



# User's Guide to the Alicat LabVIEW Drivers

The screenshot displays the Alicat LabVIEW driver interface, which is organized into several functional panels:

- Setpoint and Batching Controls:** Includes a Gas Select dropdown (CO), Setpoint (0.05 LPM, 117.97), Batch Setpoint (0.00 SL, Mass Flow), and buttons for Manual Tare (Tare Flow, Tare Pressure, Reset Totalizer, Tare AP Sensor).
- Graphing Options:** Features checkboxes for AutoScale Chart, Adjust Scale, and Enable Graphing, along with checkboxes for Pressure, Temp, Volume, Mass, and Setpoint.
- Data Frame Enables:** Contains checkboxes for Serial and Display (Pressure, Temperature, Volumetric, Mass Flow, Tot. Avg Flow, Gas Selected) and Serial Only (Valve Drive, Totalizer, Totalizer Timer, Totalizer Peak Flow, Show Abs., Gauge and Baro. pressures).
- Measurement Data:** Displays real-time values for Absolute Pressure (1034 PSI), Gauge/Diff. Pressure (0 PSI), Barometric Pressure (0 N/A), Temperature (78.78 F), Volumetric Flow (6.5 LPM), Mass Flow (3.42 SLPM), Setpoint (0.05 LPM), Valve Drive (0 %), Totalizer (4.89 SL), Totalizer Timer (0 [h] 1 [m] 25 [s]), Totalizer Avg. Flow (0 SL/M), Totalizer Peak Flow (0 SL), and Gas selected (CO). It also includes Range Exceeded and Error Present indicators.
- Controller Options and Analog Signal Information:** Includes PID Settings (P Gain: 100, D Gain: 5000, I Gain: 0, Valve Offset: 24000), Read/Write Options (Volumetric Flow, Controller Select, Serial, SetPoint Source, Disabled, AutoTare), and Read-Only Options (0-5V, Analog SP, Pressure, Control Invert, Reserved(A), Main PWM, Fixed 0.00V, Aux PWM).
- Data Logging Options:** Features checkboxes for Absolute Press., Gauge/Diff. Press., Barometric Press., Temperature, Volumetric, Mass Flow, Setpoint, Valve Drive, Totalizer, Tot. Timer [s], Tot. Avg. Flow, Tot. Peak Flow, and Gas Selected. A Log Data button and a note about altering log options are also present.
- COM Port Settings:** Shows Unit ID (b), Baud Rate (19200), and COM4.
- Tare Options:** Includes checkboxes for Volumetric, Display, None, External, and Auto-Tare Delay [s] (1.2).
- VI Timing Options:** Shows Time between readings [ms] (0) and Meas. per second [Hz] (48.0046, 20.8313).
- Register Values:** Includes a Read Register button and a value of 0.
- COMPOSER gas mix input:** A table for defining gas mixtures with columns for Gas #1 through Gas #5 and Mix % 1 through Mix % 5. A Mix name (MyMix1) and a Mix # (236) are entered. Buttons for Create Mix, Delete Mix, and Completion text are provided.
- Manufacturer Info:** Lists ALICAT SCIENTIFIC, www.alicat.com, Ph 520-290-6060, and Fax 520-290-0109.

The central graph displays multiple data series: Pressure (top axis, -920 to -1100), Temperature (middle axis, 78.1 to 78.8), and Flow (bottom axis, 0 to 7). The graph shows a clear upward trend in all three variables over time.

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## Introduction

The Alicat LabVIEW drivers were designed to make communication with Alicat devices using LabVIEW much easier, and include a wide array of serial commands bundled up as easy to use sub-VI's. These drivers will work on any Alicat device that is using either RS-232 or RS-485, and will not work for devices that are built with either the Modbus or Profibus communication protocols.

In the most basic form, the Alicat LabVIEW drivers are establishing a VISA session to an active COM port that has Alicat devices connected. Once the communication has been initialized, the sub-VI's can be called which send serial commands to the Alicat device over the opened VISA session and parse the ASCII data string that is returned.

The initialization should be done with the *COM Port Initialization* 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 Alicat 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, each serial command or sub-VI must be called sequentially. This can be accomplished 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 Alicat devices 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).

In the update from version 5 to version 6 of the Alicat software found on all Alicat meters and controllers, new functionality was added that altered what data was potentially available on the RS-232 output (as well as a few other alterations). Because of this, the data frame format query (??D\*) that was used in the original (version 1) LabVIEW drivers to determine the data frame format, full scale, etc. will run into complications that break their ability to correctly parse the data. All of the VI's contained in the Version 2 library are fully backwards compatible with nearly all Alicat devices dating back at least 10 years (excluding only the ones sold with heavily customized firmware, which would have only been made upon request). If you are using older (version 1) VI's within an existing code and do not want to go through the hassle of determining exactly which VI's need to be replaced (and with what new version) to make the program work, you can make use of the Version 1 Legacy sub-VI's (see table of contents) to bring your programs up to date quickly and as easily as possible.

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## Known Issues

The string-to-number conversions performed in the data parsing VI's uses the system default decimal format. In some areas, this can cause issues due to LabVIEW expecting a comma for a decimal point instead of the period that will be present in the Alicat's 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. This will be updated in the next revision of the LabVIEW driver library (undetermined date).

## Alicat VI Tree

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

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## Sub-VI's

### Initialization

These sub-VI's are used to open a VISA session with the configuration settings required with Alicat devices and to determine the software version of an Alicat device (used as an optional input in many of the other sub-VI's). These sub-VI's should be run in the beginning of the code, likely prior to the main while loop.

#### COM Port Initialization



Initializes the serial connection to a specified COM port. Baud rate should match the baud rate of the connected Alicat(s). If multiple Alicats are connected to the specified COM port, ensure that they all have unique unit ID's.

The Unit ID is not used for the initialization step. If connecting to multiple Alicats, leave it as the default "A" in the Communications Settings control cluster.

#### Inputs:

Communication Settings is a cluster that contains the Unit ID, Baud Rate, and COM Port Number used for establishing communication with an Alicat. It is a required input, but the unit ID is not used in this 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

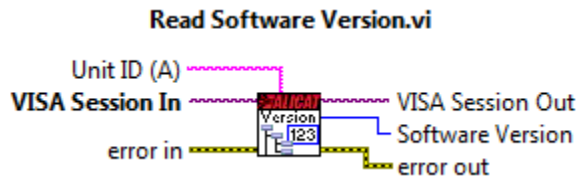
#### Outputs:

VISA Session Out is the opened VISA session reference that needs to be used for all subsequent Alicat 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 Alicat commands to separate unit ID's in parallel, separate COM ports need to be used and initialized separately.

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

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## Read Software Version



Returns the software version as an integer. If the query is not valid, the VI will return a 1. A non-valid query would be due to having an Alicat device that contains an older circuit board and software version, whose firmware does not support the version query command.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

Software Version is an unsigned 8 bit integer, representing the main software revision number (e.g. “5” for a device that has software version 5v12). On units with GP series software, this sub-VI will return a value of “1”. The Software Version value is used as an optional input for many of the Alicat sub-VI’s. The optional software version inputs should be wired for achieving the fastest speed possible when using these sub-VI’s (if the Software Version input terminal on these is left un-wired, the VI will call the *Read Software Version* sub-VI to determine the software version before executing the code it contains, and will therefore be slower).

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

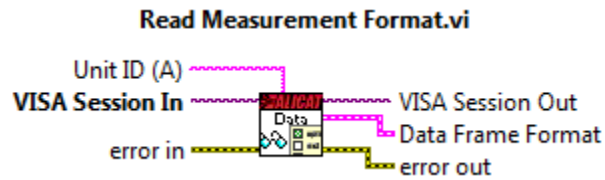
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## Data Collection

These sub-VI’s are used for collecting and parsing the data that an Alicat device outputs through its data frame.

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## Read Measurement Format



Determines the format of the data frame. This VI is required for the Read Measurements VI to know how to parse the data properly. This can be run at the beginning of a program outside the main loop, and should be re-run every time the data frame output is altered.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

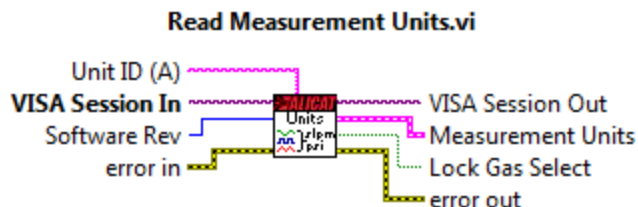
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

Data Frame Format is a cluster containing the information regarding what variables are enabled and what time format the totalizer timer has. Each Boolean is either true or false, depending on what variables are configured to show up on the Alicat’s data frame. Configuration of the data frame output can be done using the *Write Data Frame Options* sub-VI.

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

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## Read Measurement Units



Reads the measurement units for the available variables. Measurement units are returned as strings.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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



Software Rev is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

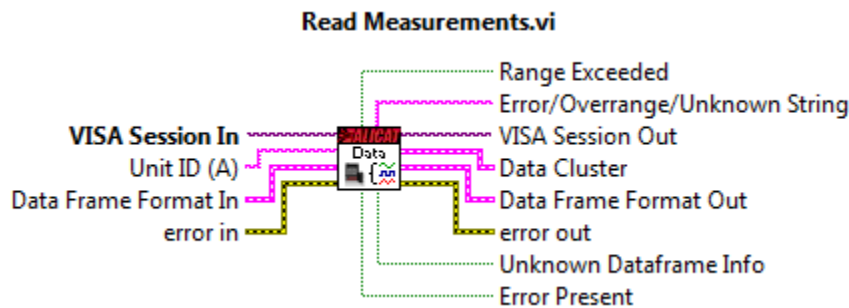
Measurement Units is a cluster containing the string representations of the measurement units for all of the data frame outputs.

Lock Gas Select is a Boolean indicating whether the Gas Selection should be locked or not. On pre-Software Version 6 mass flow devices whose output was configured for units of true mass (e.g. Kg/min, Lbs/Hr, etc.), the gas selection feature of the Alicat device was disabled due to how the conversion factor was applied. If the Lock Gas Select Boolean is "true," gas selection commands are not supported.

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

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Read Measurements



Polls the Alicat device for its data frame and outputs cluster of data, retrieved/used data flags, and error/overrange/unknown indicators and strings. Data is parsed according to data flag inputs, and if none are present the device will query the data flags (adding a considerable amount of time to the VI's execution).

**Inputs:**

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

Unit ID is an optional input. If left un-wired, the default "A" will be used.

