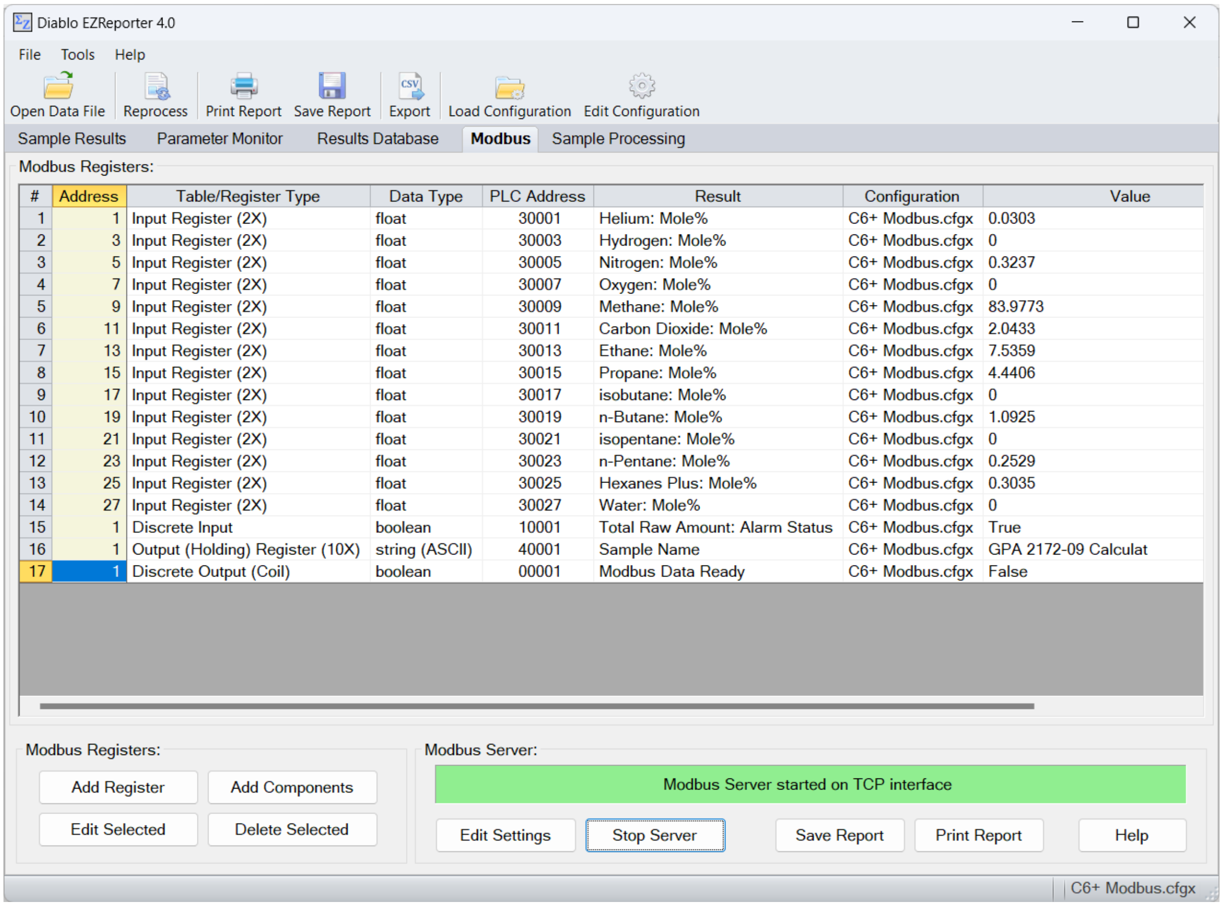
Diablo EZReporter 4.0

Modbus Module



Modbus Registers:

