User's Guide to the AALBORG DFC LabVIEW Drivers
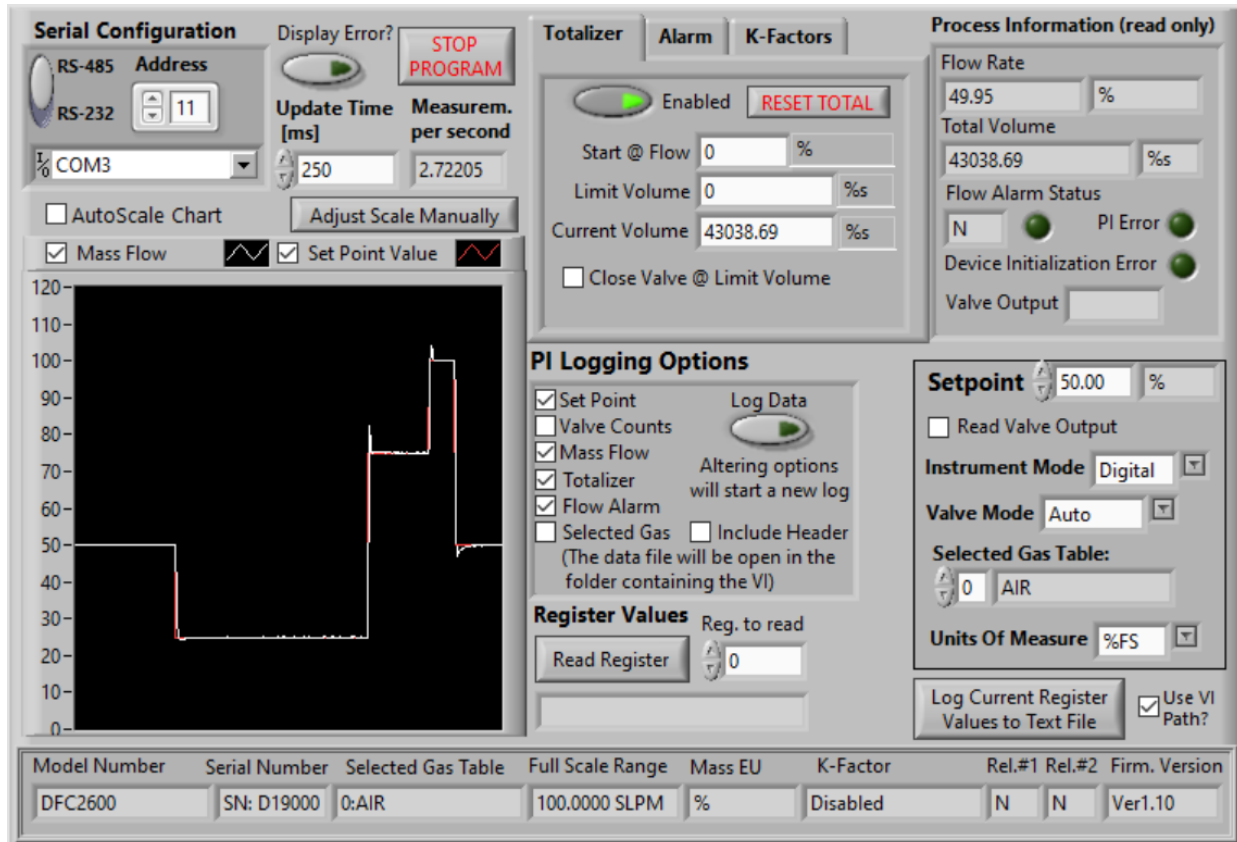
AALBORG

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1. Introduction

The AALBORG DFC LabVIEW drivers were designed to make communication with DFC 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 DFC instrument that is configured for RS-232 or RS-485 interface and connected to the instrument's digital communication interface (pins 11,17 and 24 on the instrument's 25 pins D-connector).

In the most basic form, the DFC LabVIEW drivers are establishing a VISA session to an active COM port to which DFC devices are connected. Once the communication has been initialized, the sub-VI's can be called which send serial ASCII commands to the DFC 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 DFC 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 DFC 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).

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 DFC 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.

3. AALBORG DFC VI Tree

The AALBORG DFC 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.

4. Sub-VI's

4.1 Initialization

These sub-VI's are used to open a VISA session with the configuration settings required by DFC instruments and to initialize key instrument parameters according to data in the "*InstrumentConfiguration.txt*" file. The "InstrumentConfiguration.txt" file holds configuration parameters for up to 32 instruments.

4.1.1 Initialize COM Port

Initialize COM Port (SubVI).vi
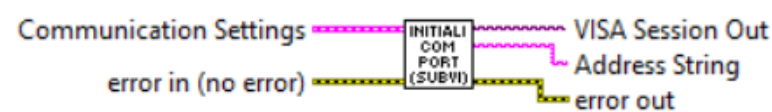
Initializes the serial connection to a selected COM port. Baud rate for DFC instruments is fixed to 9600 and cannot be changed. If multiple instruments are connected to the same COM port, ensure that DFC instruments configured for RS-485 interface and they all have unique RS-485 Addresses.

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 RS232 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.

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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 DFC 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 DFC 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.

4.1.2 Initialize Instrument Configuration

Initialize Instrument Configuration (SubVI).vi
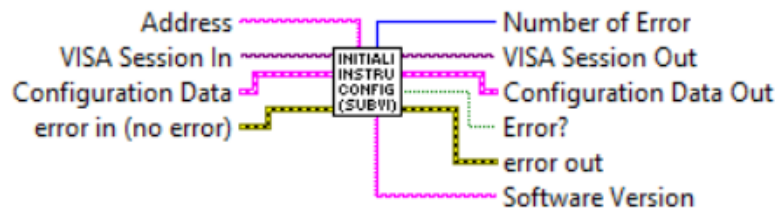
Initializes key instrument parameters according to data in the "Configuration Data" cluster. "Configuration Data Out" cluster represents actual instrument parameters it was initialized with. This sub-VI can be run at the beginning of a program outside the main loop, and should be re-run every time the 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.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

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

Outputs:

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

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 Data Out is cluster of strings containing actual configuration parameter the instrument was initialized with.

Error? is the boolean output that is triggered when at least one communication error occurred during uploading configuration parameters to 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.

Software Version is a string representing the main software revision number of the connected DFC instrument. The Software Version value is used as an optional input for some of the DFC sub-VI's. The optional software version inputs should be used to determine if instrument supports additional ASCII commands which were added to Ver 1.10 of the DFC firmware.

4.1.3 Read Firmware Version

Read Firmware Version (SubVI).vi
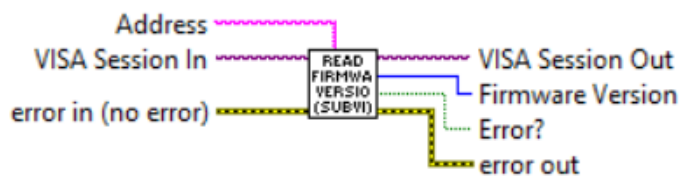
Reads instrument's firmware version and returns unsigned 32 bits integer which represents last to digits of the firmware revision (e.g. 10 for device with firmware version of 1.10). The firmware revision can be used to determine if instrument supports additional ASCII commands which were added to Ver. 1.10 of the DFC 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 DFC 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.

4.1.4 Read Register

Read Register (SubVI).vi
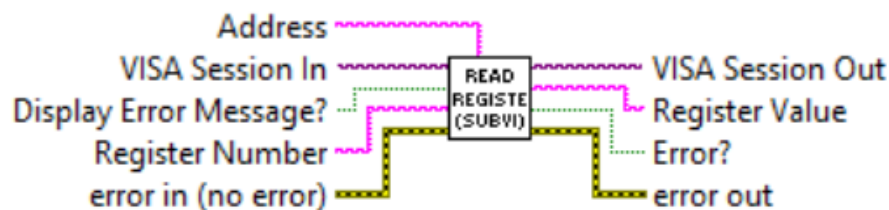
Reads single EEPROM register. Valid values for decimal string wired to the "Register Number" terminal are from 0 to 63 and from 100 to 134. Returns response as a string (unedited) which represent EEPROM register value.

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 63 and from 100 to 134.

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.