Data Frame Format In is the cluster of values indicating which variables are present in the data frame. Ideally, this should be wired to the output of the *Read Measurement Format* sub-VI. If the data frame variables are known, a constant can be wired to this input, but an incorrect Data Frame Format In cluster will result in an error when the *Read Measurements* sub-VI tries to execute. If left blank, this sub-VI will first call the *Read Measurement Format* sub-VI to obtain the needed information, and will result in a longer execution time.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

Range Exceeded is a Boolean indicator that is flagged “true” if an over-range status is present (POV, TOV, MOV, or VOV, indicating that the pressure, temperature, mass flow, or volumetric flow currently exceed their maximum readable values)

Error/Overrange/Unknown String returns the remaining string in the data frame output after the sub-VI has tried to parse all of the output variables. This string will contain any over-range text, error text, or remaining data frame text (the last case usually being present when the Data Frame Format In does not properly match the Alicat’s data frame output).

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

Data Cluster is the cluster of the parsed data from the Alicat device. The data variables are all doubles, aside from the gas selection, which is a string.

Data Frame Format Out is a cluster containing the information regarding what variables are enabled and what time format the totalizer timer has. Each Boolean is either true or false, depending on what variables are configured to show up on the Alicat’s data frame. Configuration of the data frame output can be done using the *Write Data Frame Options* sub-VI. This output would only be different from the Data Frame Format In if the Data Frame Format In terminal was left unwired.

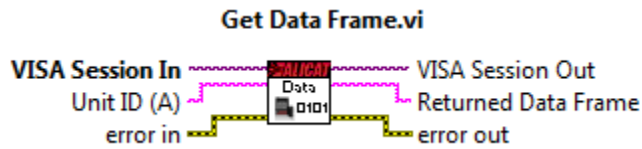
Error Out is the error cluster output, and contains information on the errors (if any) that occurred when executing this sub-VI. This terminal should be connected to the error input of the next called sub-VI.

Unknown Dataframe Info is a Boolean that indicates whether there is additional (unaccounted for) text in the data frame after the sub-VI has parsed all of the information. Text here most commonly indicates that the Data Frame Format In cluster does not properly match the variables contained in the Alicat’s data frame output.

Error Present is a Boolean indicator that is triggered when a status or error indicator is present at the end of the data frame string that is not an over-range indication.

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## Get Data Frame



Polls the Alicat device for data and returns the Alicat's un-edited data string (space delimited).

### Inputs:

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

Unit ID is an optional input. If left un-wired, the default "A" will be used.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

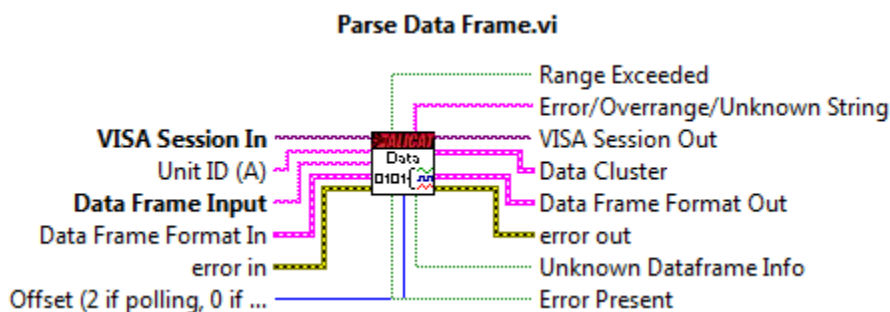
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Returned Data Frame is the raw data string received from the Alicat device.

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

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## Parse Data Frame



Parses data string obtained from an Alicat device according to data flag inputs, and if none are present the device will query the data flags (adding a considerable amount of time to the VI's execution). Outputs cluster of data, retrieved/used data flags, and error/overrange/unknown indicators and strings.

### Inputs:

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

Unit ID is an optional input. If left un-wired, the default "A" will be used.

Data Frame Input is a required input, and should contain the raw data string received from the Alicat device. This raw data string can be obtained by calling the *Get Data Frame* sub-VI.

Data Frame Format In is the cluster of values indicating which variables are present in the data frame. Ideally, this should be wired to the output of the *Read Measurement Format* sub-VI. If the data frame variables are known, a constant can be wired to this input, but an incorrect Data Frame Format In cluster will result in an error when the *Read Measurements* sub-VI tries to execute. If left blank, this sub-VI will first call the *Read Measurement Format* sub-VI to obtain the needed information, and will result in a longer execution time.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

Offset (2 if polling, 0 if streaming) is an integer that denotes how many characters to offset before beginning the parsing of the data frame. The default value is "2", which skips the unit ID and the first space before beginning the parsing. A value of 0 can be used if the Alicat device is in streaming mode (at which point it will have no unit ID), but streaming mode is not currently supported in the Alicat LabVIEW drivers.

#### **Outputs:**

Range Exceeded is a Boolean indicator that is flagged "true" if an over-range status is present (POV, TOV, MOV, or VOV, indicating that the pressure, temperature, mass flow, or volumetric flow currently exceed their maximum readable values)

Error/Overrange/Unknown String returns the remaining string in the data frame output after the sub-VI has tried to parse all of the output variables. This string will contain any over-range text, error text, or remaining data frame text (the last case usually being present when the Data Frame Format In does not properly match the Alicat's data frame output).

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Data Cluster is the cluster of the parsed data from the Alicat device. The data variables are all doubles, aside from the gas selection, which is a string.

Data Frame Format Out is a cluster containing the information regarding what variables are enabled and what time format the totalizer timer has. Each Boolean is either true or false, depending on what variables are configured to show up on the Alicat's data frame. Configuration of the data frame output can be done using the *Write Data Frame Options* sub-VI. This output would only be different from the Data Frame Format In if the Data Frame Format In terminal was left unwired.

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.

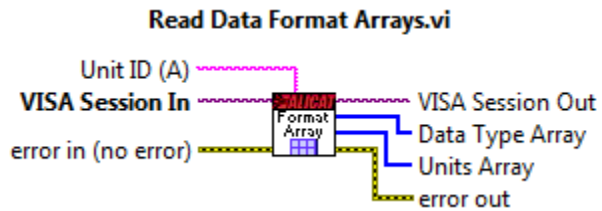
Unknown Dataframe Info is a Boolean that indicates whether there is additional (unaccounted for) text in the data frame after the sub-VI has parsed all of the information. Text here most commonly indicates

that the Data Frame Format In cluster does not properly match the variables contained in the Alicat's data frame output.

Error Present is a Boolean indicator that is triggered when a status or error indicator is present at the end of the data frame string that is not an over-range indication.

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Read Data Format Arrays



Reads off the data frame variables and units from a device with firmware rev 6v0 and above. Used as a sub-VI in other Alicat VI's. ONLY WORKS WITH FIRMWARE REVISION 6v0 AND ABOVE.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

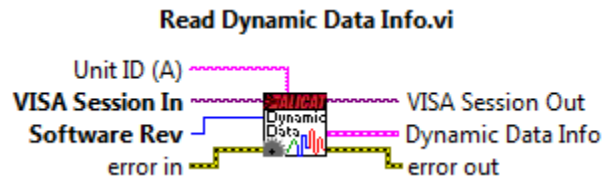
Data Type Array is the 1-D array of integers representing the data types (variables) associated with the data frame output (array index corresponding to position of the data type/variable in the data frame and value corresponding to the unique number internally associated with the given data type/variable)

Units Array is the 1-D array of integers representing the units of measure associated with the data frame output (array index corresponding to position of the data type/variable in the data frame and value corresponding to the number internally associated with the units of measure of the given data type/variable)

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

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## Read Dynamic Data Info



Returns the data information from firmware revision 6 units and above. The outputs are arrays containing the data variable, the data units, and whether or not the data is a string (array indexes are matched to the order that the data columns appear in the serial data frame). This VI is to be paired with the "Read Dynamic Measurements" VI. This VI only needs to be called at the beginning of the program, or if the data frame has been altered.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Rev is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input. It is a required input for this sub-VI because this sub-VI is only operable with software version 6v0 and greater.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

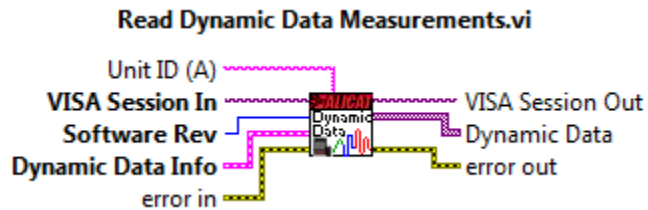
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Dynamic Data Info contains a cluster of 1-D arrays. Each array's index corresponds to the position of the given variable in the data frame output string, and the three 1-D arrays share the same indices. The Data Variable array contains strings of the data variable names. The Data Units array contains strings of the data variable units of measure. The Data is String array contains Booleans indicating whether the output data is a string (if "false," the data is in the format of a double precision float).

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

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## Read Dynamic Data Measurements



Reads the measurements contained in the Alicat unit's data frame in the order that they appear. This sub-VI's output is an array whose indices match those found in the Dynamic Data Info cluster input. The data is output as a variant class, and can later be converted into a string or double as needed.

The benefit of using this method of reading the data is speed, simplicity, and flexibility. The drawback is that the number of columns of the data output of an Alicat is dependent on the configuration and product type, so a given column number may represent different data depending on what device is connected.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Rev is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input. It is a required input for this sub-VI because this sub-VI is only operable with software version 6v0 and greater.

Dynamic Data Info is a required input cluster containing the 1-D arrays of the string labels for the data variables and the units of measure (data units), as well as the Boolean indicators of which data variable is a string rather than a double precision float. This cluster is output from the *Read Dynamic Data Info* sub-VI. The only array actually used from this input is the Data is String array, which is used to determine whether to read a double or a string from the data frame.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Dynamic Data is the 1-D array output of the data frame's data values, and the index of this array matches those of the Dynamic Data Info cluster's 1-D arrays (see *Read Dynamic Data Info* above for a more detailed explanation).

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

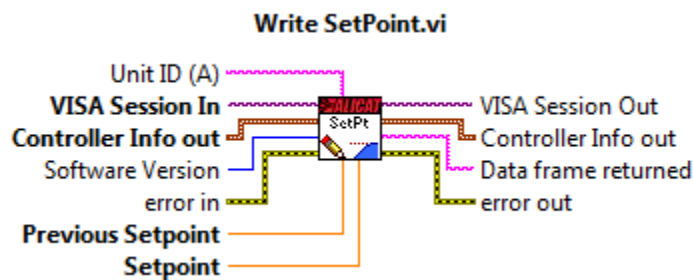
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## Setpoint

These sub-VI's are used for writing setpoints (the main setpoint for the control variable and the batch setpoint for dispensing batches of gas/liquid) to an Alicat device.