#	Address	Table/Register Type	Data Type	PLC Address	Result	Configuration	Value
1	1	Input Register (2X)	float	30001	Helium: Mole%	C6+ Modbus.cfgx	0.0303
2	3	Input Register (2X)	float	30003	Hydrogen: Mole%	C6+ Modbus.cfgx	0
3	5	Input Register (2X)	float	30005	Nitrogen: Mole%	C6+ Modbus.cfgx	0.3237
4	7	Input Register (2X)	float	30007	Oxygen: Mole%	C6+ Modbus.cfgx	0
5	9	Input Register (2X)	float	30009	Methane: Mole%	C6+ Modbus.cfgx	83.9773
6	11	Input Register (2X)	float	30011	Carbon Dioxide: Mole%	C6+ Modbus.cfgx	2.0433
7	13	Input Register (2X)	float	30013	Ethane: Mole%	C6+ Modbus.cfgx	7.5359
8	15	Input Register (2X)	float	30015	Propane: Mole%	C6+ Modbus.cfgx	4.4406
9	17	Input Register (2X)	float	30017	isobutane: Mole%	C6+ Modbus.cfgx	0
10	19	Input Register (2X)	float	30019	n-Butane: Mole%	C6+ Modbus.cfgx	1.0925
11	21	Input Register (2X)	float	30021	isopentane: Mole%	C6+ Modbus.cfgx	0
12	23	Input Register (2X)	float	30023	n-Pentane: Mole%	C6+ Modbus.cfgx	0.2529
13	25	Input Register (2X)	float	30025	Hexanes Plus: Mole%	C6+ Modbus.cfgx	0.3035
14	27	Input Register (2X)	float	30027	Water: Mole%	C6+ Modbus.cfgx	0
15	1	Discrete Input	boolean	10001	Total Raw Amount: Alarm Status	C6+ Modbus.cfgx	True
16	1	Output (Holding) Register (10X)	string (ASCII)	40001	Sample Name	C6+ Modbus.cfgx	GPA 2172-09 Calculat
17	1	Discrete Output (Coil)	boolean	00001	Modbus Data Ready	C6+ Modbus.cfgx	False

Modbus Server started on TCP interface

Diablo Analytical EZReporter Software

EZReporter Modbus Module Manual

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Manual Revision 20230907-1148