4.1.5 Send Command

Send Command (SubVI).vi
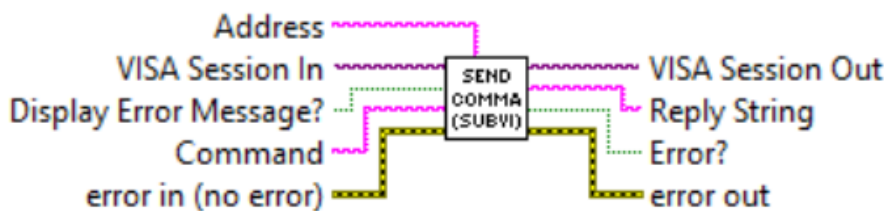
Sends the specified ASCII command to the instrument. Returns response as a string (unedited) which represent instrument's response for particular ASCII command (see APPENDIX 4 in the DFC operating manual for the list of supported ASCII commands). **WARNING: Use "MW" (EEPROM register write command) carefully, 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 DFC instrument (see APPENDIX 4 in the DFC 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.

4.1.6 Update Instrument Information Cluster

Update Instrument Information Cluster (SubVI).vi

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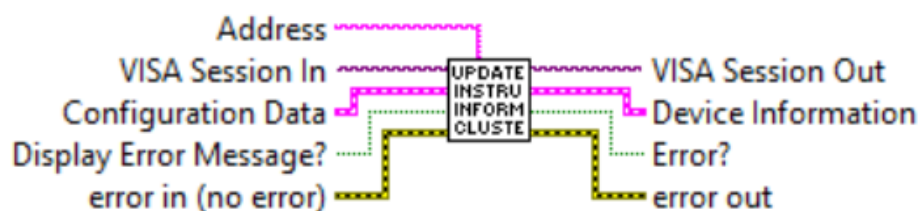
Takes key instrument configuration parameters from device "*Configuration Data*" cluster and combines them in to the "*Device Information*" cluster. This sub-VI can be run at the beginning of a program outside the main loop and should be re-run every time the instrument address is changed (for RS-485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

Inputs:

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.

Configuration Data is a cluster of strings containing the information regarding instrument's configuration parameters.

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 Information is a cluster of strings containing the information regarding 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.

4.2 Device Configuration

These sub-VI's are used for updating instrument configuration parameters such as: active gas table, instrument reference mode, valve mode, relay assignments and set point value. 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 Gas Table Command

Process Gas Table Command (SubVI).vi
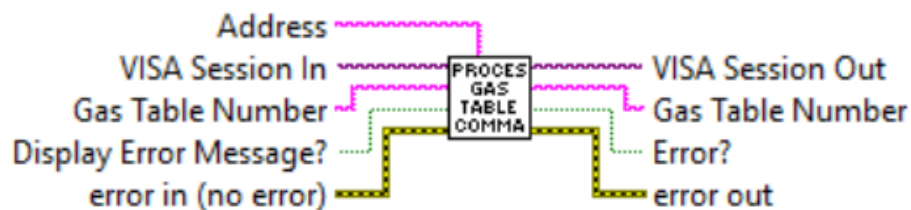
Sets/Reads currently selected Gas Table Number. When "Gas Table Number" terminal is empty this Sub-VI performs "Read" function. Read function is only supported by DFC instruments with firmware version 1.10 and higher. This Sub-VI will check for firmware revision and send Read Gas Table number command only when firmware revision is 1.10 or higher.

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.

Gas Table Number is the numerical string with index of the currently selected gas table (required input). Valid values are from 0 to 9.

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 Table Number is a string that contains instrument's currently selected gas index (0-9).

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.

4.2.2 Process Instrument Mode Command

Process Instrument Mode Command (SubVI).vi
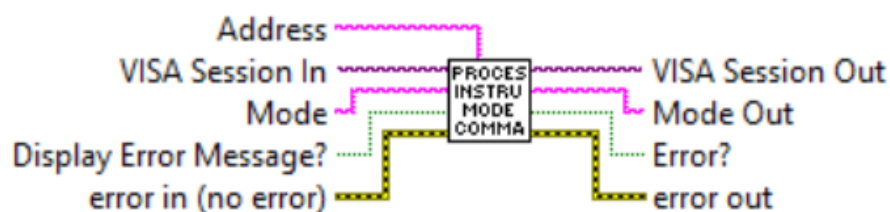
Reads/Sets instrument operation Mode: "Analog" or "Digital". When "Mode" terminal is empty this Sub-VI performs "Read" function.

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.

Mode is the one character string with desired instrument mode value. Valid values are:

      A - for Analog mode.

      D - for Digital 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.

Mode Out is a string that contains instrument's currently selected operating mode (Analog or Digital).

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.

4.2.3 Process Relay Action Command

Process Relay Action Command (SubVI).vi
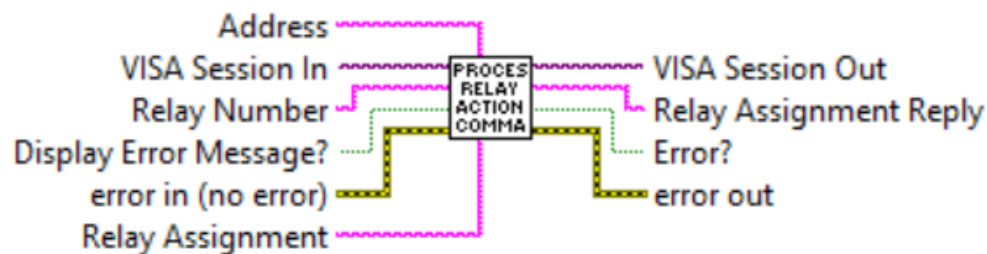
Reads and writes instrument's Relays assignment parameter. Refer to DFC ASCII commands set (Appendix 4 in the DFC operating manual) to determine valid values for "Relay Number" and "Relay Assignment" input terminals.

"Relay Number" terminal valid settings: decimal string with 1 or 2 value.

"Relay Assignment" terminal valid settings: N,T,H,L,R,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.

Mode is the one character string with desired instrument mode value. Valid values are:

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Relay Number is the one character decimal string with desired relay number value. Valid settings are: 1 or 2.

Relay Assignment is the one character string with desired relay assignments value. Valid settings are:

       N - No Action (relay disabled);

       T - Totalizer volume exceeded limit;

       H - High Flow Alarm;

       L - Low Flow Alarm;

       R - Range between High and Low Alarm settings;

       S - Read current relay 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.

Relay Assignment Reply is a one character string that contains selected relay current assignment value: N,T,H,L,R.

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.

4.2.4 Process Set Point Command

Process Set Point Command (SubVI).vi
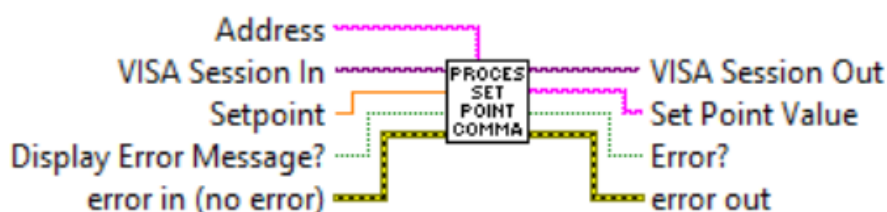
Writes/Reads instrument Set Point Value. When "Setpoint" terminal value less than zero this Sub-VI performs "Read" function. Read function is only supported by DFC instruments with firmware version 1.10 and higher. This Sub-VI will check for firmware revision and send Read Set Point value command only when firmware revision is 1.10 or higher.

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.

Setpoint is a required input and reflects the set point value (doubble) in the currently selected mass flow units that will be written to the device. In order to read current set point value wire to the "Setpoint" terminal -1 (instrument will reply floating point string with current set point 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.

Set Point Value is the instrument's current set point 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.

4.2.5 Process Valve Mode Command

Process Valve Mode Command (SubVI).vi
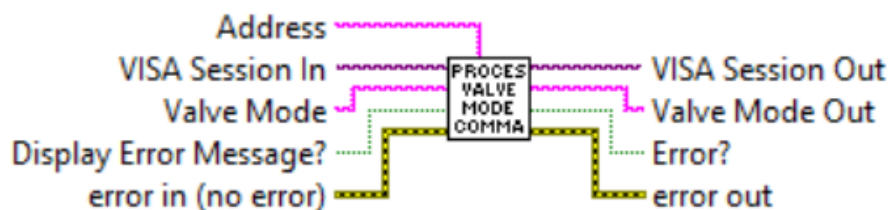
Reads/Sets instrument's Valve Mode: "Auto", "Close", or "Open".

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.

Valve Mode is the one character string with desired valve mode value. Valid values are: A - "Auto", C - "Close", O - "Open".

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.

Valve Mode Out is a string that contains selected valve mode value: Closed, Auto, Opened.

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.

