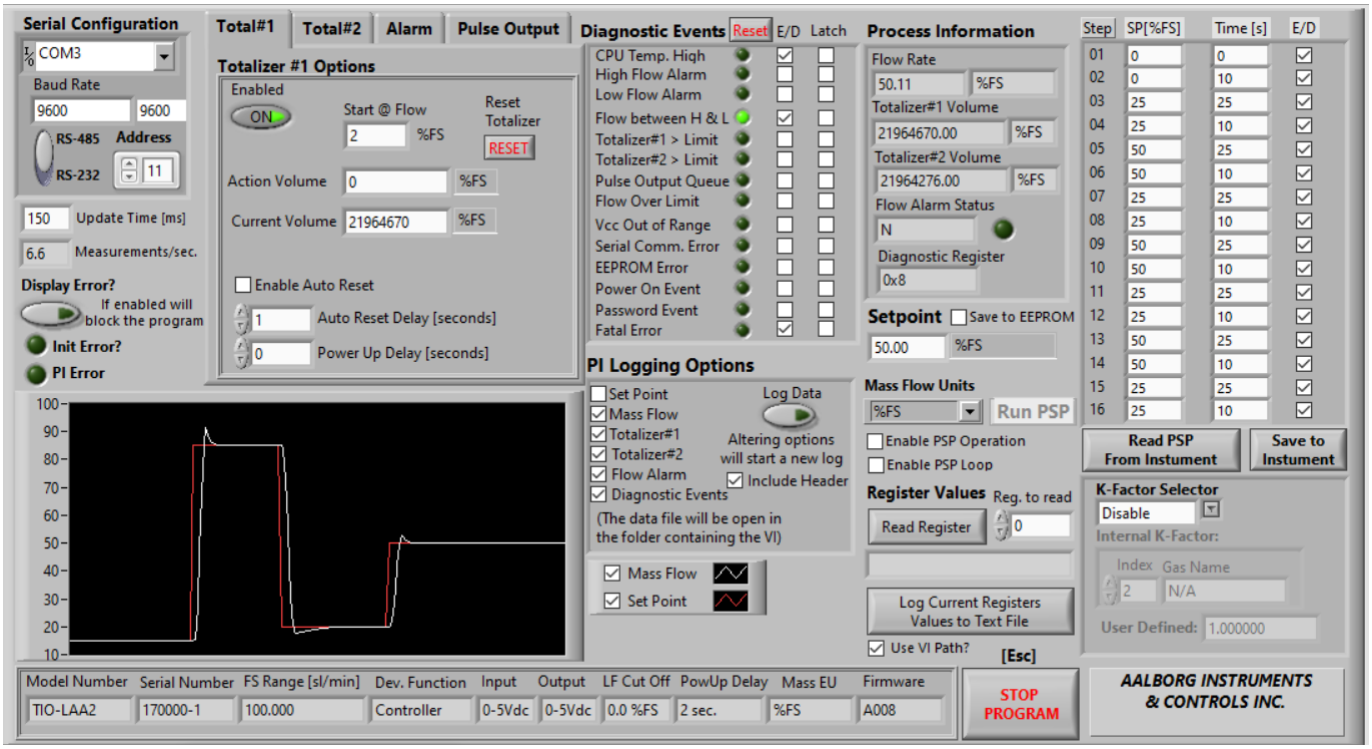
5.3 TIO Extended Driver Example with Diagnostic and Data Log



This example program utilizes almost all VI's included in the AALBORG TIO *LabView Driver Library*. In addition to the simple program example it provides access to the *Totalizers, Flow Alarm, Pulse Output, Program Set Point parameters, PI data Waveform Chart, Diagnostic Events, Instrument's EEPROM registers* and *Process Information* data logging settings and features of the TIO instruments.

NOTE: This VI example does not check set point value entered in currently selected mass flow engineering units on the subject of validity. User must make sure that set point value do not exceed 110% of instrument full scale flow.

NOTE: The Interface Type (RS232 or RS485), RS485 Address and COM port parameters must be selected before start of the program.