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### Write Setpoint



Writes a new setpoint to the specified Alicat device. If device type and/or fullscale range is unspecified, the device is queried. If device is not a controller, or setpoint is NaN, setpoint update is skipped.

It also performs a check to see if the setpoint is different from previously written value. If not, the setpoint command is skipped. The previous setpoint should be obtained by use of a shift register.

This VI also returns the data frame after a write command is sent, which can then be parsed using the "Parse Data Frame" VI. If the write is skipped, the data frame return will be an empty string constant instead.

#### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Controller Info out is a required input and is generated from the *Read Controller Info* sub-VI. This cluster will contain the controller full scale, the selected variable that you are controlling on, and whether the device has an inverted or bi-directional range. If none is selected, the *Read Controller Info* sub-VI will execute, which takes additional time.

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input. It is a required input for this sub-VI because this sub-VI is only operable with software version 6v0 and greater.



Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

Previous Setpoint is a required input, and should contain the previously written setpoint. This input exists to avoid burning out the EEPROM with excessive writes (writing multiple times per second for long durations). If the setpoint needs to be altered several times per second and the unit will be running for extended periods of time, please use the *Write Power-up Settings* sub-VI to disable saving serial/local setpoints to the EEPROM (the last saved value will be left in memory and will be used upon power cycling the unit). If the previous setpoint and the new setpoint match, the sub-VI will skip executing any code.

Setpoint is a required input and reflects the setpoint (in the units of the currently selected control variable) that will be written to the device.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

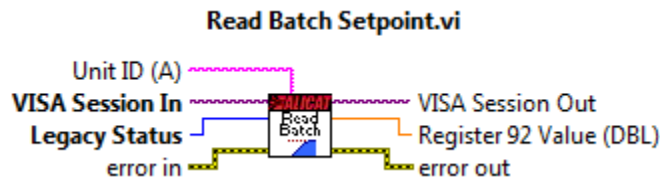
Controller Info out is the controller info cluster. If nothing is wired to the Controller Info input, this sub-VI will get the controller info from the *Read Controller Info* sub-VI and pass it through to this output terminal. If a Controller Info cluster is wired to the input, this output terminal will pass that cluster through with no changes.

Data frame returned is the raw data string received from the Alicat device.

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

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## Read Batch Setpoint



Reads the value of the register containing the batch setpoint value in the Alicat device. ONLY AVAILABLE FOR R22 BOARDS (run "Legacy Detector" to determine board revision). Does nothing if the device is not a controller with the totalizer activated and a firmware version greater than 4v33 (run "Batch detect" to determine whether a unit has batching available).

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Legacy Status is a required input, and is output from the *Legacy Detector* sub-VI. The batch setpoint register does not exist for circuit boards older than revision 22 (“Black board”).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

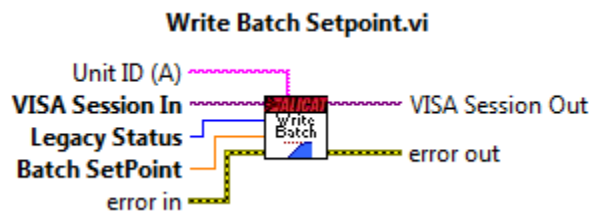
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

Register

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

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Write Batch Setpoint



Writes a batch setpoint into an Alicat device. ONLY AVAILABLE FOR R22 BOARDS AND ABOVE (run "Legacy Detector.vi" to determine board revision), provided that the unit is a controller with totalizer functionality and a firmware version of at least 4v33.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

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

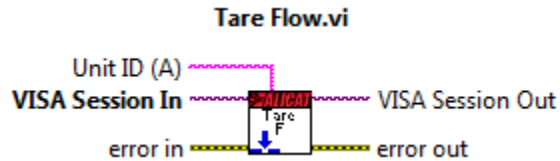
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## Tare Functions

These sub-VI's are used for performing various tares on an Alicat device.

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### Tare Flow



Performs a flow tare of an Alicat device.

#### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

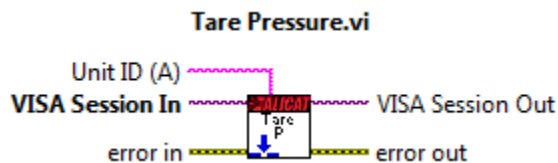
#### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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### Tare Pressure



Performs a pressure tare of an Alicat device. Not applicable to absolute pressure units; this can be accomplished using the "Tare AP Sensor with Internal Barometer" VI (if supported by the hardware and firmware).

#### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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Tare AP Sensor with Internal Barometer

**Tare AP Sensor with Internal Barometer.vi**



Performs a tare of the absolute pressure sensor of a mass flow or absolute pressure Alicat device using the internal barometer chip. To work, the Alicat must have firmware revision 6v0 or higher and an on-board barometer chip.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

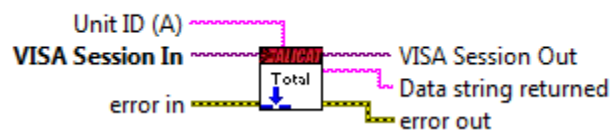
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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Reset Totalizer

**Reset Totalizer.vi**



Performs a reset of the totalizer.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

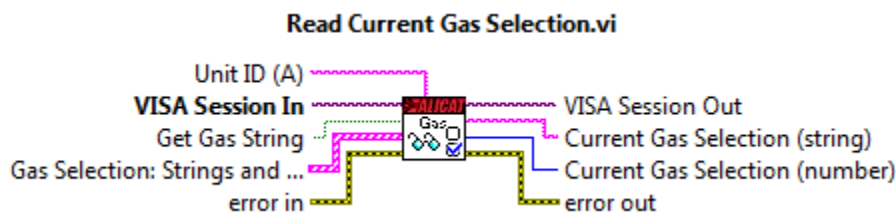
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## Gas Selection

These sub-VI's are used to read and manipulate the gas list and currently selected gas on an Alicat mass flow device. They also contain the COMPOSER mix creation and deletion functions.

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### Read Current Gas Selection



Reads the currently selected gas number and gas name string (if enabled using the boolean). If the gas name string output is enabled, the "Gas Selection: Strings and Values" control needs to be wired (this is obtained using the "Read Gas List" sub-VI).

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Get Gas String is an optional input, defaulting to False. If true, then the sub-VI will return both the number associated with the current gas as well as the string name. This requires the "Gas Selection: Strings and Values" terminal to be properly wired, which can be obtained from the *Read Gas List* sub-VI.

Gas Selection: Strings and Values is an optional input. The strings and values used to decipher the specific gas names and indices from the connected Alicat can be obtained by calling the *Read Gas List* sub-VI. This input is only needed if the value wired into the “Get Gas String” terminal is True.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

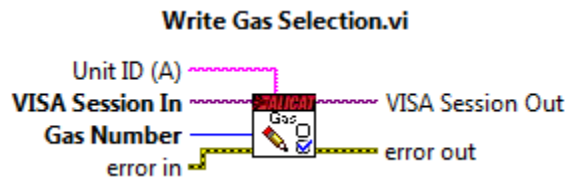
Current Gas Selection (String) returns the string name associated with the currently selected gas, based on the Alicat’s internal gas list. If the value wired to the “Get Gas String” terminal is false, then this will return an empty string.

Current Gas Selection (Number) returns the number associated with the currently selected gas, based on the Alicat’s internal gas list.

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

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Write Gas Selection



Writes the specified gas number into an Alicat as the currently selected gas.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Gas Number is a required input, specifying the ID number of the gas that you would like for the Alicat to change to. These gas numbers can relate to different gases on different Alicats, based on options specified during specification/purchase.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

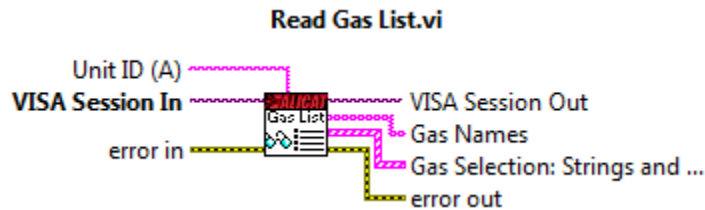
**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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## Read Gas List



Outputs an array of gas names and numbers (paired for use with an arbitrary gas list, including custom mixes). The output "Gas Selection: Strings and Values" can be used with the "Strings and Values" property of a write property node linked to a ring control on the front panel to provide a ring control populated with the gas names.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

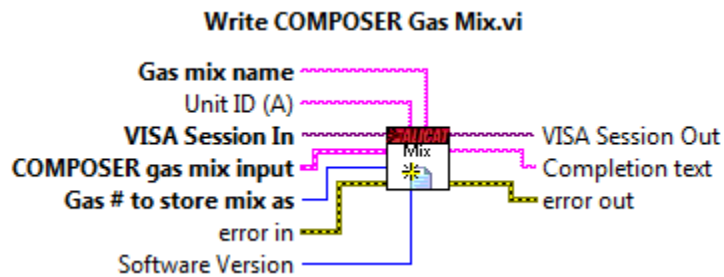
Gas Names is a 1D array of the gas name strings. The order in the array corresponds to the order that they appear in the Alicat, but the indices do not necessarily correspond to the gas numbers in the Alicat since some blocks of numbers are either reserved or blank. For the associated gas numbers, please see the output of the "Gas Selection: Strings and Values".

Gas Selection: Strings and Values is an output containing a 1D array of clusters, which contain the paired string names and gas numbers of all selectable gases in the Alicat device. This output can also be fed into the "Strings and Values" property of a write property node linked to a ring control on the front panel to provide a ring control populated with the gas names.

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

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## Write COMPOSER Gas Mix



Writes a new COMPOSER gas mix with the specified gas concentrations, gas name (up to 6 characters), and gas number (236-255).

This can be used to update a currently selected COMPOSER gas mix in real time.

### Inputs:

Gas mix name is a required input that specifies the name that will be associated with the new COMPOSER gas mixture that is to be created. This name should be 6 characters or less.

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Composer gas mix input is a required input that specifies the gas numbers and mixture percentages of the COMPOSER gas mix that is being created. These percentages must add up to 100%, and the gas numbers are required to be gases that the Alicat device has in its internal gas table (other COMPOSER gas mixes are also valid gas numbers to use for the mix constituents).