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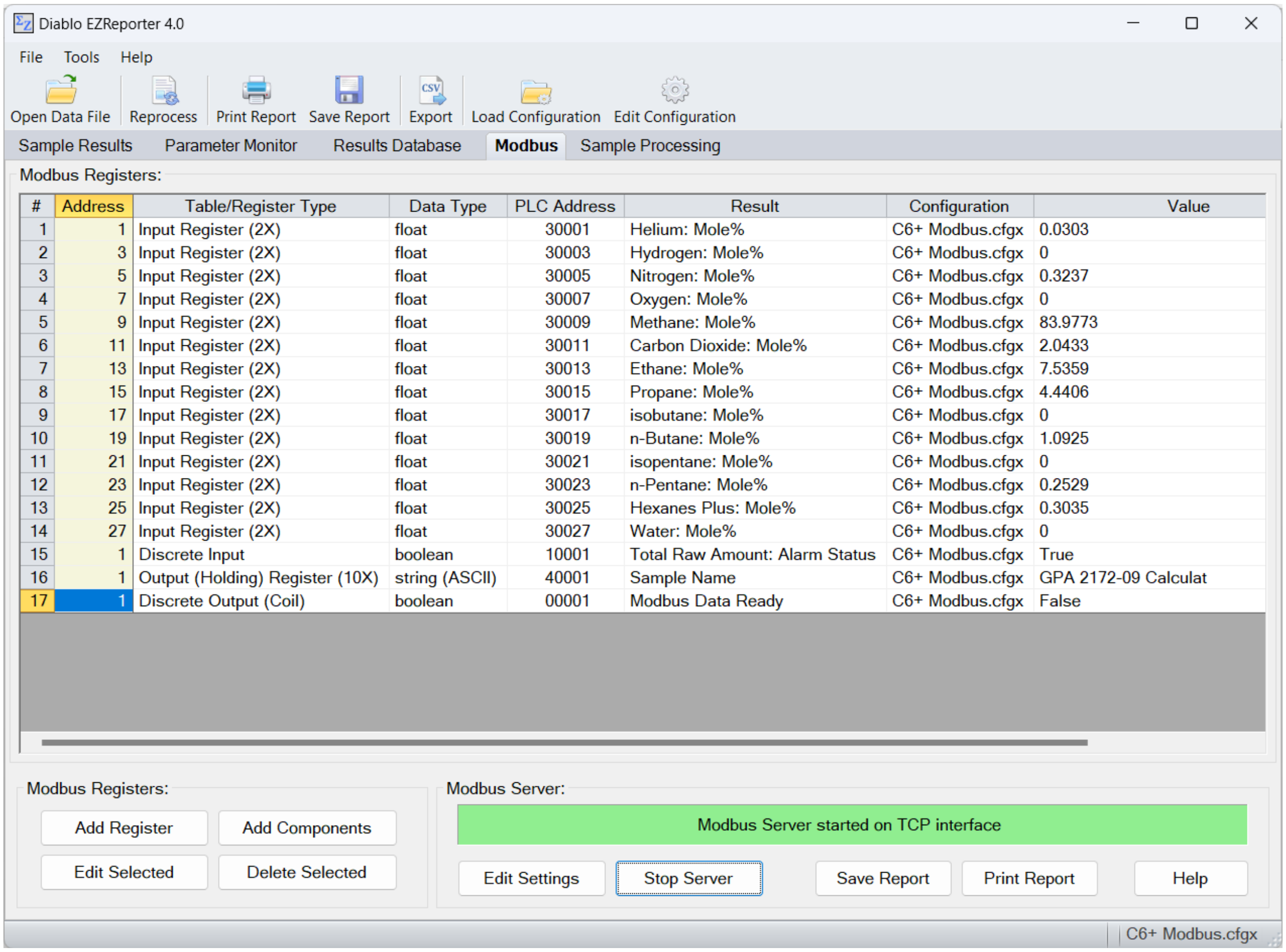
Contents

Introduction

Overview

The EZReporter 4.0 Modbus Module is an optional module that adds Modbus TCP Slave functionality to any of the EZReporter 4.0 editions. Most numeric results that are calculated and reported in the edition of EZReporter you are running can be assigned to a Modbus register for a Modbus Master to read.



#	Address	Table/Register Type	Data Type	PLC Address	Result	Configuration	Value
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17	1	Discrete Output (Coil)	boolean	00001	Modbus Data Ready	C6+ Modbus.cfgx	False

Modbus Server started on TCP interface

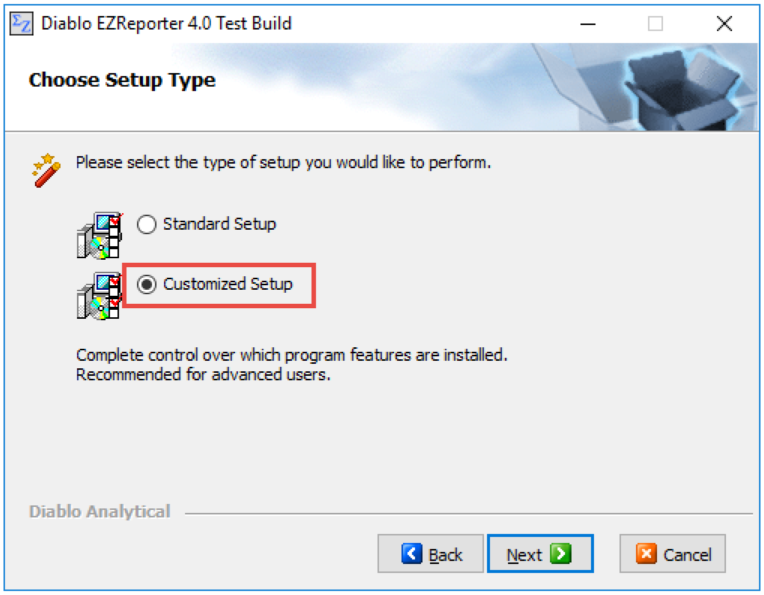
Modbus Module Specifics

The Modbus implementation provided by the EZReporter 4.0 Modbus Module includes the following:

- Implements Modbus TCP only. Modbus via serial communications (RS-232, RS-422, RS-485) is **not** currently supported.
- Supports both Modicon and Enron/Daniel addressing.
- Supports both single-precision Float and Int32 data in addition to standard Discrete/Bit/Boolean and Int16 data. With Modicon register addressing sequential registers are used for Float and Int32 data, and the upper and lower sets of bytes can be swapped.
- String results can be encoded as either UNICODE (UTF16) characters with 1 16-bit character per INT16 register, or as ASCII (UTF8) characters with 2 8-bit characters packed into each INT16 register.
- Most Modbus registers are read only input registers or input discretes. However selected results are defined as Modbus output coils and holding (read/write) output registers.

Installation

Because of the very specialized nature of the Modbus module, it is not installed by default. If you want to enable Modbus functionality, you must select "Customized Setup" during installation, and then check the "Modbus Slave Server" option:



Diablo EZReporter 4.0 Test Build

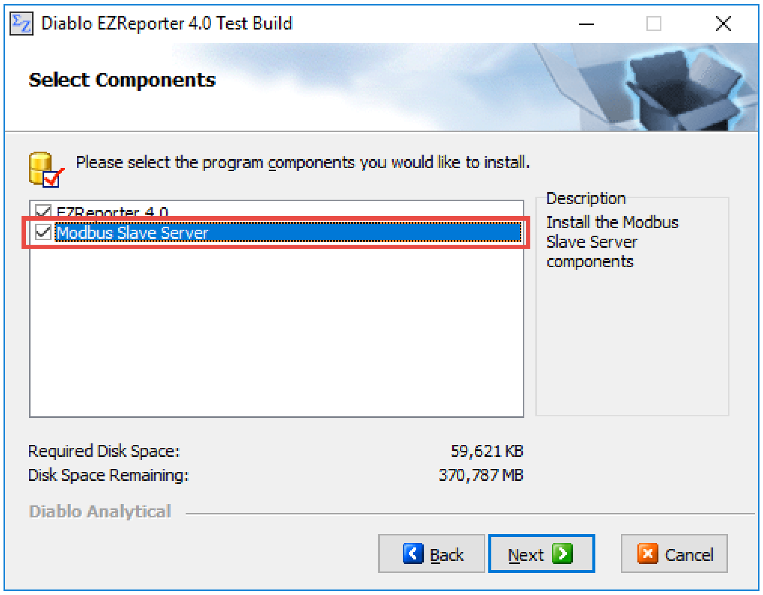
Choose Setup Type

Please select the type of setup you would like to perform.

○ Standard Setup

● Customized Setup

Complete control over which program features are installed.
Recommended for advanced users.



Please select the program components you would like to install.

☑ EZReporter 4.0
☑ Modbus Slave Server

Description
Install the Modbus Slave Server components

Required Disk Space: 59,621 KB
Disk Space Remaining: 370,787 MB

Licensing and Activation

The EZReporter 4.0 Modbus Module is active when running in “Trial” mode. After you have activated your license, the Modbus module will only be active if the Modbus module was included in the license that you purchased. You may add the Modbus module to any existing EZReporter license by purchasing a license for the module, and then reactivating the license using your original serial code. See the EZReporter 4.0 Software License Guide for more information.

What is Modbus

From the Frequently Asked Questions (FAQ) page of the Modbus organization’s web site:

“Modbus Protocol is a messaging structure developed by Modicon in 1979. It is used to establish master-slave/client-server communication between intelligent devices.”

http://www.modbus.org/faq.php

Modbus provides a standard way to transfer data between a data generating device like EZReporter (the Slave) and a data consuming device like a programmable logic controller (PLC), human-machine interface (HMI), supervisory control and data acquisition system (SCADA), or other process control system.