If you have questions regarding VI's used in this example, please refer to the "AALBORG TIO Operating Manual (available on the AALBORG website). If you still have questions, please contact AALBORG at 845-770-3000 or info@aalborg.com

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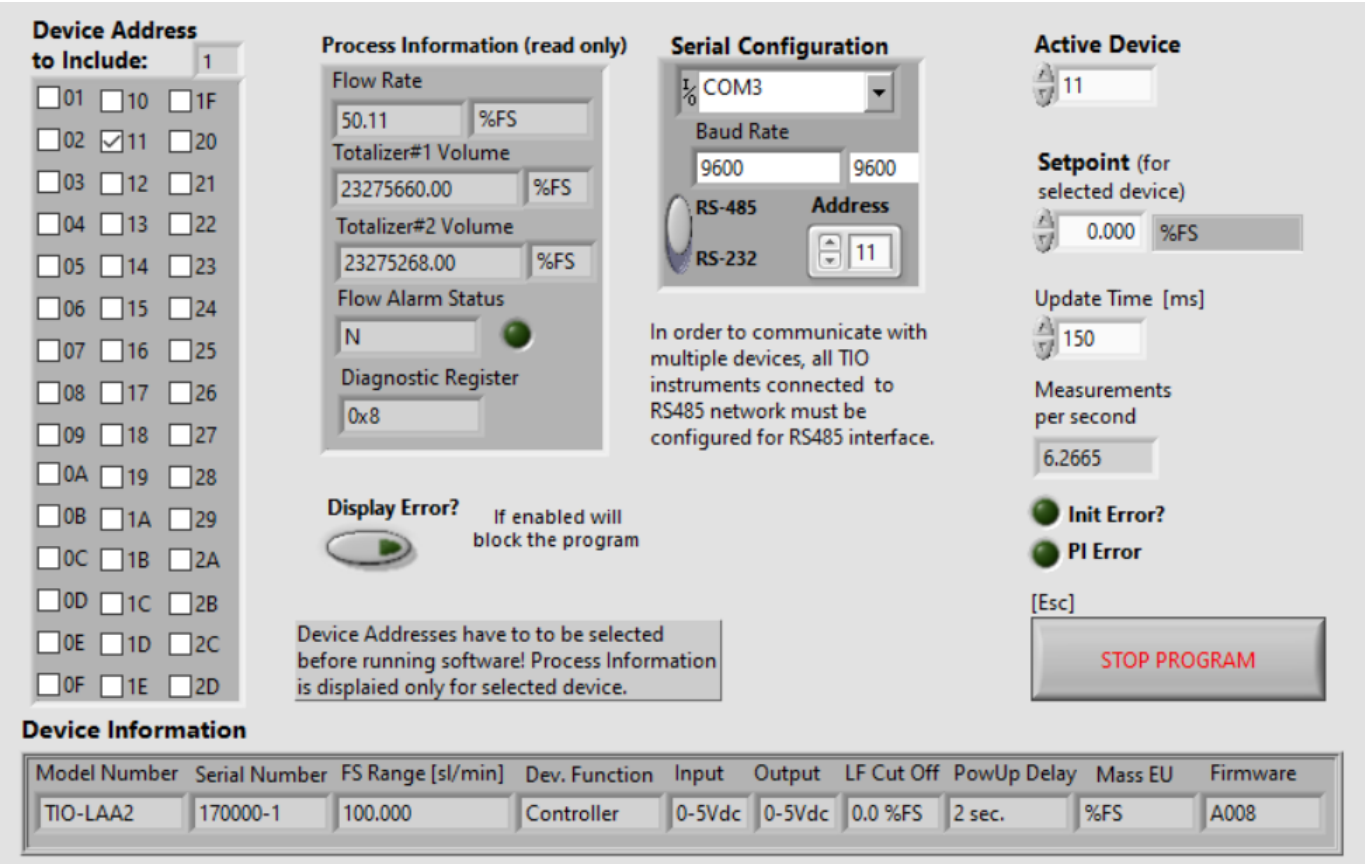
5.4 TIO Simple Driver Example Multiple Devices with Setpoint



Simple example program initializing the COM port, determining the instruments configuration data for up to 45 TIO instruments, acquiring the data of the same number of instruments, displaying the data only for the one with the selected *Active Device* address. Tis example also allows to write a *Set Point* value to the instrument which address is selected in the "*Active Device*" control.
This example will work only for TIO instruments with digital communication interface configured for RS-485 interface option.
When developing the program for multiple TIO instruments connected to the same single RS-485 COM port without the use of for loops with shift registers, ensure that each ASCII command is executed sequentially. Make sure each device connected to the RS-485 network has unique address.