4.2.6 Read Full Scale Range

Read Full Scale Range (SubVI).vi
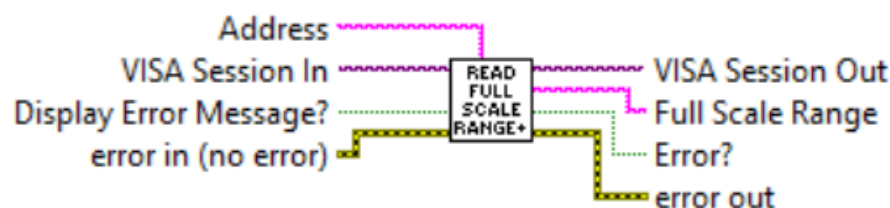
Reads instrument full scale range in SLPM. The full scale range value always based on selected gas table.

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.

Full Scale Range is a string that contains instrument full scale range in SLPM 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.

4.2.7 Read Model Number

Read Model Number (SubVI).vi
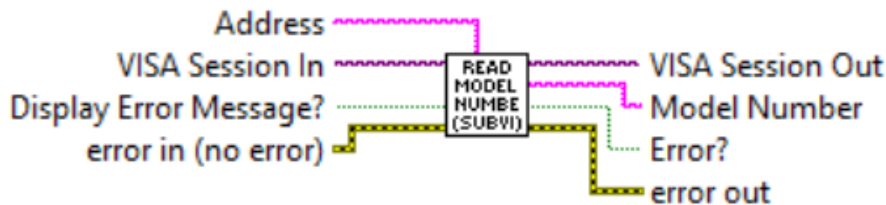
Reads instrument model number.

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.

4.2.8 Read Serial Number

Read Serial Number (SubVI).vi
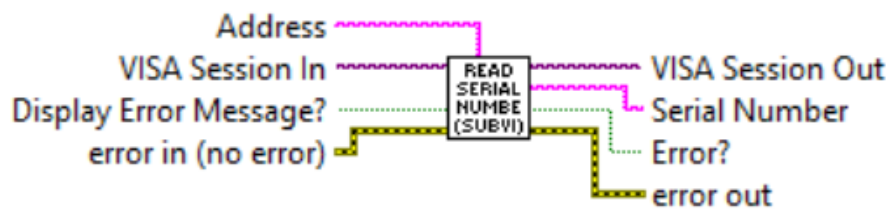
Reads instrument serial number.

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.

4.3 Diagnostic

These sub-VI's are used for collecting instrument diagnostic parameters stored in instrument's volatile memory (SRAM) registers such as: proportional solenoid valve drive output values, sensor zero adjustment counts, analog input and output counts, sensor compensated counts. . In order to get access to SRAM registers the instrument's back door access must be opened using "Open Back Door Command" Sub-VI.

4.3.1 Open Back Door Command

Open Back Door Command (SubVI).vi
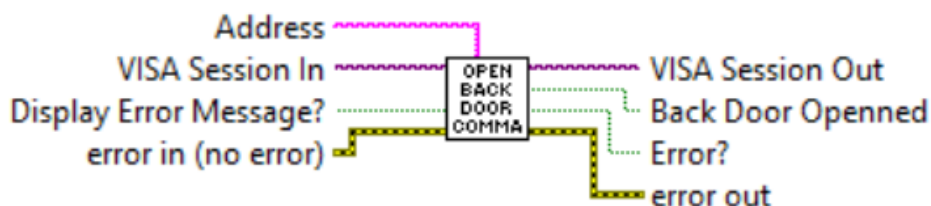
Opens Back Door for accessing instrument's diagnostic volatile memory (SRAM) registers.

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.

Back Door Opened is the boolean output that is set to "TRUE" when back door was opened successfully.

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.
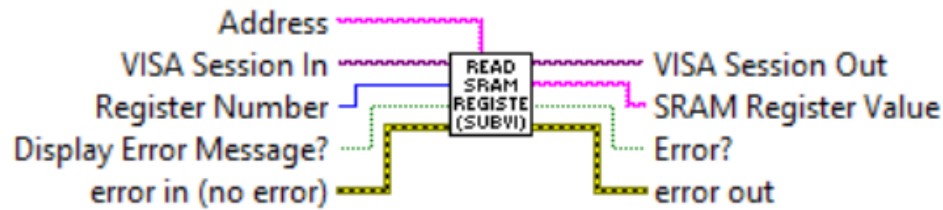
4.3.2 Read SRAM Register

Read SRAM Register (SubVI).vi

Reads instruments SRAM registers. Use this Sub-VI for diagnostic purposes. Valid numbers for SRAM diagnostic registers are:

1 - Read ADC[1] counts (Analog Set Point Input)

2 - Sensor Average counts (1.5 second delay)

3 - Sensor signed PFS average (0-100% notation, supported by firmware 1.10 and up)

4 - DAC[0] counts (zero adjustment control)

5 - DAC[1] counts (analog output signals control)

6 - DAC[2] counts (solenoid valve current control)

7 - Sensor Average Compensated counts (after DRC filter)

8 - Analog Input expressed in PFS (0 - 100% notation)

9 - Check if EEPROM write protected area is opened.

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.

Register Number (unsigned 32-bit integer) is a required input and should contain the SRAM register number that is to be read out from the instrument.

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.

SRAM Register Value is a returned string which represents the value stored in the specified SRAM 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.
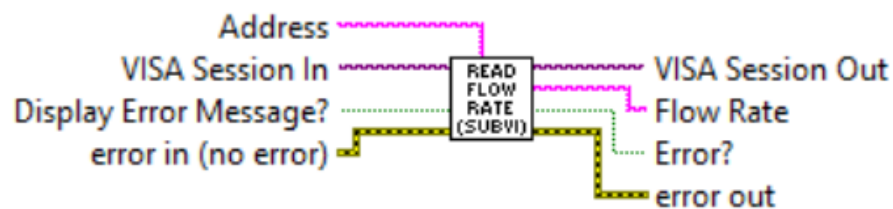
4.4 Process Information

These sub-VI's are used for collecting instrument process information parameters such as: mass flow rate, Totalizer reading, flow alarms status and proportional solenoid valve drive output value.

4.4.1 Read Flow Rate

Read Flow Rate (SubVI).vi

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.

4.4.2 Read PI Data

Read PI Data (SubVI).vi
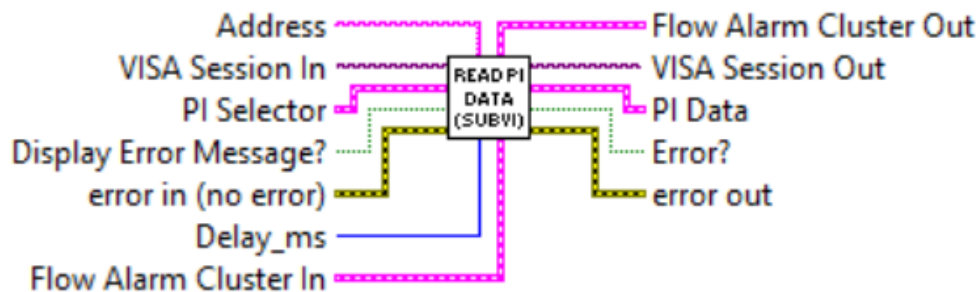
Reads the instrument's Process Information parameters: Mass Flow Rate, Totalizer reading and Flow Alarm status and composes the cluster of string representing following parameters: Mass Flow Rate (MEU), Totalizer value (MEU), Flow Alarm Status [N,H,L]. It also updates Flow Alarm Status in the "Flow Alarm" 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.

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PI Selector is a cluster of Booleans. Each Boolean is either True or False, depending on whether the corresponding parameter must be acquired from 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.

Delay_ms is an unsigned 32-bit integer, representing minimum delay time in milliseconds between successive parameters readings. For RS-485 interface it is recommended not to use delays below 50 milliseconds.

Flow Alarm Cluster In is a cluster containing the information regarding instrument's Flow Alarm 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 Data Is a cluster of strings with instrument's 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.

Flow Alarm Cluster Out is a cluster containing the information regarding instrument's Flow Alarm parameters with updated "*Alarm Status"* parameter value.

4.5 Engineering Units

4.5.1 Convert Mass Flow EU to Totalizer EU

Convert Mass Flow EU to Totalizer EU (SubVI).vi

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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:

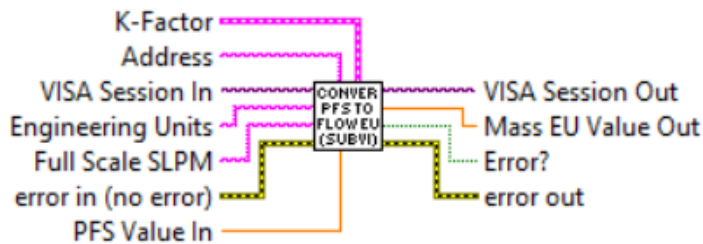Mass Flow EU is a string which represents mass flow units of measure name (time based).