A more detailed description of Modbus is beyond the scope of this manual. Visit the Modbus organization’s web site using the link above for more information.

About Modbus Registers

With Modbus a Slave server makes data available to a Master device through a “Register” that exposes numeric data held in an internal data table. Each register in each data table has a unique address so that the Modbus Master knows how to access specific results.

Important: The Modbus standard defines 4 data tables, each with registers that can be addressed individually – two of those data tables hold read-only data (Discrete Inputs and Input Registers), while two hold read/write data (Discrete Outputs/Coils and Input/Holding Registers). EZReporter maintains separate address spaces for all four tables. See “Modbus Addressing” on page 19 for more information.

Modicon Floating Point and 32-bit Integer Support

The original Modbus standard only supported two types of data: 16-bit integer (Int16) and single-bit (Boolean/Discrete) data. Since signed 16-bit integers must fall in the range of -32,768 to +32,767, this provides a very limited option for exchange of data - particularly since most of the results generated by modern analytical instrumentation are floating-point (for example, 1.23456).

Fortunately, since both single-precision floating-point data and 32-bit integer data can be represented by two 16-bit integers, it is possible to use two sequential Modbus Int16 registers to hold those integers. One complication is that there is no official standard for which register should contain which integer, and different Master devices may handle this “byte order” differently. To address this complication, the EZReporter 4.0 Modbus Module provides an option to swap Int32 and Float bytes.

Important: By default, the EZReporter Modbus Module limits Modicon register addresses for both the Holding/Input table and Coils/Discretes table to a range of 1-2000 in order to simplify management of the Modbus configuration.

Enron Floating Point and 32-bit Integer Support

Some Master devices support an alternative to the standard Modicon approach of using two registers to hold 32-bit Floats and Int32 data. This alternative approach is generally referred to as “Enron” or “Daniel” addressing. In this approach, 32-bit Floats and Integers can be held in single registers. However, the registers are restricted to specific address ranges:

Enron Int32 Address Range: 5000-6999

Enron Float Address Range: 7000-8999

Important: If you have added Float or Int32 results to your Modbus configuration and switch from Modicon-to-Enron or Enron-to-Modicon addressing, the Modbus Module will automatically re-assign the register addresses to the correct range.

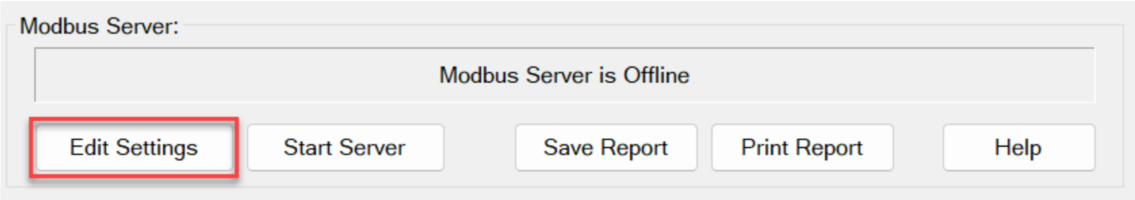
String Support

Modbus string registers are supported for selected sample information/text results. The strings can either be encoded as ASCII/UTF8 characters with 2 8-bit characters packed into each INT16 register, or they can be encoded as UNICODE/UTF16 characters with 1 16-bit character per INT16 register. You set the length of the string (and thus the number of registers required) when configuring the register. If the actual length of the string result is longer than the specified string length, the string will be truncated.