Gas # to store mix as is a required input and represents the gas number that the Alicat will use to store the new mixture as. Valid numbers here are 236-255.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

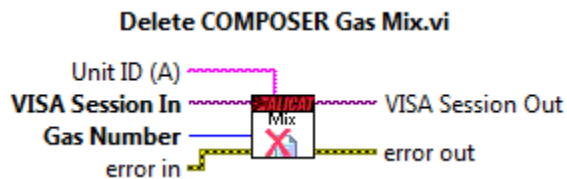
Completion text is a string output that relates any errors encountered in the COMPOSER creation procedure back to the user.



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

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### Delete COMPOSER Gas Mix



Deletes a custom COMPOSER gas mix based on the specified gas number. Valid gas numbers for COMPOSER gases are 236-255.

#### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Gas Number is a required input, referencing the Alicat gas table index number of the COMPOSER mix you wish to delete. Valid values here are 236-255, since these are the only numbers that can be associated with COMPOSER mixtures. This deletion is permanent.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

#### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

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

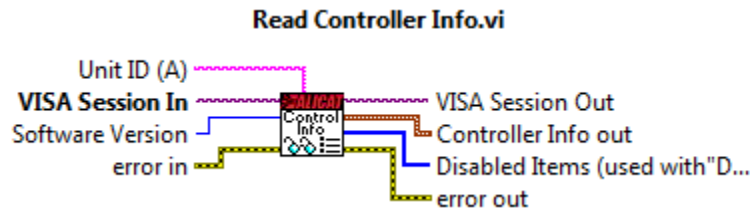
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### Control Options

These sub-VI’s allow for the user to read and adjust various control settings of their Alicat device. Please note: some of the following adjustments can negatively impact the performance of the connected Alicat controller.

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## Read Controller Info



Reads multiple registers to determine the Alicat controller settings required to run the "Write Setpoint" VI. Outputs the currently selected control variable, its full scale, and whether the full scale is inverted, normal, or bi-directional.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

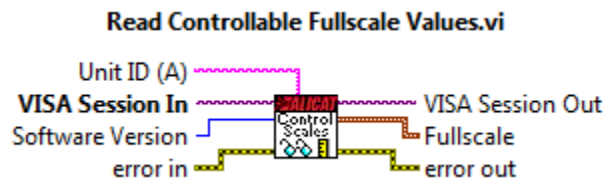
Controller Info Out is a cluster containing the controller's full scale control value, what controller variable it is controlling on, and whether it has a special control range (inverted full scale such as 0 to -100 SCCM or bi-directional such as -100 to +100 SCCM).

Disabled Items is contains a 1D array that specifies which control variables should be greyed out and correspond to the mass flow, volumetric flow, absolute pressure, gauge pressure, and differential pressure. This is used in the example VI to grey out and disable certain options based on the Alicat's configuration.

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

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## Read Controllable Fullscale Values



Retrieves fullscale value from device for all controllable measurement types.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. “5” for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

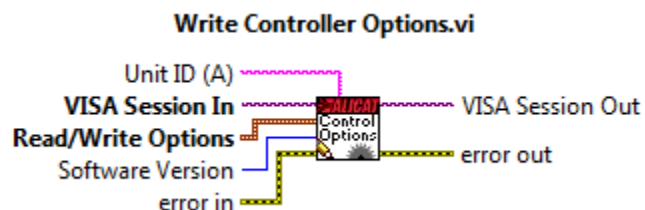
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

Fullscale contains a cluster of 4 elements, providing the full scale ranges of the absolute pressure, gauge/differential pressure, volumetric flow, and mass flow.

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

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## Write Controller Options



Writes the controller options to a connected Alicat: Selected control variable, setpoint source, and auto tare on/off. These options can be read from the device using the *Read Output Definitions and Controller Options* Sub-VI located in the Settings folder/category.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Read/Write Options contains the changeable settings for the control variable being used, the setpoint source (note: in software revisions 6v0 and higher, there is no difference between local and serial setpoint sources, as both are usable regardless of which is selected – analog still locks the setpoint input to the analog signal), and whether the auto-tare functionality is enabled or disabled.

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. “5” for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

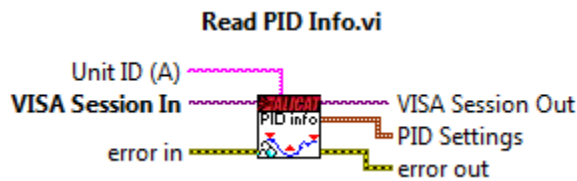
### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

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

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### Read PID Info



Returns the PID control algorithm settings: P gain, I gain, D gain, PID loop type, valve offset, and whether the device is a single vale unit or a dual valve unit.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

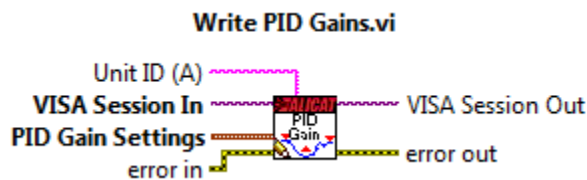
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

PID Settings is a cluster containing the PID gains and related settings. The "Valve Amount" setting contains the logic for the Alicat to know whether it needs to control twin valves for positive and negative gas/fluid displacement. PID type can be altered between PDF and PD2I. PDF uses only the P gain and D gains, while PD2I makes use of Alicat's proprietary PD<sup>2</sup>I control algorithm that uses P gain, D gain, and I gain. Valve offset is the valve drive value that the controller jumps to when coming off of a zero setpoint, and essentially represents the valve drive percentage required to overcome the static forces holding the de-powered valve from leaking through.

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

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Write PID Gains



Writes the P, I, and D gains to an Alicat controller.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

PID Gain Settings is a required input that allows writing adjustments to the P, I, and D gains used by the Alicat's internal control algorithm. Please contact Alicat if you need assistance or would like to retrieve the gain values that the device was initially sent out with.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

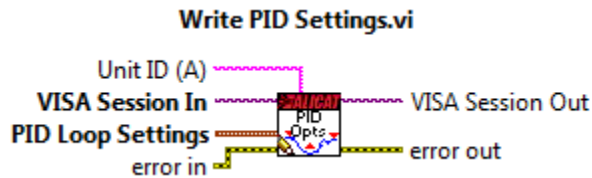
**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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## Write PID settings



Writes the PID loop type and the valve offset options to the connected Alicat device. PID loop type is default PDF for single valve units and can only be PD2I if using a dual valve unit. The valve offset effects the initial kick to the valve to begin flowing from a hard zero (contact Alicat for default values if not functioning properly: (520) 290-6060 or [info@alicat.com](mailto:info@alicat.com)).

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

PID Loop Settings is a required input containing the valve offset and PID loop type used by the Alicat controller. Altering these can drastically impact the operation of the Alicat controller.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

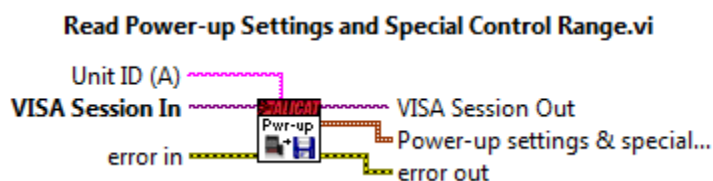
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## Settings

These sub-VI's contain various settings that can be tweaked to make the Alicat more customized to the specific application being run.

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## Read Power-up Settings and Special Control Range



Queries the Alicat Scientific device for power-up options related to retention of setting changes, front panel display and buttons, valve zeroing, taring, and controller range.

IF WRITING MULTIPLE SETPOINTS PER SECOND: DISABLE SAVING SERIAL/LOCAL SETPOINTS TO PREVENT BURNING OUT THE EEPROM OF THE ALICAT DEVICE (using the *Write Power-up Settings* sub-VI).

**Inputs:**

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI’s.

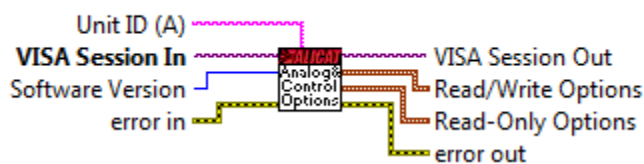
Power-up settings & Special Control Options contains the information regarding the Alicat’s settings that are retained upon power cycling (the serial/local setpoint, last front panel button that was pressed, the initial screen that it boots to, what gas was last selected), as well as whether to perform a tare on power-up (with a delay of up to 25.4 seconds), whether the unit has a bi-directional or inverted control, and lastly whether the device will actively control to a zero setpoint or simply cut all power to the valve when the setpoint drops to zero.

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

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Read Output Definitions and Controller Options

**Read Output Definitions and Controller Options.vi**



Returns the controller options from the internal configuration registers of an Alicat: selected controller variable, setpoint source, auto tare status, analog setpoint input requirement, variables and voltages of the analog outputs, and whether the control logic is set up for normal or inverse control (labeled pressure or vacuum, respectively due to their common applications).

**Inputs:**

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

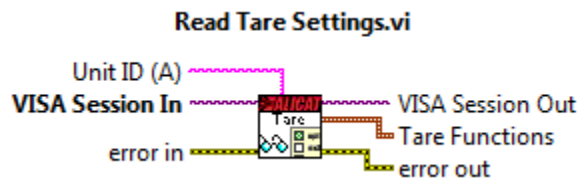
Read/Write Options is a cluster containing the currently selected control variable, setpoint source and Auto tare settings, in the same format as the cluster input to the *Write Controller Options* sub-VI is expecting.

Read-Only Options is a cluster containing the device's information regarding the analog inputs and outputs, as well as whether the device is set up for forward or back-pressure control (inverting the control logic).

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

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### Read Tare Settings



Returns the tare settings of an Alicat device: Which variable the display tare button is for, Which variable the remote tare pin is associated with, and the auto tare delay upon power up (0 indicates no tare upon power up).

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**



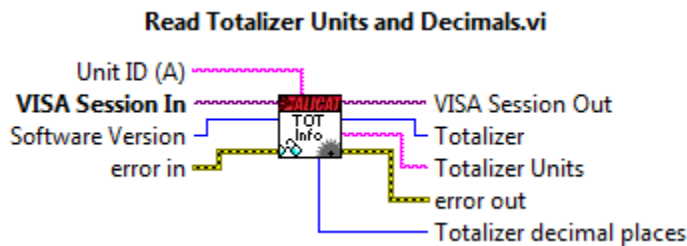
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Tare Functions is a cluster containing information regarding what tare function is displayed on the main screen of the Alicat, what tare function will be used if the analog input pin is grounded on a meter, and whether the device is set up to automatically tare itself after X seconds when it powers up.