Outputs:

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

4.5.2 Convert PFS to Flow EU

Convert PFS to Flow EU (SubVI).vi

Converts mass flow PFS @ Factory STD conditions ([0.0-100.0%] notation) to the engineering units (STP conditions) which are wired to the "Engineering Units" 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:

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 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 Full Scale Range" 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.

K-Factor 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 "*Engineering Units*" 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 "*Engineering Units*" terminal.

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.

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.

4.5.3 Process Engineering Units Command

Process Engineering Units Command (SubVI).vi
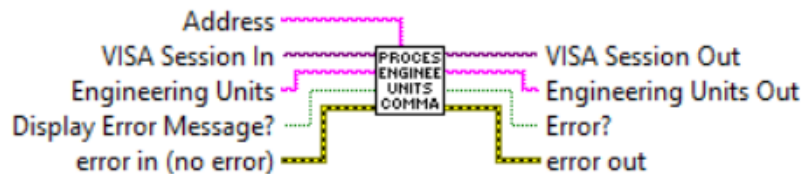
Sets/Reads currently selected mass flow units of measure. When "*Engineering Units*" terminal is empty this Sub-VI performs "*Read*" function. Read function is only supported by DFC instruments with firmware version 1.10 and higher. This Sub-VI will check for firmware revision and send Read currently selected units of measure command only when firmware revision is 1.10 or higher. NOTE: This Sub-VI does not support "UD" User Defined unit command.

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.

Engineering Units 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).

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.

4.5.4 User Defined Unit Command

User Defined Unit Command (SubVI).vi
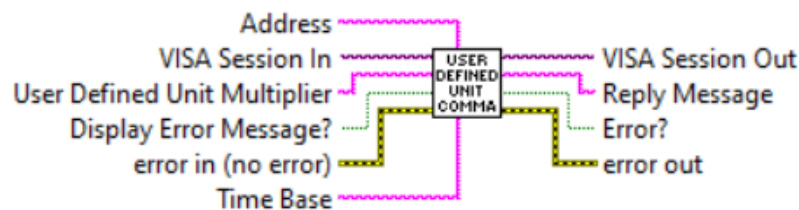
Activates user defined unit of measure . If successful returns coma delimited string with user specified name [UD], floating point multiplier value and single character Time Base value. "User Defined Unit Multiplier" input terminal value must be more than zero. "Time Base" input terminal values are:

"S" - Time base in seconds

"M" - Time base in minutes

"H" - Time base in hours.

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 Unit Multiplier is a required input and is a floating point string representing conversion coefficient from *SLPM* unit to the *User Defined Unit* (must be more than zero).

Time Base is an one character string representing User Defined Unit time base [S,M,H].

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.

Reply Message is a string that contains coma delimited parameters of the instrument's currently selected "*User Defined Unit*" of measure.

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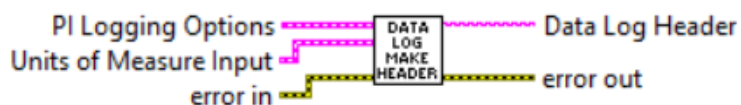
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

4.6 Data Logging

4.6.1 Data Log Make Header

Data Log Make Header.vi

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.

4.6.2 Log EEPROM Registers Values

Log EEPROM Registers Values (SubVI).vi
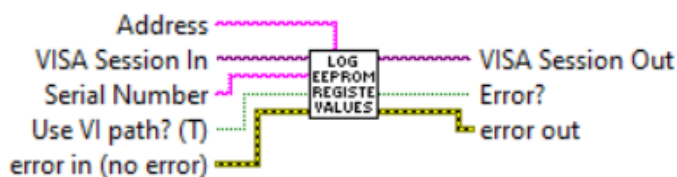
Reads the value of each EEPROM configuration register, and stores the values in a text file. Generates file name as a time-stamp (by default saves it to the current working directory).

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.

4.6.3 PI Log Make Data String

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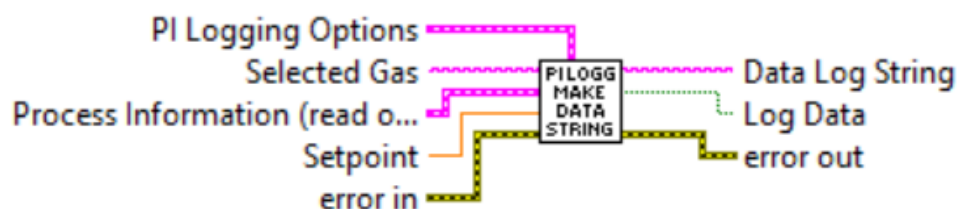
Generates a comma delimited string from the data based on the logging options selected. This is for use with AALBORG LabVIEW's examples which utilize *Data Log* feature.

Inputs:

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

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

Selected Gas is a string with instrument's currently selected gas name.

Setpoint is a required input and reflects the instrument's set point value (double) in the currently selected mass flow units.

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.

Outputs:

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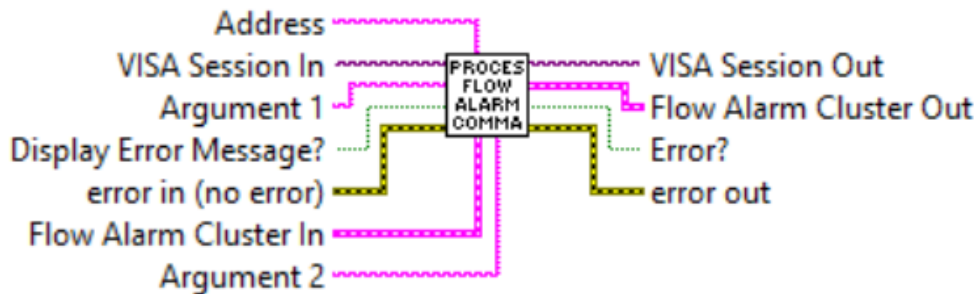
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

4.7 Flow Alarm

4.7.1 Process Flow Alarm Command

Process Flow Alarm Command (SubVI).vi

Reads and writes Flow Alarm parameters. Refer to ASCII commands set in the DFC operating manual for proper values of the strings wired to the Argument#1 and Argument#2 inputs. This Sub-VI parsing output data frame and updates corresponding parameters of the Flow Alarm 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.

Flow Alarm Cluster In is a cluster of 4 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.

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 4 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.

4.7.2 Update Flow Alarm Parameters

Update Flow Alarm Parameters (SubVI).vi
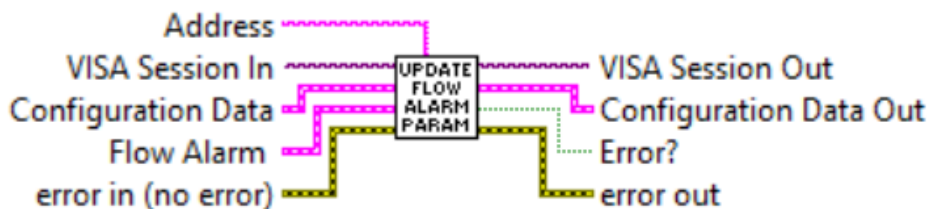
Updates instrument Flow Alarm parameters in the "*Configuration Data*" cluster according to data in the "*Flow Alarm*" cluster. "*Configuration Data Out*" cluster represents actual Flow Alarm parameters it was updated with.

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.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

Flow Alarm is cluster of 7 elements containing the information regarding instrument's Flow Alarm parameters.

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.

Configuration Data Out is a cluster of strings containing the information regarding instrument's configuration parameters with updated *Flow Alarm* parameters.

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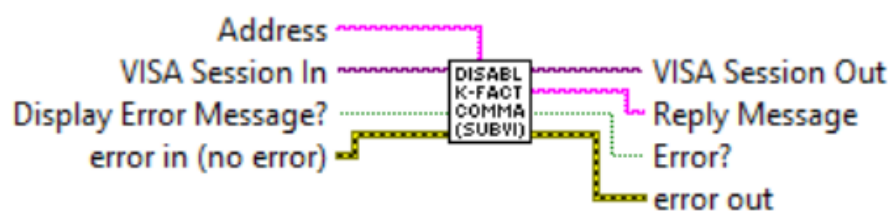
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

4.8 K-Factors

4.8.1 Disable K-Factor Command

Disable K-Factor Command (SubVI).vi

Disables K-Factor applied to currently selected Gas Table. If successful returns "KD" string. This command will reset K-Factor value to 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.