Configuring the Modbus Module

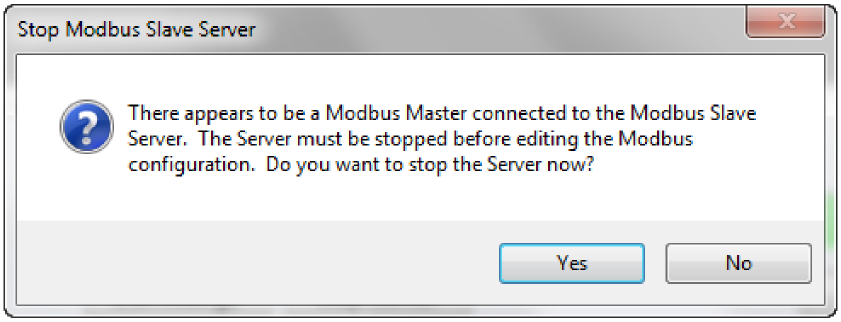
Configure Server Settings

To begin using the Modbus module, you should first configure the Modbus Server and Modbus register addressing settings. Click the “Edit Settings” button located in the Modbus Server section of the main Modbus Module panel:



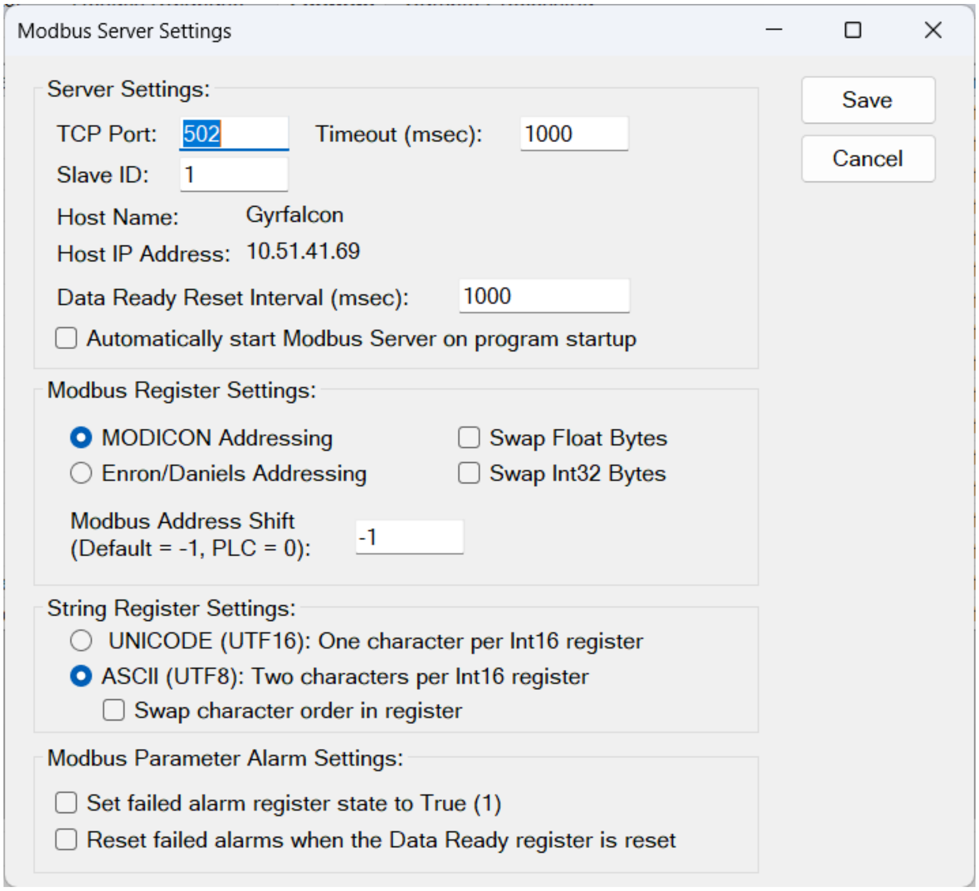
Modbus Server is Offline

Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.



There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before editing the Modbus configuration. Do you want to stop the Server now?

The Modbus Server settings can usually be left at their default values. However, it is very important that the Modbus Register Settings match the settings that the Modbus Master will use in order for the results contained in the registers to be read correctly. This is particularly important for “Float” and “Int32” results (which represent most of the results from EZReporter).