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

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## Read Totalizer Units and Decimals



Returns the variable of the totalizer (if applicable), the totalizer units (as a string), and the number of decimals of the totalizer data.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Totalizer indicates what variable the Alicat mass flow device is totalizing (mass flow or volumetric flow).

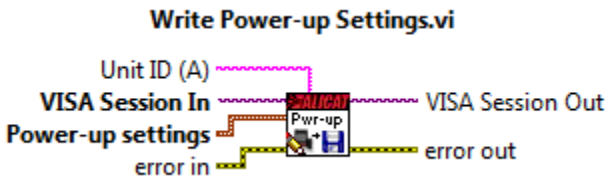
Totalizer units is a string that contains the units of measure for the totalizer (can be different from the units of measure of the instantaneous readings).

Totalizer decimal places indicates how many digits come after the decimal on the totalizer output.

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

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### Write Power-up Settings



Writes the options for the saving of serial/local setpoints, the initial screen option, and the selected gas to the EEPROM of an Alicat device.

IF WRITING MULTIPLE SETPOINTS PER SECOND: DISABLE SAVING SERIAL/LOCAL SETPOINTS TO PREVENT BURNING OUT THE EEPROM OF THE ALICAT DEVICE.

#### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Power-up settings is a required input containing the settings for what the Alicat remembers after a power cycle. This allows changes to three of the values output from the *Read Power-up Settings and Special Control Options* sub-VI. The write command for the power-up tare option can be found in the *Write Tare Settings* sub-VI, as it was grouped by functionality.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

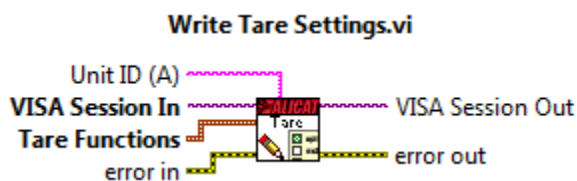
#### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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### Write Tare Settings



Writes the tare options to an Alicat device: variable associated with the front panel tare button, variable associated with the remote tare pin (only applicable for meters), and the auto tare delay upon power up (a 0 indicates that no tare is performed on power up).

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Tare Functions is a required input that allows the user to alter what tare functionality is linked to the display and the remote tare pin, as well as whether to automatically tare upon power-up.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

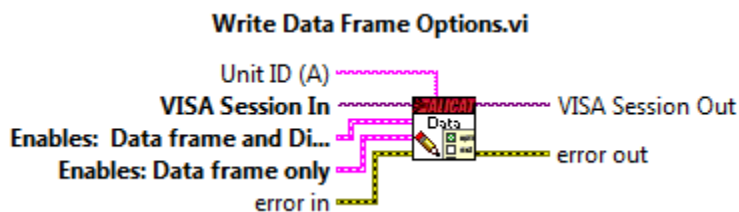
### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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## Write Data Frame Options



Writes new options into an Alicat device to modify the data frame output. This can be used to pare down an Alicat's data frame to increase the serial data speed.

NOTE: for reading the data frame options, the *Read Measurement Format* sub-VI can be used.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Enables: Data frame and Display is a required input that allows the user to alter what variables are shown on the data frame AND the front panel display. Disabling these will increase the speed of communication by eliminating unnecessary data to transfer at the expense of also disabling the variables from being monitored on the Alicat's front panel display.

Enables: Data frame only is a required input that allows the user to alter whether specific serial-only data is sent. This has no impact on the data displayed on the Alicat's front panel.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

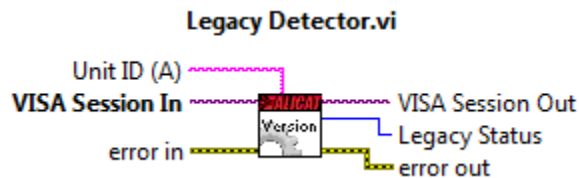
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### Device Information

These sub-VI's request data from the Alicat that can then be provided to the user or the software to help identify the device (which allows the software to determine what functions are valid).

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### Legacy Detector



Returns the revision of the circuit board that the Alicat contains. This is used to determine whether certain features and functions are available using other Alicat sub-VI's.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

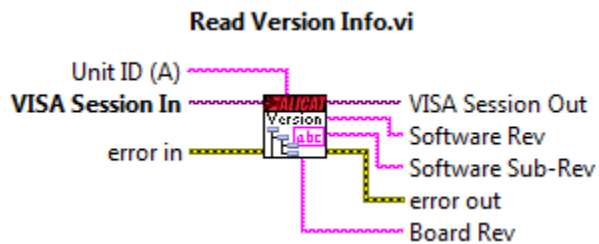
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Legacy Status is an output that tells whether the connected device contains a revision 21, 22, or 23 main circuit board. This information is used by the batch setpoint sub-VI's.

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

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## Read Version Info



Reads the version info of the Alicat device. Returned values are the firmware/software version and sub-version, as well as the circuit board revision (if stored on the device). If the query is not supported (the device is too old), the returned values will be 1 for the software revision and 0 for the others.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Software Rev contains a string that indicates the main revision of the software loaded onto the Alicat device. For a version string of 6v21.1-R22, this will output "6".

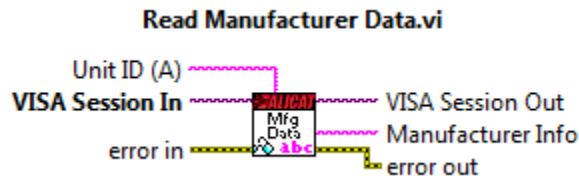
Software Sub-Rev contains a string that indicates the sub revision of the software loaded onto the Alicat device. For a version string of 6v21.1-R22, this will output "21.1".

Board Rev contains a string that indicates the revision of the circuit board inside of the Alicat device. For a version string of 6v21.1-R22, this will output "R22".

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

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## Read Manufacturer Data



Reads the manufacturing data from the specified Alicat device.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

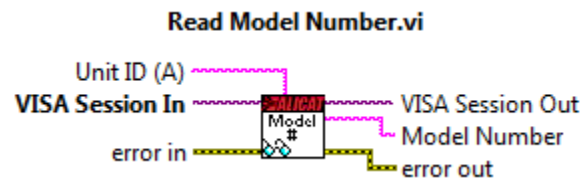
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Manufacturer Info contains the multi-line information stored on each Alicat, including the company contact info, model number (can be approximate if heavily customized), manufacture date, calibration date & technician, and software version.

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

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## Read Model Number



Reads the model number of the device from the stored manufacturer's data query.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

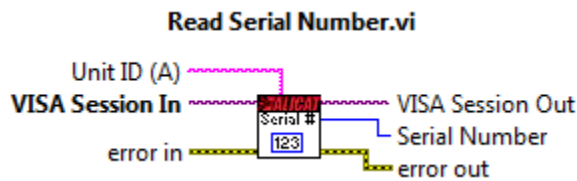
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Model Number contains only the model number from the manufacturing data query above. This model may not be exactly correct if the device was heavily customized at the time of order.

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

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Read Serial Number



Returns the serial number of the queried Alicat device.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

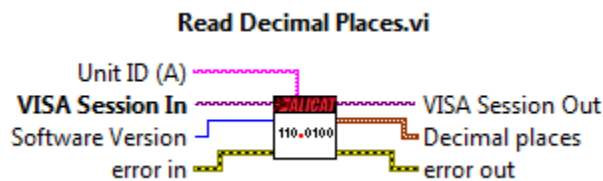
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Serial Number contains the serial number of the connected Alicat device.

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

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Read Decimal Places



Reads the decimal places of the pressure and flow rate variables.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Decimal Places is a cluster containing the number of decimal places for each serial output variable. This is called from within other sub-VI's.

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

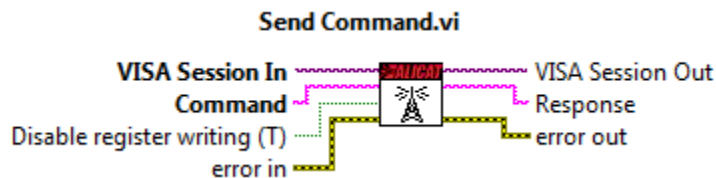
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## Utilities

These sub-VI's act as lower level tools that can be used in a program to perform a wide variety of adjustments to the Alicat.

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### Send Command



Sends the specified text command to an Alicat device. Register writes are disabled by default, but can be enabled by wiring a false constant to the "Disable register writing" terminal. Returns Alicat response as a string (unedited).

### Inputs:

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



Command is the exact string command that will be sent out on the serial connection (does not automatically include the unit ID).

Disable register writing (T) will prevent any command that contains a “W” character for its second letter, preventing registers from being written accidentally. Wiring a false wire to this input will enable register write commands.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

#### Outputs:

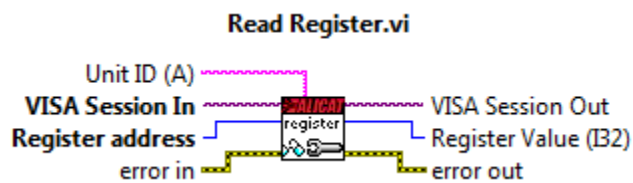
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Response is the exact string response that the Alicat outputs. If the response would be a multiple-line response, this will only return the first line.

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

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### Read Register



Reads the value of the specified register of an Alicat device.

#### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Register Address is a required input and should contain the configuration register that is to be read out from the Alicat.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

#### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Register Value (I32) is the returned integer stored in the Alicat's specified configuration register.

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

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## Write Register



Writes the specified integer value into the desired configuration register of an Alicat device.

NOTE: Not all of the registers allow writing of new values. Some are read-only. Please contact Alicat if you have any questions.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

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

Register Address is a required input and should contain the Alicat configuration register that is to be written to.

Register Value is a required input and should contain the Value that is to be written to the specified Alicat configuration register.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

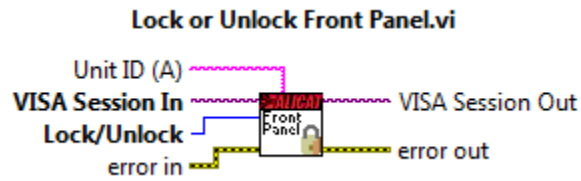
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Register Written Successfully returns a True value if the Alicat's response matches the “Register Value” input, and a False value otherwise.