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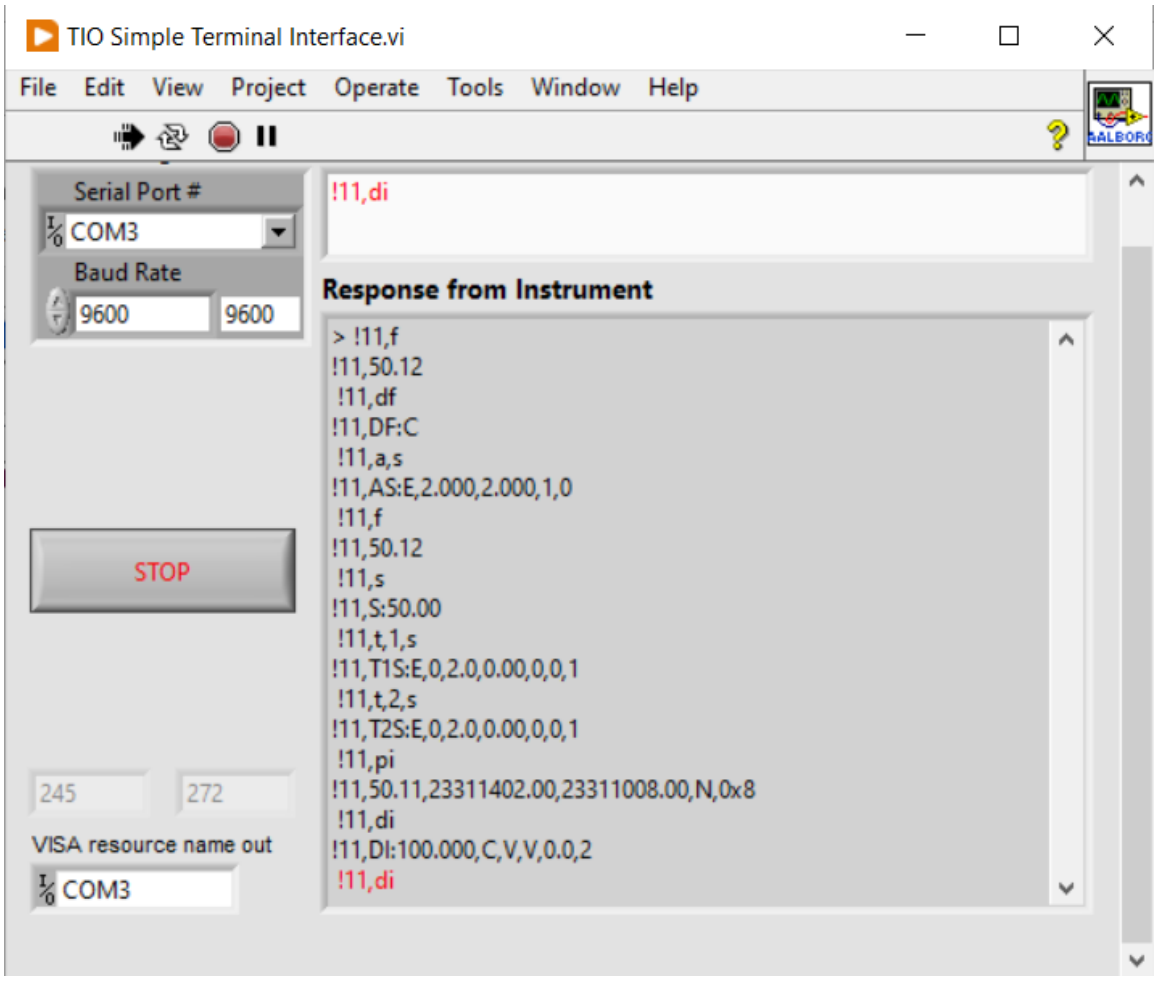
5.5 TIO Simple Terminal Interface



Example VI for communicating with AALBORG TIO instruments via serial communication interface using ASCII commands set (see TIO instrument operating manual for complete list of supported commands). For RS485 interface the start character is always ! and two hexadecimal characters of address with coma delimiter in the end must be submitted before each command (see example below).

!11,F

For the RS232 interface, the start character ! and two hexadecimal characters for the address must be omitted. For all interfaces the command string is terminated with the equivalent of a carriage return; line feeds are automatically stripped out by the TIO instrument.

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