Modbus Server Settings

Server Settings:

TCP Port: 502 Timeout (msec): 1000

Slave ID: 1

Host Name: Gyrfalcon

Host IP Address: 10.51.41.69

Data Ready Reset Interval (msec): 1000

□ Automatically start Modbus Server on program startup

Modbus Register Settings:

● MODICON Addressing □ Swap Float Bytes

○ Enron/Daniels Addressing □ Swap Int32 Bytes

Modbus Address Shift (Default = -1, PLC = 0): -1

String Register Settings:

○ UNICODE (UTF16): One character per Int16 register

● ASCII (UTF8): Two characters per Int16 register

□ Swap character order in register

Modbus Parameter Alarm Settings:

□ Set failed alarm register state to True (1)

□ Reset failed alarms when the Data Ready register is reset

Server Settings

The following settings apply to the Modbus Slave Server.

TCP Port

This is the TCP port on which the Modbus Slave Server will listen for connections from a Modbus Master. The default port for Modbus TCP is port 502.

Timeout

This Timeout value is used by the Modbus Slave Server to determine if a Modbus Master is connected to the Server. If the timeout period expires without a message being transmitted from a Master, then the Slave assumes there are no Master devices connected.

The Timeout setting in milliseconds should be equal to or longer than the polling rate of the Modbus Master (the rate at which the Modbus Master checks for new results). If you set the Timeout to a value that is too short, then the Server may not be able to detect reliably when a Modbus master has connected. If you set the Timeout to a value that is too long, then the Server will not detect that the Modbus Master has disconnected until after the Timeout period has expired. The default Timeout value is 1000 milliseconds (1 second).

Slave ID

Each Modbus Slave device can be addressed by a unique ID number in the range 1-247. Make sure that the Modbus Master is using the correct Slave ID when connecting to the Modbus Slave. The default Slave ID is 1.

Host Name

The host computer name. This is a read-only value that cannot be changed.

Host IP Address

The IP address of the host computer. This is a read-only value that cannot be changed.

Note: The IP address displayed is for the primary network adapter, which is the first adapter in the binding order.

Data Ready Reset Interval

The Modbus Module provides a “Modbus Data Ready” result that the Modbus Master can use to detect when new results are available. The value of this Boolean result changes to “True” (1) after all of the Modbus registers have been updated when processing results. The value then changes back to “False” (0) after the Data Ready Reset Interval has expired. This setting is entered in milliseconds and should be long enough for the Modbus Master to detect, but shorter than the interval between runs and updating of results.

The default value is 1000 milliseconds. If you set this value to -1, the Modbus Data Ready register will be set to True/1 until it is reset manually by the Modbus master.

Automatically start Modbus Server on program startup

Check this box if you want the Modbus Slave Server to start automatically whenever you start EZReporter 4.0.

Modbus Register Settings

See “About Modbus Registers” on page 3 for details on Modbus registers and addressing.

Modicon Addressing

This option specifies the standard Modbus “Modicon” addressing protocol. 32-bit floating point and integer values are represented by two 16-bit integers placed in sequential registers. To accommodate Master devices with different expectations for which integer should be placed in which register, the Modbus module provides an option to swap the “byte order” for Float and Int32 data.

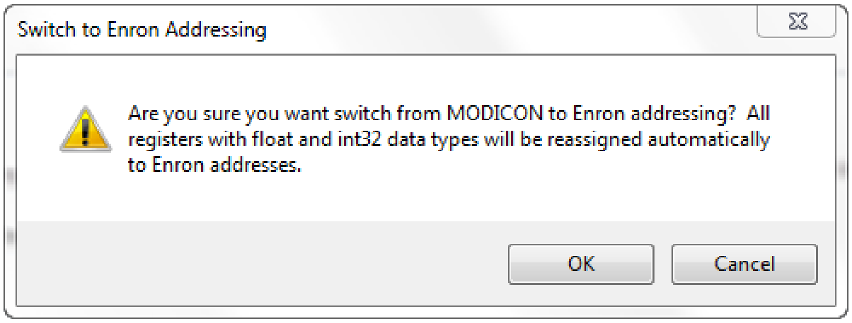
Enron/Daniel Addressing

This option specifies the alternative Enron/Daniel addressing protocol. If you choose this option, the Int32 and Float results will be restricted to the following specific register address ranges.