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

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## Lock or Unlock Front Panel



Locks or unlocks the front panel. A locked Alicat front panel will not allow users to make any changes using the push button menu.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Lock/Unlock is a required input that tells the VI whether the selected device should be locked or unlocked.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

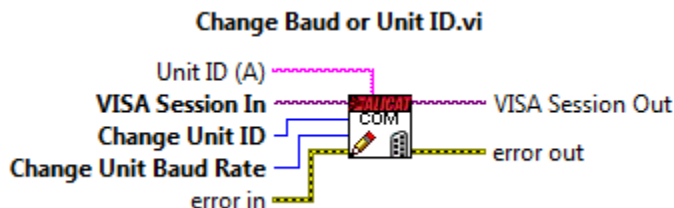
### Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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## Change Baud or Unit ID



Changes the baud rate or the unit ID of an Alicat device.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Change Unit ID is a required ring input whose values correspond to the value parts of register 17 that are responsible for the unit ID associated with a given Alicat device.

Change Unit Baud Rate is a required Enum input whose values correspond to the value parts of register 17 that are responsible for the baud rate associated with a given Alicat device.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

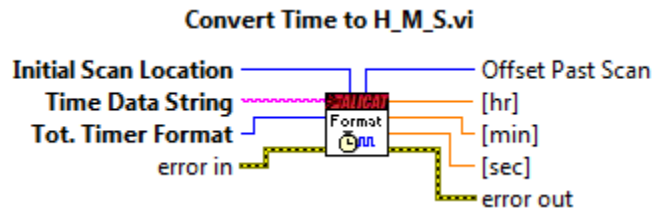
**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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Convert Time to H\_M\_S



Converts the Totalizer Timer data string into H:M:S doubles based on the time string format. A timer format of 2 is used if the Totalizer Timer is already outputting data in the H:M:S format.

If unsure of the format your Alicat uses, the output of the *Read Measurement Format* sub-VI will output the timer format for use with this sub-VI.

**Inputs:**

Initial Scan Location is a required input that provides this sub-VI information on where to start looking for the time data.

Time Data String is a required input and should be a string that contains the time data (generally a data frame).

Tot. Timer Format is a required input that indicates what format the totalizer timer info is presented in. This is a default of "2" for older devices, but can be user-adjusted in newer devices. The specific totalizer timer format of the connected device can be read off using the *Read Measurement Format* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

[hr] is the number of hours.

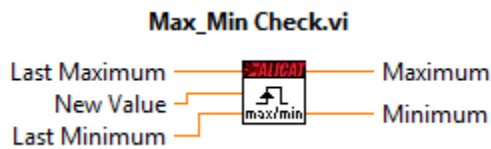
[min] is the number of minutes.

[sec] is the number of seconds.

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

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### Max\_Min Check



Compares new data value with the previous maximum and minimum values, and outputs the new maximum and minimum values. This sub-VI is called in other VI's.

#### Inputs:

Last Maximum should be wired to the previous maximum value that the new value will be compared against.

New Value should be wired to the new value that needs to be compared to the old values.

Last Minimum should be wired to the previous minimum value that the new value will be compared against.

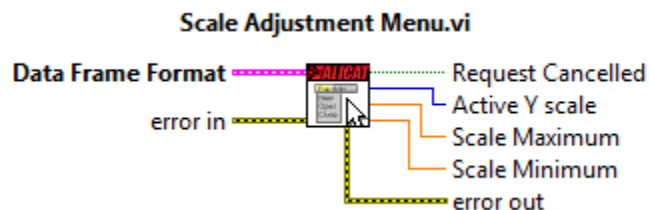
#### Outputs:

Maximum is the maximum value between "Last Maximum" and "New Value"

Minimum is the minimum value between "Last Minimum" and "New Value"

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### Scale Adjustment Menu



Adjustment menu for manually setting the chart scales for a desired variable. Used in the "Alicat Full Example" VI.

#### Inputs:

Data Frame Format is a required input that should be obtained from the output of the *Read Measurement Format* sub-VI. This determines what menu options populate in the pop-up menus.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

Request Cancelled is a Boolean that indicates whether the user cancelled the menu selection.

Active Y scale indicates what chart to alter (the numbering is based on the chart in the *Full Example VI*).

Scale Minimum is the new minimum that should be associated with the given active Y scale.

Scale Maximum is the new maximum that should be associated with the given active Y scale.

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

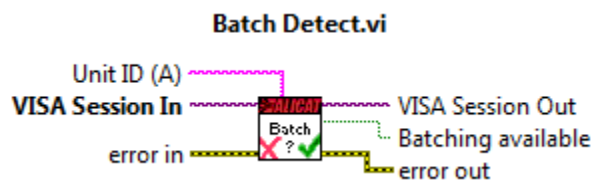
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## Validity Checks

These sub-VI's exist to double check what functions are available and that the desired changes are valid choices (similar to the device information section, but with more emphasis on ensuring that improper commands are not sent to an Alicat device).

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## Batch Detect



Checks whether the Alicat device supports batch setpoints or not.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

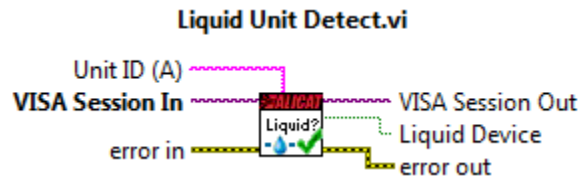
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Batching Available is a Boolean return stating whether the device has the ability to perform batch fill control (must be a flow controller with a totalizer).

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

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## Liquid Unit Detect



Determines if the device connected is a liquid unit.

### Inputs:

Unit ID is an optional input. If left un-wired, the default “A” will be used.

VISA Session In is a required input, and is initially generated from the *COM Port Initialization* 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. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

### Outputs:

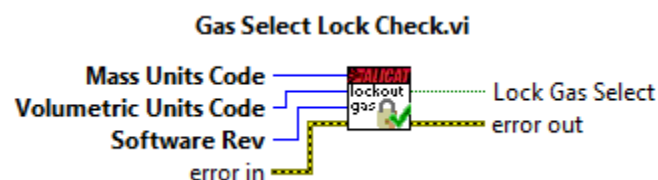
VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

Liquid Device is a Boolean return stating whether the connected Alicat device is a liquid controller/meter, and is used by other VI's to determine what options are valid/present.

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

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## Gas Select Lock Check



Determines if a firmware revision 5 or lower device allows gas selection changes or not. Older devices (firmware revision 5 and lower) made the conversion to true mass flow rate using a constant density factor, and did not allow selectable gases.

### Inputs:

Mass Units Code is a required input that corresponds to the portion of register 45 indicating the mass flow units of measure.

Volumetric Units Code is a required input that corresponds to the portion of register 45 indicating the volumetric flow units of measure.



Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

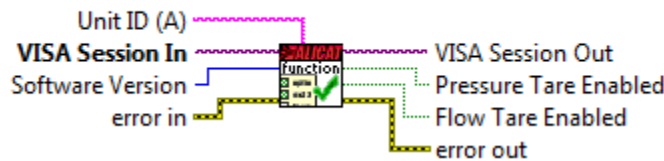
Lock Gas Select is a Boolean return stating whether the connected device should have its gas select ability locked out (within the LabVIEW program) due to operating with fixed true mass units of measure.

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

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Flow and Pressure Function Check

**Flow and Pressure Function Check.vi**



Checks to see if pressure tare and flow tare functions are enabled in the devices firmware.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

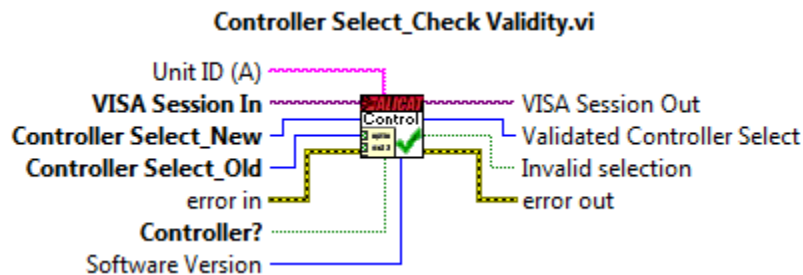
Pressure Tare Enabled is a Boolean return indicating whether a pressure tare is possible on the selected device. This is used elsewhere to disable specific tare controls within a LabVIEW program.

Flow Tare Enabled is a Boolean return indicating whether a flow tare is possible on the selected device. This is used elsewhere to disable specific tare controls within a LabVIEW program.

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

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## Controller Select\_Check Validity



Checks the validity of a control variable selection. It will only return as valid if the variable is supported by the software and the unit is a controller. If using a controller, it will also report a variable selection of "No Controller" as invalid.

If unsupported or not a controller, this sub-VI will output the originally selected control variable as the validated selection.

### Inputs:

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Controller Select\_New is a required input containing the desired new controller variable.

Controller Select\_Old is a required input containing the previously read controller variable.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

Controller? is a Boolean input stating whether the connected device is a controller or not. If not a controller, "No Controller" is the only valid selection.

Software Version is an unsigned 8 bit integer representing the main software revision number of the connected Alicat device (e.g. "5" for a device that has software version 5v12). If left un-wired, this sub-VI will execute the *Read Software Version* sub-VI before executing the rest of its code, taking more time. For fastest execution, read the Software Version before the main code loop and wire the result to this input.

## Outputs:

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

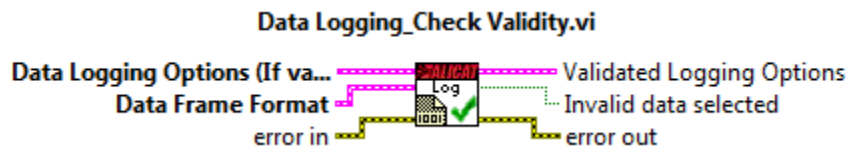
Validated Controller Select is a return containing the validated controller variable option. If the desired new control variable is a valid option then it will return this, otherwise it will return either the previous control variable selection or "No controller".

Invalid selection is a Boolean return that indicates whether or not the new selection was altered due to incompatibilities. If True, then the new selection does not match the validated selection.

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

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## Data Logging\_Check Validity



Check to see if the selected variables to log are present in the Alicat data frame. If invalid data logging options are present, this sub-VI will indicate this with a Boolean output, while also outputting the data logging options that are valid with the given Alicat data frame variables.

## Inputs:

Data Logging Options (If valid) is a required input that represents the desired data logging options.