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 Message 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.

4.8.2 Enable Internal K-Factor

Enable Internal K-Factor (SubVI).vi
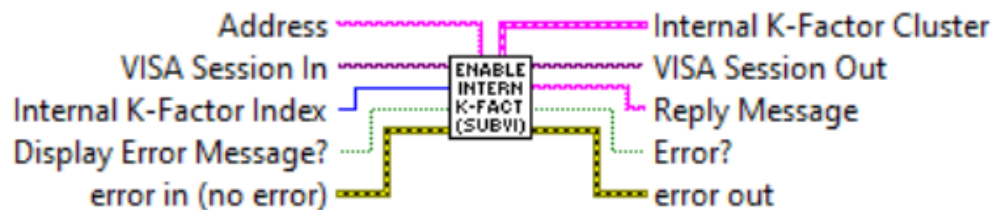
Applies Internal K-Factor to currently selected Gas Table. If successful returns K-Factor Index, Gas Name and floating point number with K-Factor value in the Internal K-Factor cluster. K-Factor does not work with %FS engineering unit. Changes take effect after next set point command. Valid Internal K-Factor Indexes are from 0 to 134.

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 0 to 134.

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.

Internal K-Factor Cluster is a cluster of 3 elements which represents Internal K-Factor parameters: Gas Index, Gas Name, Internal K-Factor value.

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

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.

4.8.3 Enable User Specified K-Factor

Enable User Specified K-Factor (SubVI).vi
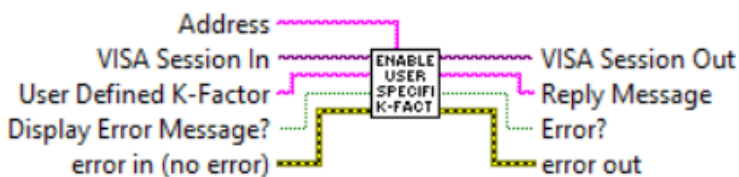
Applies user specified K-Factor to currently selected Gas Table. If successful returns floating point string with user specified K-Factor value. K-Factor does not work with %FS engineering unit. Changes take effect after next set point command.

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.

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 Message is a floating point string with uploaded user specified K-Factor 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.

4.8.4 Read K-Factor Command

Read K-Factor Command (SubVI).vi
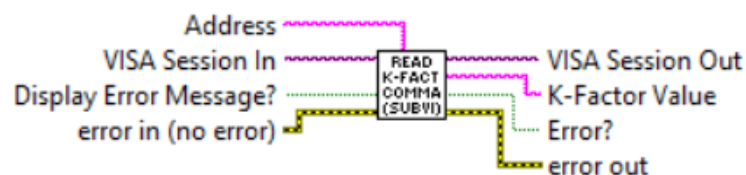
Reads currently selected K-Factor value. Read K-Factor value function is only supported by DFC instruments with firmware version 1.10 and higher. This Sub-VI will check for firmware revision and send Read K-Factor value command only when firmware revision is 1.10 or higher.

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.

K-Factor Value is a floating point string with currently active K-Factor 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.

4.8.5 Update K-Factor Parameters

Update K-Factor Parameters (SubVI).vi
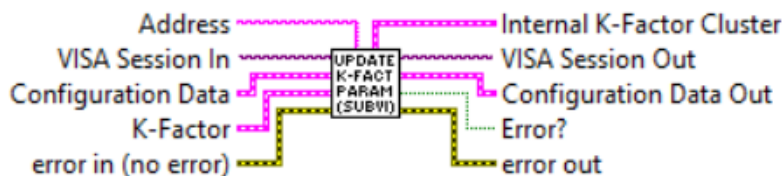
Updates instrument K-Factor parameters according to data in the "*K-Factor*" cluster. "*Configuration Data Out*" cluster represents actual K-Factor parameters it was updated with.

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.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

K-Factor is a cluster of 3 elements which represents K-Factor parameters to be updated with.

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.

Internal K-Factor Cluster is a cluster of 3 elements which represents Internal K-Factor parameters: Gas Index, Gas Name, Internal K-Factor value.

Configuration Data Out is a cluster of strings containing the information regarding instrument's configuration parameters with updated K-Factor parameters.

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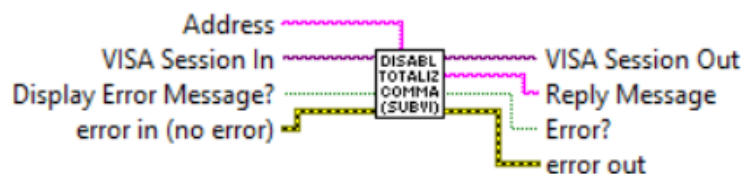
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

4.9 Totalizer

4.9.1 Disable Totalizer Command

Disable Totalizer Command (SubVI).vi

Disables Totalizer execution. If successful returns "TD" string. This command will also reset Totalizer reading to zero.

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 Message is a string with instrument's reply message to be evaluated.
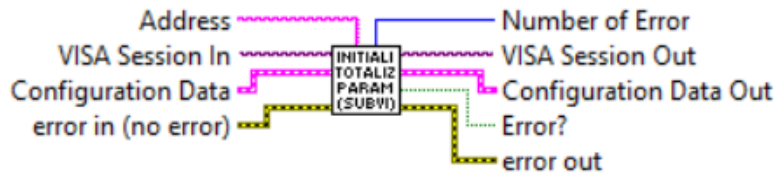
Error? is the boolean output that is triggered when communication error or time out occurred during communication with the instrument.

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.

4.9.2 Initialize Totalizer Parameters

Initialize Totalizer Parameters (SubVI).vi

Initializes instrument Totalizer parameters according to data in the "Configuration Data" cluster. "Configuration Data Out" cluster represents actual Totalizer parameters it was initialized with. 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.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

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

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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.

Number of Error is unsigned long 32 bit integer representing number of errors which occurred during uploading Totalizer parameters to the instrument.

Configuration Data Out is a cluster of strings containing the information regarding instrument's configuration parameters with updated 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.

4.9.3 Read Totalizer Command

Read Totalizer Command (SubVI).vi
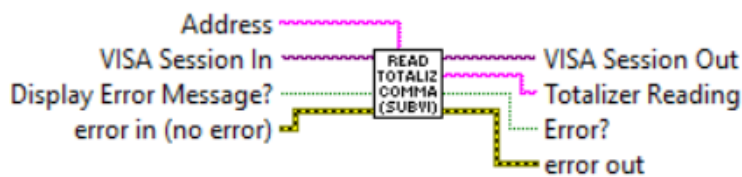
Reads current Totalizer volume in currently selected (not time based) mass flow units of measure.

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.

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.

4.9.4 Reset Totalizer Command

Reset Totalizer Command (SubVI).vi
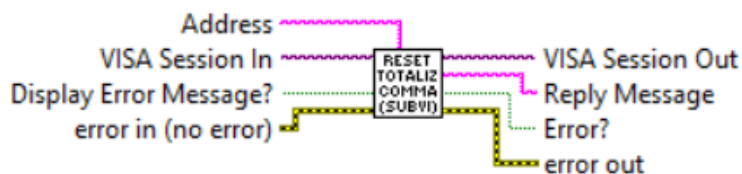
Performs a reset of the Totalizer reading. If successful returns "TZ" string.

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.

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.

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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 Message 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.

4.9.5 Start Totalizer Command

Start Totalizer Command (SubVI).vi
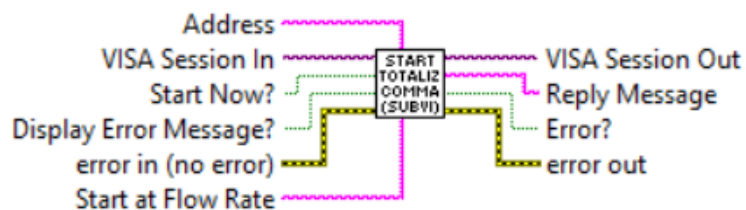
Performs Start Totalizer function. Based on value of the "Start Now?" input terminal Totalizer ether starts unconditionally (when set to TRUE) or when flow rate reaches, or exceeding value set in "*Start at Flow Rate*" input terminal. "*Start at Flow Rate*" terminal value must be set in currently selected 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.