Data Frame Format is a required input that should be obtained from executing the *Read Measurement Format* sub-VI, and is used to validate whether the desired data logging options are possible (it can only log data for the data variables that are actually present).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

## Outputs:

Validated Logging Options is an output cluster that contains only the parts of the input desired data logging options that are valid.

Invalid data selected is a Boolean return that indicates whether the data options that were input were invalid and needed to be changed.

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

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## Data Logging

These sub-VI's handle generating comma delimited text that can be written into a .CSV or .TXT file, as well as generating and uploading a register log of all the current values stored in an Alicat device.

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### Data Logging\_Generate Header

#### Data Logging\_Generate 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.

#### Inputs:

Data Logging Options is a required input that represents the desired data logging options. This can be validated using the *Data Logging\_Check Validity* sub-VI to ensure that the data being logged matches what is expected.

Units of Measure Input is a cluster containing the units of measure strings for each variable. This should be obtained using the *Read Measurement Units* sub-VI. If a False value is wired to the "Include Units in Header" terminal, then this terminal can be left blank as it will be unused.

Include Units in Header (F) is a Boolean input that determines whether or not to append the units of measure for each selected variable to the data log header.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

#### Outputs:

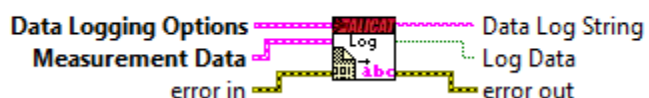
Data Log Header is a comma delimited data string containing the data column headers.

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

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### Data Logging\_Generate Data String

#### Data Logging\_Generate Data String.vi



Generates a comma delimited string from the data based on the logging options selected. This is for use with LabVIEW's "Write to Text File" sub-VI to make data logging easier.

**Inputs:**

Data Logging Options is a required input that represents the desired data logging options. This can be validated using the *Data Logging\_Check Validity* sub-VI to ensure that the data being logged matches what is expected.

Measurement Data is a required input cluster containing all of the measurement data that is output from the *Read Measurements* or *Parse Data Frame* sub-VI's.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

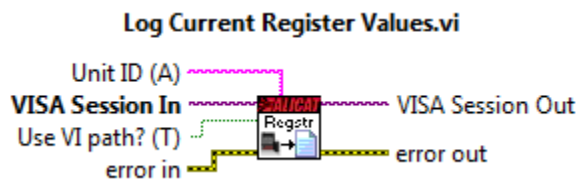
Data Log String is a comma delimited data string containing the variables selected with the "Data Logging Options" input.

Log Data returns the value located in the "Data 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 CSV string to a data file.

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

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### Log Current Register Values



Reads off the value in each configuration/diagnostic register, and stores the values in a text file. Alicat saves a register log of each device before it leaves our facility; please contact us at (520) 290-6060 or by email at [info@alicat.com](mailto:info@alicat.com) if you are in need of this log file.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

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 (T), or if user action is needed to specify a file name and path (F).

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

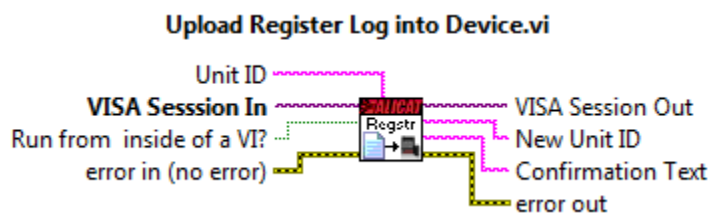
**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

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

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Upload Register Log into Device



Loads a text file log of register numbers and their corresponding values into LabVIEW, and writes all of the values into the corresponding Alicat registers.

**Inputs:**

Unit ID is an optional input. If left un-wired, the default "A" will be used.

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

Run from inside of a VI? Is a Boolean control that tells this VI whether to use the existing COM port connection (T) or to launch a new COM port connection (F). Basically, a false value here allows this to be run as a standalone VI.

Error In is the error cluster input, and should be connected to this VI from the error output of the previously called VI. Many of the Alicat LabVIEW drivers have error cases that skip their serial commands and functions if an error is present.

**Outputs:**

VISA Session Out is the output VISA session reference, and should be wired to the VISA Session In terminals of subsequent Alicat sub-VI's.

New Unit ID indicates the unit ID that the device has after a successful register value upload (since the unit ID information is held within a configuration register).

Confirmation text returns a string that states whether the operation was completed or aborted (which would only occur if it was cancelled by the user or if there was a communication error at the start of the VI's process).

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

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## Example Programs

These VI's serve as examples that can be used as starting points for either creating a new program or adding Alicat functionality to an existing program.

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### Alicat Full Driver Example

This is intended to serve as a very full example containing nearly all of the sub-VI's created. This can be used to view and log data from a single Alicat or to modify configuration settings.

#### Connecting to an Alicat:

The screenshot displays the Alicat software interface with several panels. The 'COM Port Settings' panel is highlighted with a red circle, showing 'A' for Unit ID, '19200' for Baud Rate, and 'COM1' for the COM port. Other panels include 'Setpoint and Batching Controls', 'Manual Tare', 'Data Frame Enables', 'Controller Options and Analog Signal Information', 'Data Logging Options', 'VI Timing Options', 'Register Values', and 'COMPOSER gas mix input'. The 'COMPOSER gas mix input' panel shows five gas mixers, each with a 'Mix #' and 'Mix %' field, and a 'Create Mix' button. The 'Alicat Scientific' logo is visible in the bottom right corner.

To connect to an Alicat, simply select the appropriate COM port that the Alicat is connected to and ensure that the Unit ID and Baud rate controls are set to match the values on the Alicat that you would like to talk to. The example VI will continually try opening the COM port and querying for a connected Alicat; if no Alicat 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 Alicat is established, the program will query the current device settings and use these to populate the VI's controls, disabling controls that are not valid with the connected Alicat. Any white text/number/check box is a control that can be adjusted, and any grey text/number box is an indicator that is read-only. During the initialization phase, a text box will appear to indicate that the connection is established and that the VI is populating with the device information.

**Warning:**

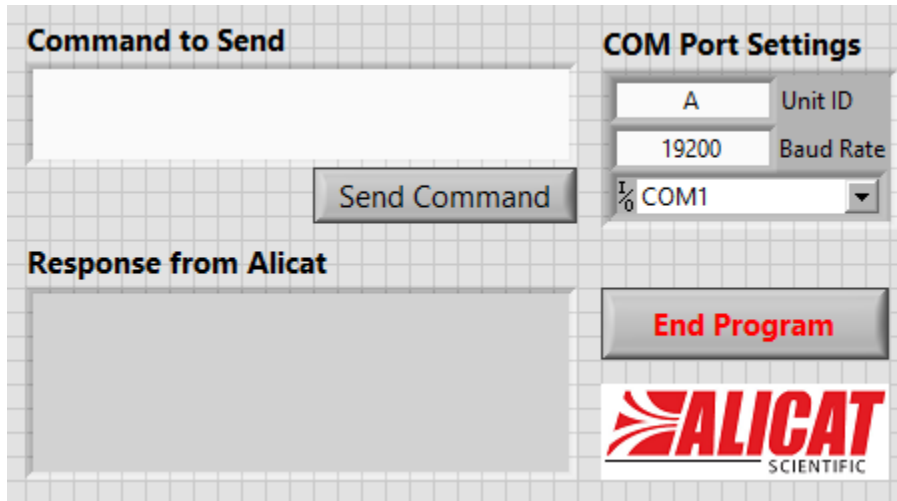
This program initializes all of the controls to the values currently in the Alicat, which helps prevent unwanted adjustments from occurring. The control clusters that are grouped write all options into the Alicat when changed. **DO NOT** restore all values to their default status using Edit -> “Reinitialize Values to Default, as this can cause unwanted values to be written to the device.

**Possible issues:**

If the VI example message stating that the VI is populating with the device’s current values (pops up once the connection is established and goes away when the initialization is complete) pops up and does not go away or pops up repeatedly, then there is something causing an error to flag from one of the Alicat sub-VI’s. Generally, this is an issue like a wiring issue where a non-connected ground pin is causing an intermittent drop in communications. If you receive this message constantly or repeatedly and have checked your wiring thoroughly, then the next possible issue may be due to an incompatibility with VERY old Alicat devices (the earliest device that was tested was from 2006, so older ones may have potentially unknown conflicts with the sub-VI’s that are called in this example program). If the issue persists, please contact Alicat at [info@alicat.com](mailto:info@alicat.com) or (520) 290-6060 for support.

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Alicat Simple Terminal Interface



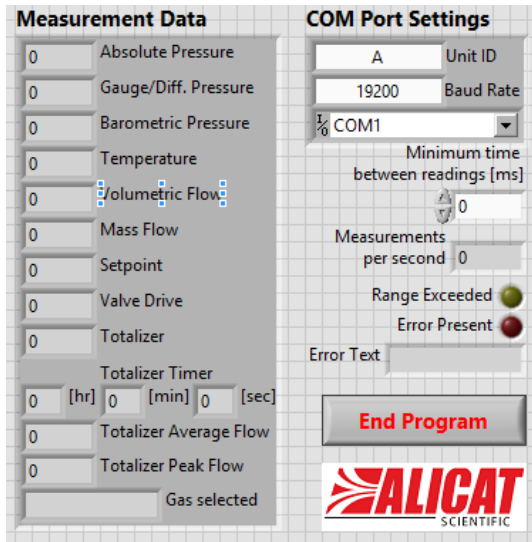
This is a VI example that acts like a terminal program (such as HyperTerminal). Any device command can be sent to the Alicat by typing it into the text box and clicking the “Send Command” button. The response received will be displayed in the indicator box below. There is no parsing performed on any of the received data.

The COM port settings MUST be set prior to running the VI for a connection to be established (there are no automated connecting attempts, and the COM port is opened with the given settings at the start of the VI)

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## Alicat Simplified Driver Example



This is a simplified version of an example program that only contains the measurement data that is read out from an Alicat device. By adjusting the minimum time between readings, a delay between successive reads can be added (utilizing the LabVIEW “Wait” sub-VI; if the minimum time is set to a value lower than the lowest value achievable with the current settings (limited by the data rate and the number of characters sent in each data frame), this will have no effect.

This is intended to be used as a starting point for creating a new program or for integrating an Alicat into an existing LabVIEW program.