Start Now? is a Boolean input stating whether the Totalizer start unconditionally (when set to TRUE) or when flow rate reaches, or exceeding value set in "*Start at Flow Rate*" input terminal.

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Start at Flow Rate is a floating point string representing flow rate value (in currently selected mass flow units) at which Totalizer will start.

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 Message is a string with instrument's reply message to be evaluated. When "*Start Now?*" terminal is connected to "TRUE" the "*Reply Message*" must be "N". When "*Start Now?*" terminal is connected to "FALSE" the "Reply Message" must be equal to the string connected to the "*Start at Flow Rate*" 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.

4.9.6 Stop Totalizer Command

Stop Totalizer Command (SubVI).vi
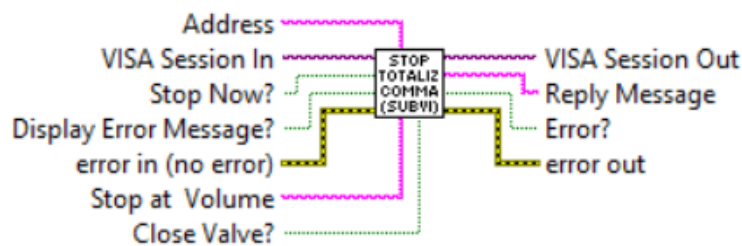
Performs Stop Totalizer function. Based on value of the "*Stop Now?*" input terminal Totalizer ether stops unconditionally (when set to TRUE) or when total volume reaches, or exceeding value set in "*Stop at Volume*" input terminal. "*Stop at Volume*" terminal value must be set in currently selected mass/volume units of measure (not time based). When "*Stop Now*?" input terminal wired to "FALSE" and "*Close Valve?*" input terminal wired to "TRUE" when total volume reaches, or exceeding value set in "*Stop at Volume*" input terminal DFC instrument valve will be closed (unenergized).

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.

Stop Now? is a Boolean input stating whether the Totalizer stops unconditionally (when set to TRUE) or when flow rate reaches, or exceeding value set in "*Stop at Volume*" input terminal.

Stop at Volume is a floating point string representing Totalizer reading value (in currently selected not time based mass flow units) at which Totalizer will stop.

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

Close Valve? is a Boolean input stating whether the instrument's valve must be closed (if set to TRUE) when total volume reaches, or exceeding value set in "*Stop at Volume*" input terminal.

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 Message is a string with instrument's reply message to be evaluated. When "*Stop Now?*" input terminal is connected to "TRUE" the "*Reply Message*" must be "N". When "*StopNow?*" terminal is connected to "FALSE" the "*Reply Message*" must be equal to the string connected to the "*Stop at Volume*" terminal. When "*Close Valve?*" input terminal is connected to "TRUE" in the end of the reply string will be "C" character. When "*Close Valve?*" input terminal is connected to "FALSE" in the end of the reply string will be "N" character.

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.

4.9.7 Update Totalizer Parameters

Update Totalizer Parameters (SubVI).vi
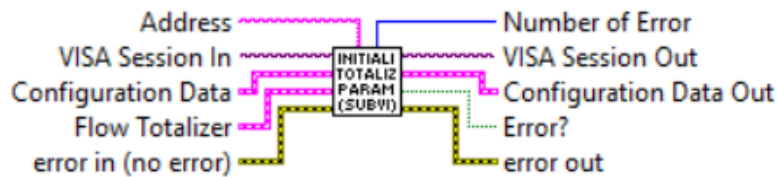
Updates instrument Totalizer parameters according to data in the "Flow Totalizer" cluster. "Configuration Data Out" cluster represents actual Totalizer parameters it was updated with.

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.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

Flow Totalizer is cluster of 9 elements containing the information regarding instrument's *Flow Totalizer* parameters.

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.

Number of Error is unsigned long 32 bit integer representing number of errors which occurred during uploading Totalizer parameters to the instrument.

Configuration Data Out is a cluster of strings containing the information regarding instrument's configuration parameters with updated 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.

4.10 Utilities

4.10.1 Comm Error Check1

Comm Error Check1 (SubVI).vi

Reply String ———— [COMM ERROR CHECK1 (SUBVI)] ———— Error Code
———— Error?

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.

4.10.2 Comm Error Notify

Comm Error Notify (SubVI).vi

Error Number ———— [COMM ERROR NOTIFY (SUBVI)]
Activate Message? ————
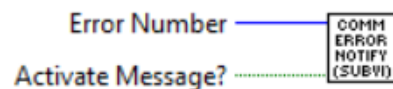
Displays Communication Error Message based on input Error code number generated by "Comm Error Check1" Sub-VI.

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".
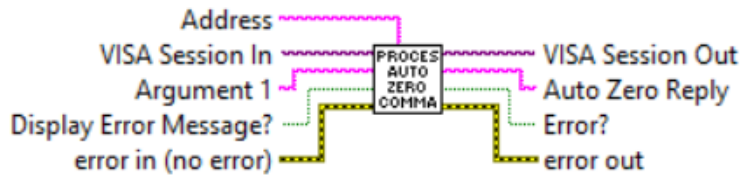
Inputs:

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.

4.10.3 Process Auto Zero Command

Process Auto Zero Command (SubVI).vi

Performs Auto Zero function for the DFC instruments. Refer to DFC ASCII commands set (Appendix 4 in the DFC operating manual) to determine valid values for "Argument 1" input terminal.

WARNING: Make sure absolutely no flow through the instrument during Auto Zero procedure. For best result make sure inlet and outlet fittings are open to the atmosphere!
WARNING: To prevent EEPROM burning, avoid executing "Save Auto Zero" command ("Z,W") more often than one time per 10 minutes.
NOTE: Do Zero Now command "Z,N" may take several minutes to complete. Instrument will not respond on other commands except "Z,S" status command when this is in progress. To stop Auto Zero process immediately, send "Z,STOP" command.

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.
Argument#1 is the string with one ASCII character specifying the Auto Zero command you would like to execute. Refer to DFC ASCII commands set (Appendix 4 in the DFC operating manual) to determine valid values for "Argument 1" 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.

Auto Zero Reply is a string with instrument's reply message to be evaluated. Refer to DFC ASCII commands set (Appendix 4 in the DFC operating manual) to determine valid values for "*Auto Zero Reply*" 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.

4.10.4 Process Maintenance Timer Command

Process Maintenance Timer Command (SubVI).vi
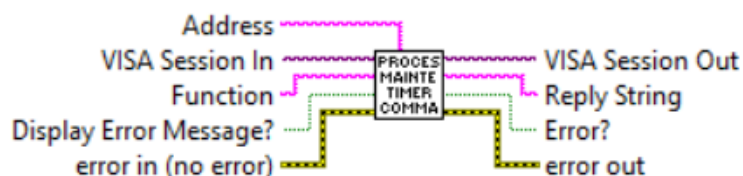
Reads/Resets instrument's maintenance timer. When "R" string is wired to the "Function" input terminal the instrument replies with floating point string representing current maintenance timer value in hours. When "C" string is wired to the "Function" input terminal the maintenance timer is set to zero and instrument replies with "CC" 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 DFC ASCII commands set (Appendix 4 in the DFC 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.

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 DFC ASCII commands set (Appendix 4 in the DFC 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.

4.10.5 Read Instrument Configuration

Read Instrument Configuration (SubVI).vi
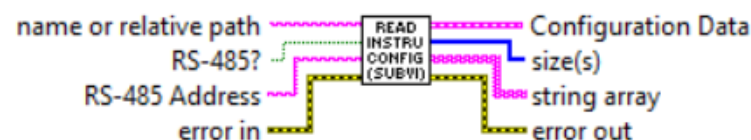
Reads instrument's configuration parameters from the ASCII file stored on the PC hard drive in to the Configuration Parameters cluster. This version of the DFC LabVIEW driver supports up to 32 instruments (when used with RS-485 interface option). Each line of the configuration file represents configuration parameters for single instrument. For RS-232 interface option the program takes configuration data from the last line (address 2F). For RS-485 interface option device address must be wired to the "RS-485 Address" terminal to identify and read corresponding instrument configuration data.

NOTE: Make sure the InstrumentConfiguration.txt file is in the directory specified in the "name or relative path" input terminal. This Sub-VI is required to initialize instrument's parameters with data stored in previous session of the program.

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:

Name or relative path is string with the relative path to the file "*InstrumentConfiguration.txt*" which holds all instruments configuration parameters not stored in the DFC non volatile EEPROM memory.

RS-485? is a boolean input stating whether the DFC instrument communication interface is RS-485 type (when set to "TRUE").

RS-485 Address is a 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. Connect this input terminal to the "*Address*" output terminal of the "*Initialize Comm 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.

Outputs:

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters.

size(s) is an unsigned integer which represent number of the instrument parameters read from the "InstrumentConfiguration.txt" file. This output should be equal to 23 when all instruments parameters are successfully read from the file.

string array is an array of strings containing the information regarding instrument's configuration parameters read from the "InstrumentConfiguration.txt" 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.

4.10.6 Save Instrument Configuration

Save Instrument Configuration (SubVI).vi
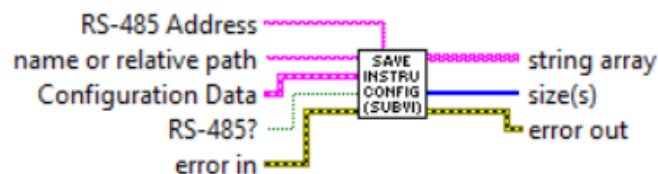
Writes instrument's configuration parameters from "*Configuration Parameters*" cluster in to the ASCII file stored on the PC hard drive. This version of the DFC LabVIEW driver supports up to 32 instruments (when used with RS-485 interface option). Each line of the configuration file represents configuration parameters for single instrument. For RS-232 interface option the program writes configuration data to the last line (address 2F). For RS-485 interface option device address must be wired to the "*RS-485 Address*" terminal to identify and write configuration data to the corresponding instrument.

NOTE: Make sure the *InstrumentConfiguration.txt* file is in the directory specified in the "*name or relative path*" input terminal. This Sub-VI is required to preserve instrument's parameters with data used in currently running session of the program.

Inputs:

Name or relative path is string with the relative path to the file
"*InstrumentConfiguration.txt*" which holds all instruments configuration parameters not stored in the DFC non volatile EEPROM memory.

RS-485? is a boolean input stating whether the DFC instrument communication interface is RS-485 type (when set to "TRUE").

RS-485 Address is a 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. Connect this input terminal to the "*Address*" output terminal of the "*Initialize Comm Port*" Sub-VI.

Configuration Data is cluster of strings containing the information regarding instrument's configuration parameters to be saved in the "*InstrumentConfiguration.txt*" file.

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

Outputs:

size(s) is an unsigned integer which represent number of the instrument parameters saved in the "InstrumentConfiguration.txt" file. This output should be equal to 23 when all instrument's configuration parameters are successfully written in the file.

string array is an array of strings containing the information regarding instrument's configuration parameters written in the "InstrumentConfiguration.txt" 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.

4.10.7 Save Multiple Devices Configuration

Save Multiple Devices Configuration (SubVI).vi
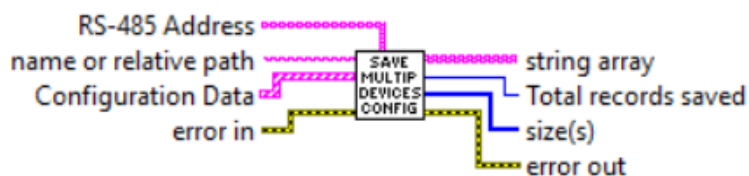
Writes instrument's configuration parameters from array of "*Configuration Parameters*" clusters in to the ASCII file stored on the PC hard drive. This version of the DFC LabVIEW driver supports up to 32 instruments (when used with RS-485 interface option). Each line of the configuration file represents configuration parameters for single instrument. This Sub-VI must be used only for application where *Configuration Parameters* from multiple DFC with RS-485 devices must be saved in to the text file. The array of the Device address which configuration parameters have to be saved must be wired to the "*RS-485 Address*" terminal to identify and write configuration data to the corresponding instrument.

NOTE: Make sure the *InstrumentConfiguration.txt* file is in the directory specified in the "*name or relative path*" input terminal. This Sub-VI is required to preserve instrument's parameters with data used in currently running session of the program.

Inputs:
Name or relative path is string with the relative path to the file "*InstrumentConfiguration.txt*" which holds all instruments configuration parameters not stored in the DFC non volatile EEPROM memory.

RS-485 Address is a 1D array of strings which contains start character and two hexadecimal characters of the device address prefix for devices which configuration data have to be saved in to the file.

Configuration Data is 1D array of clusters of strings containing the information regarding instrument's configuration parameters to be saved in the "*InstrumentConfiguration.txt*" file.

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

Outputs:
size(s) is an unsigned integer which represent number of the instrument parameters saved in the "InstrumentConfiguration.txt" file. This output should be equal to 23 when all instrument's configuration parameters are successfully written in the file.

string array is a 2D array of strings containing the information regarding instrument's configuration parameters written in the "InstrumentConfiguration.txt" file.
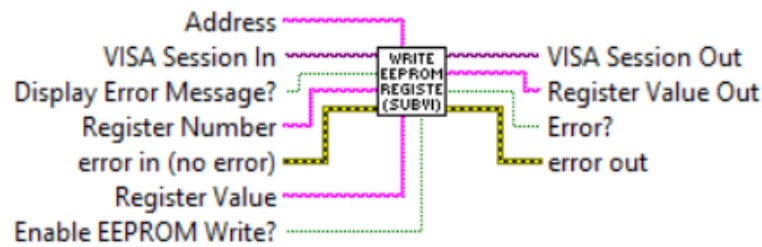
Total Records Saved is unsigned 32-bit integer which represent total number of the devices for which configuration parameters have been saved.

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.

4.10.8 Write EEPROM REgister

Write EEPROM Register (SubVI).vi

Address
VISA Session In
Display Error Message?
Register Number
error in (no error)
Register Value
Enable EEPROM Write?

WRITE EEPROM REGISTE (SUBVI)

VISA Session Out
Register Value Out
Error?
error out

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 (unsigned 32-bit integer) 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 0 to 63 and from 100 to 134.

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.

5. Example Programs

5.1 DFC Simple PI Read Driver with Setpoint Example

Simple example program which allow user to select interface type, instrument address (only applicable for RS485 interface), initialize COM port, continuously read instrument *Process Information* (PI) data and write set point value to the DFC instruments. Once COM port is initialized the program reads instrument configuration information from ASCII file stored on PC hard drive in to "*Configuration Data*" cluster, initializes instrument and then it continuously reads PI data and displays the waveform chart for Mass flow rate and Set Point value. In addition, this program allows user to change "*Instrument Mode*" parameter, "*Valve Mode*" parameter and "*Set Point*" value parameter during VI run time.
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 125% 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 DFC instruments in to the existing program.

To connect to DFC instrument, simply select the appropriate COM port that the instrument is connected to and ensure that the *Interface Type* (*RS-232 or RS-485*) and *Address* controls are set to match the values on the DFC instrument that you would like to talk to.
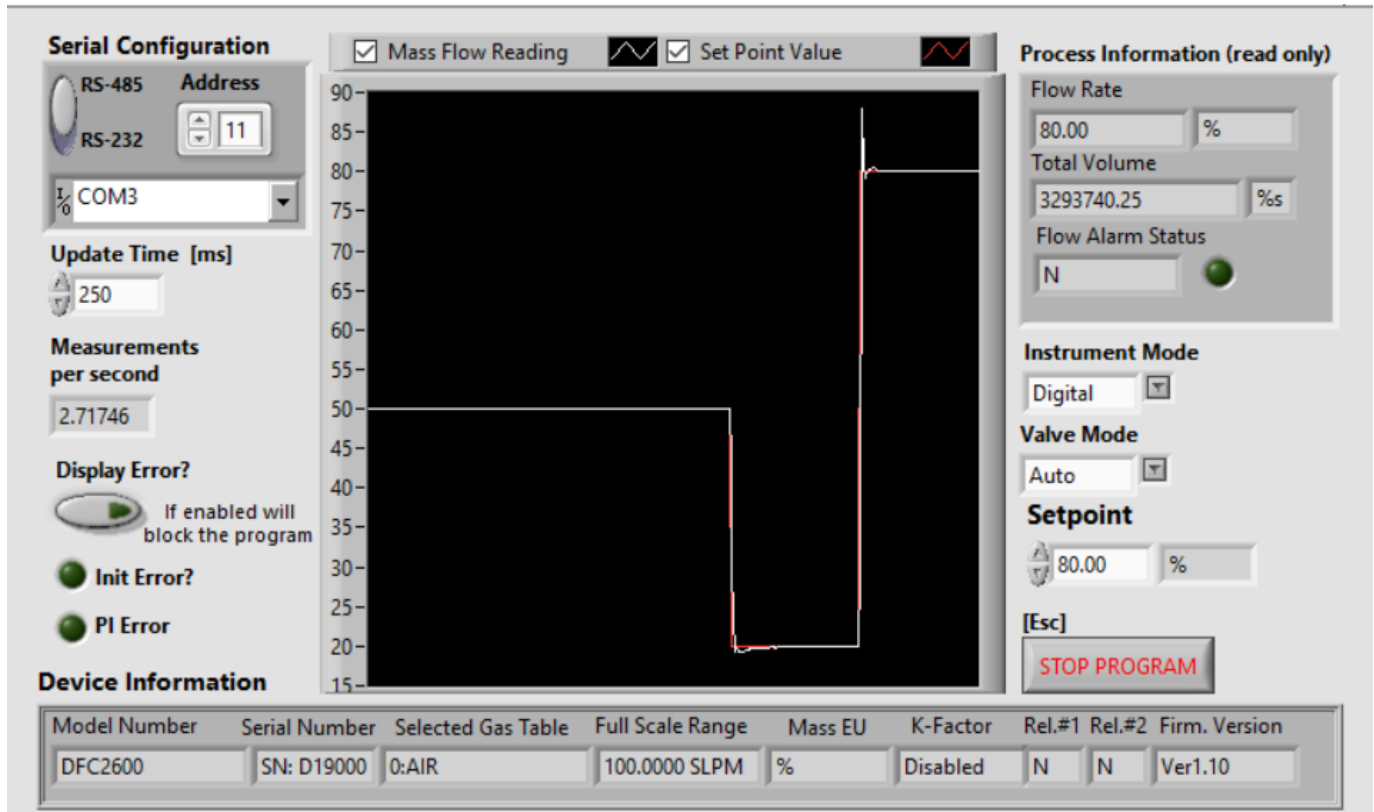
NOTE: DFC instrument has fixed 9600 baud rate. For stable operation do not decrease "*Update Time*" parameter below 150 ms.