The COM port settings MUST be set prior to running the VI for a connection to be established (there are no automated connecting attempts, and the COM port is opened with the given settings at the start of the VI)

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## Alicat Simplified Driver Example\_Logging

Data Logging Options (If valid)	Measurement Data	COM Port Settings
<input checked="" type="checkbox"/> Absolute Press. <input type="checkbox"/> Valve Drive <input checked="" type="checkbox"/> Gauge/Diff. Press. <input checked="" type="checkbox"/> Totalizer <input checked="" type="checkbox"/> Barometric Press. <input type="checkbox"/> Tot. Timer [s] <input checked="" type="checkbox"/> Temperature <input type="checkbox"/> Tot. Avg. Flow <input checked="" type="checkbox"/> Volumetric <input type="checkbox"/> Tot. Peak Flow <input checked="" type="checkbox"/> Mass Flow <input checked="" type="checkbox"/> Gas Selected <input checked="" type="checkbox"/> Setpoint	0 Absolute Pressure 0 Gauge/Diff. Pressure 0 Barometric Pressure 0 Temperature 0 Volumetric Flow 0 Mass Flow 0 Setpoint 0 Valve Drive 0 Totalizer Totalizer Timer 0 [hr] 0 [min] 0 [sec] 0 Totalizer Average Flow 0 Totalizer Peak Flow Gas selected	A Unit ID 19200 Baud Rate COM1 Range Exceeded Error Present Error Text End Program 
Minimum time between readings [ms] 0 Elapsed Time [ms] 0 Measurements per second 0		

This version of the simplified drivers is the same as the “Simplified Driver Example,” except for the fact that it has an added segment of code that logs the desired data into a file each time the data is received.

Again, this requires the COM port settings to be adjusted prior to running the VI and is primarily intended for use as a starting point for a new program or as an example for how to add Alicat functionality into an existing program.

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## Alicat Simplified Driver Example\_Setpoint

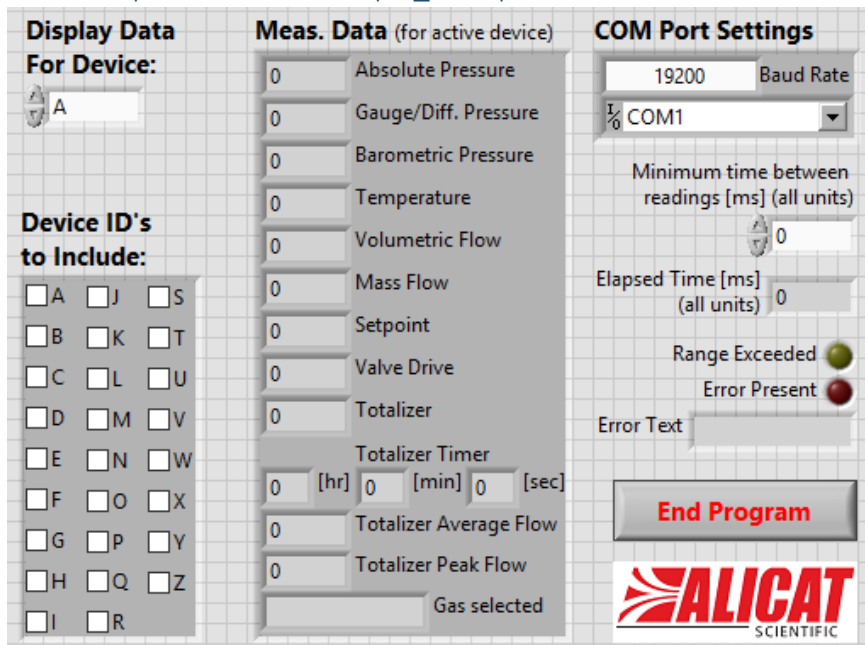
Setpoint	Measurement Data	COM Port Settings
0.000 Serial/Local setpoint should not be saved if setpoint changes more frequently than once per second (to avoid burning out the EPROM memory with excessive writes). Adjust this setting using the "Write Power-up Settings" sub-VI.	0 Absolute Pressure 0 Gauge/Diff. Pressure 0 Barometric Pressure 0 Temperature 0 Volumetric Flow 0 Mass Flow 0 Setpoint 0 Valve Drive 0 Totalizer Totalizer Timer 0 [hr] 0 [min] 0 [sec] 0 Totalizer Average Flow 0 Totalizer Peak Flow Gas selected	A Unit ID 19200 Baud Rate COM1 Min. time between readings [ms] 0 Elapsed Time [ms] 0 Range Exceeded Error Present Error Text End Program 

This version of the simplified drivers is the same as the “Simplified Driver Example,” except for the fact that it has an added segment of code that writes a setpoint to the specified device (if the setpoint has changed).

Again, this requires the COM port settings to be adjusted prior to running the VI and is primarily intended for use as a starting point for a new program or as an example for how to add Alicat functionality into an existing program.

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### Alicat Simplified Driver Example\_Multiple Devices



This version of the simplified drivers is the same as the “Simplified Driver Example,” except for the fact that it has an added segment of code that initializes and queries all selected devices. The data displayed can be selected to be associated with any of the connected Alicat devices by using the “Display data for device:” control. This example shows one easy way to read data from multiple Alicats in quick succession using a for loop that is auto-indexed on an array of device identifiers.

Again, this requires the COM port settings (AND the device ID’s to include) to be adjusted prior to running the VI and is primarily intended for use as a starting point for a new program or as an example for how to add Alicat functionality into an existing program.

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## Alicat Simplified Driver Example Multiple Devices with Setpoint

Active Device	Meas. Data (for active device)	COM Port Settings
A	0 Absolute Pressure	19200 Baud Rate
Setpoint (for device selected) 0.000	0 Gauge/Diff. Pressure	COM1
Device ID's to Include:	0 Barometric Pressure	Minimum time between readings [ms] (all units) 0
<input checked="" type="checkbox"/> A <input type="checkbox"/> J <input type="checkbox"/> S	0 Temperature	Elapsed Time [ms] (all units) 0
<input type="checkbox"/> B <input type="checkbox"/> K <input type="checkbox"/> T	0 Volumetric Flow	Range Exceeded
<input type="checkbox"/> C <input type="checkbox"/> L <input type="checkbox"/> U	0 Mass Flow	Error Present
<input type="checkbox"/> D <input type="checkbox"/> M <input type="checkbox"/> V	0 Setpoint	Error Text
<input type="checkbox"/> E <input type="checkbox"/> N <input type="checkbox"/> W	0 Valve Drive	<b>End Program</b>
<input type="checkbox"/> F <input type="checkbox"/> O <input type="checkbox"/> X	0 Totalizer	
<input type="checkbox"/> G <input type="checkbox"/> P <input type="checkbox"/> Y	Totalizer Timer 0 [hr] 0 [min] 0 [sec]	
<input type="checkbox"/> H <input type="checkbox"/> Q <input type="checkbox"/> Z	0 Totalizer Average Flow	
<input type="checkbox"/> I <input type="checkbox"/> R	0 Totalizer Peak Flow	
	Gas selected	

This version of the simplified drivers is the same as the “Simplified Driver Example\_Multiple Devices,” except for the fact that it has an added segment of code that writes a setpoint to the specified device (if the setpoint has changed).

Again, this requires the COM port settings (AND the device ID's to include) to be adjusted prior to running the VI and is primarily intended for use as a starting point for a new program or as an example for how to add Alicat functionality into an existing program.

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## Alicat Dynamic Data Example

Dynamic Data			COM Port Settings
Data Variable	Dynamic Data	Data Units	
			A Unit ID
			19200 Baud Rate
			COM1
			Minimum time between readings [ms]
			0
			Measurements per second
			0
			This example VI only works with software version 6v0 and above. If using an Alicat with older software, please use the non-dynamic versions of the data collection VI's
			<b>End Program</b>

This is a VI example that is quite similar to the “Alicat Simplified Driver Example” (and also requires the COM port settings to be adjusted before running the VI), except that it will only work for devices with software versions greater than or equal to 6v0. The main difference between this and the “Alicat Simplified Driver Example” is that this VI example makes use of variable data frame output and is compatible with any adjustments that are performed to the Alicat’s data frame. The disadvantage is that the data will be displayed in the order that it is received in the Alicat’s data frame, and not in a consistent fixed format. The advantage is that the output will only have the variables that are present in the Alicat and will automatically adjust if a different Alicat is connected to it.

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## Version 1 Legacy Converters

These sub-VI’s are included in the driver library for users who need to mutate existing code to be compatible with newer Alicat devices. They have the same input and output terminals as version 1 of the Alicat LabVIEW drivers, and are intended to be used as a temporary fix for existing LabVIEW code not operating as intended with version 1 Alicat drivers and new Alicat devices. The best fix for a situation as described above would be to adjust the LabVIEW code to allow the use of the version 2 drivers (especially for the reading/parsing of measurements).

**Care should be taken when using any of these sub-VI’s, as some of them have more limited functionality in what they can output. Specifically the *Version 1\_Read Measurement Format* and *Version 1\_Read Measurements* VI’s, which do not operate with full compatibility when connecting to newer devices. The measurement format availabilities had been increased late in revision 4 of the firmware and further in both revision 5 and revision 6. Without full knowledge of the data frame sent by the device, the *Version 1\_Read Measurements* VI will fail to properly parse the extra data (if included in the data frame).**

Below is a list of Version 1 sub-VI’s that do not have a legacy converter version available in version 2 of the Alicat LabVIEW drivers, as well as the reason why:

*Quick Test Interface* - This can be accomplished with other utilities in the new version.

*Read Communication Settings* - This was superfluous, in order to read the baud rate and unit ID, you needed an established connection to the device, which needs knowledge of the baud rate and unit ID.

*Read Gas List* - Version 2 has the same outputs as version 1 had, no legacy conversion sub-VI required.

*Read Manufacturer Data* - Version 2 has the same outputs as version 1 had, no legacy conversion sub-VI required.

*Reset Totalizer* - Version 2 has same inputs, no outputs. No legacy conversion sub-VI required.

*Send Command* - A slightly more configurable version of this exists in the version 2 VI library, no legacy conversion sub-VI required.

*Tare Flow* - Version 2 has same inputs, no outputs. No legacy conversion sub-VI required.

*Tare Pressure*- Version 2 has same inputs, no outputs. No legacy conversion sub-VI required.

*Write Gas Selection* - Version 2 has the same inputs, no outputs. No legacy conversion sub-VI required.

*Write Register* - A version of this exists in the version 2 VI library that has the same input locations but sports a check to see if the register write was successful, no legacy conversion sub-VI required.

*Write Totalizer Options* - This is to be configured at the time of order.

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