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

5.2 DFC Extended Driver Example with Chart and Data Log

This example program utilizes almost all Sub-VI's included in the *AALBORG DFC LabView Driver Library*. In addition to the simple PI program example it provides access to the PI data *Waveform Chart, Flow Totalizer* and *Alarm* parameters settings, *K-Factors* selection, *Relay Assignment* and *Process Information* and *EEPROM Registers* data logging for the DFC instruments.

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

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NOTE: Address is not required when instrument is connected over RS-232 interface.

DFC was originally designed to operate in *Master/slave* model of an asymmetric communication where one device (the "master") controls one or more other devices or processes (the "slaves") and serves as their communication hub. DFC instrument does not keep most of the configuration parameter in the nonvolatile EEPROM memory. Instead it relies on *Master* device or process, which keeps all configuration parameters in central database (or file) and uploads them in to the instrument's SRAM memory during Initialization phase. This driver is using "*InstrumentConfiguration.txt*" file which holds all instruments configuration parameters not stored in the DFC nonvolatile EEPROM memory. Make sure this file is in the same directory where your VI program is located. This version of the DFC LabVIEW driver supports up to 32 instruments (when used with RS-485 interface option). Each line of the configuration file (coma delimited string with 23 parameters) represents configuration parameters for single instrument. This example VI will continually try opening the COM port and querying for a connected instrument response. If no DFC instrument is connected that matches these settings, the program will close the COM port, wait for a given amount of time and retry.

Once a connection to an DFC instrument is established, the program reads instrument configuration information from ASCII file stored on PC hard drive in to "*Configuration Data*" cluster, initializes instrument, updates "*Configuration Data*" cluster with parameters the instrument was initialized with, populates the VI's controls and "*Device Information*" cluster. During instrument's initialization phase, a text box will appear with the message to indicate that the connection is established and that the VI panel is populating with the device information.

Possible Issues

- When communicating with instruments over RS-485 interface and "*Read Valve Output*" check box is selected some times it is possible to get "*Communication Error*" message when low (< 200 ms) *"Update Time"* settings are selected.
- Do not use "*Update Time*" settings with values below 1**50 ms**. Doing so may result in communication error.

## 5.3 DFC Simple Driver Example Multiple Devices with Setpoint

This simple example program initializing the COM port, determining the instruments configuration data for up to 32 DFC instruments (configuration data will be collected only for instrument addresses which are selected in the "*Device Address to Include*" control cluster), acquiring the data of the same number of instruments, displaying the data only for the one with the selected *Active Device* address. This 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 DFC instruments with digital communication interface configured for RS-485 interface option.

When developing the program for multiple DFC 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.

5.4 DFC Simple Terminal Interface
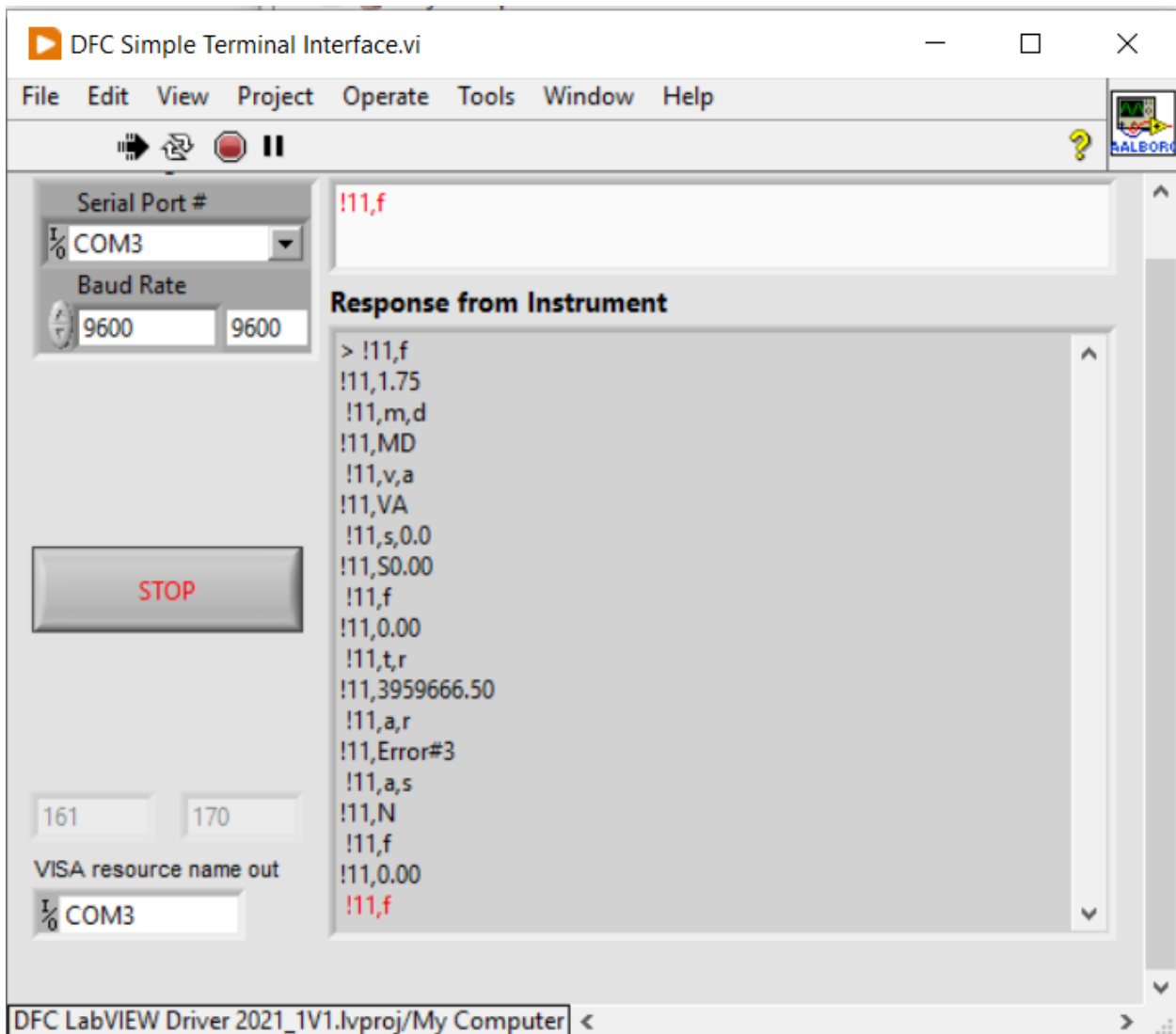
Example VI for communicating with AALBORG DFC instruments via serial communication interface using ASCII commands set (see instrument operating manual for complete list of supported commands). For RS485 interface the start character is always ! and two characters of address with coma delimiter in the 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 DFC instrument.