Enron Int32 Address Range: 5000-6999

Enron Float Address Range: 7000-8999

Important: If you have added Float or Int32 results to your Modbus configuration and switch from Modicon-to-Enron or Enron-to-Modicon addressing, the Modbus Module will automatically re-assign the register addresses to the correct range.



Are you sure you want switch from MODICON to Enron addressing? All registers with float and int32 data types will be reassigned automatically to Enron addresses.

Modbus Address Shift

Some Modbus Master devices may start counting the location of data in the data tables at a base address of 0, while others may start counting at 1. The Modbus Address Shift setting allows you to account for these addressing differences. In general you will use either a value of "0" (typically for PLCs) or "-1" (the default value).

String Register Settings

The following settings define how strings are packed into Modbus Int16 registers

UNICODE (UTF16)

The string is encoded as UNICODE/UTF16 characters with 1 16-bit character per sequential INT16 register.

ASCII (UTF8)

The string is encoded as ASCII/UTF8 characters with 2 8-bit characters packed into each INT16 register. If this option is selected, you have the option to swap the byte order of the two characters in the register.

Modbus Parameter Alarm Settings

EZReporter Monitored Parameter alarm status can be defined as a Modbus input discrete.

Set failed alarm register state to True (1)

You can define whether a failed alarm generates a True (1) or False (0) state. By default a failed alarm will generate a "True" (1) state. Uncheck this checkbox if you want a failed alarm to generate a False (0) state.

Reset failed alarms when the Data Ready register is reset

The failed alarm status will be reset automatically when the next sample is processed. Alternatively, you can configure the alarm status to be reset when the Data Ready flag is reset.

Add or Edit Register

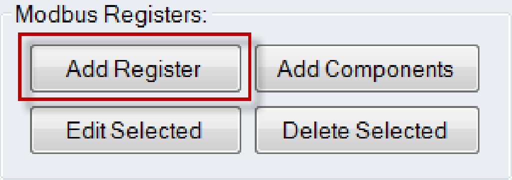
The EZReporter Modbus Module provides a couple of easy ways to add registers to the registers table. You can add single registers or you add a range of component registers containing component results.

Important: By default, most Modbus registers are "locked" to the EZReporter configuration file that was loaded when the register was defined. This is to ensure that the selected result is valid - different configuration files often have different component lists, sample information fields, and calculated results. This means that when the Modbus register table is updated at the end of a run, only the registers that match the current configuration file will be updated. Once a register has been created, the only way to change the linked configuration file is to delete the register and add it again with the new configuration file loaded.

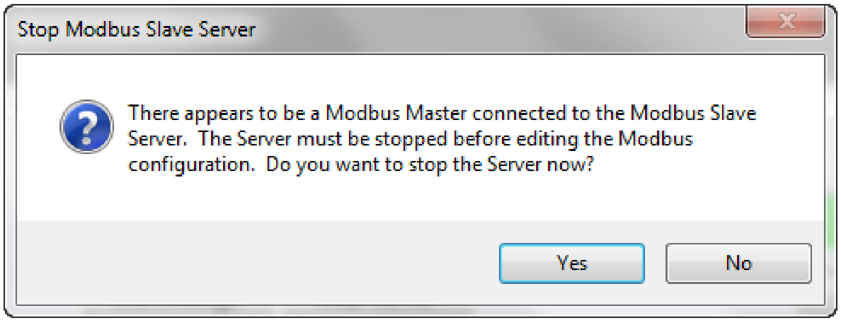
However, you can choose to update a register with results from ANY compatible configuration file. You need to be careful when enabling this option since registers will only be updated correctly if the current configuration contains the same result as the original configuration file.

Add a Single Register

To add a new register to the Register Table in your Modbus configuration, click the “Add Register” button on the main Modbus Module panel:



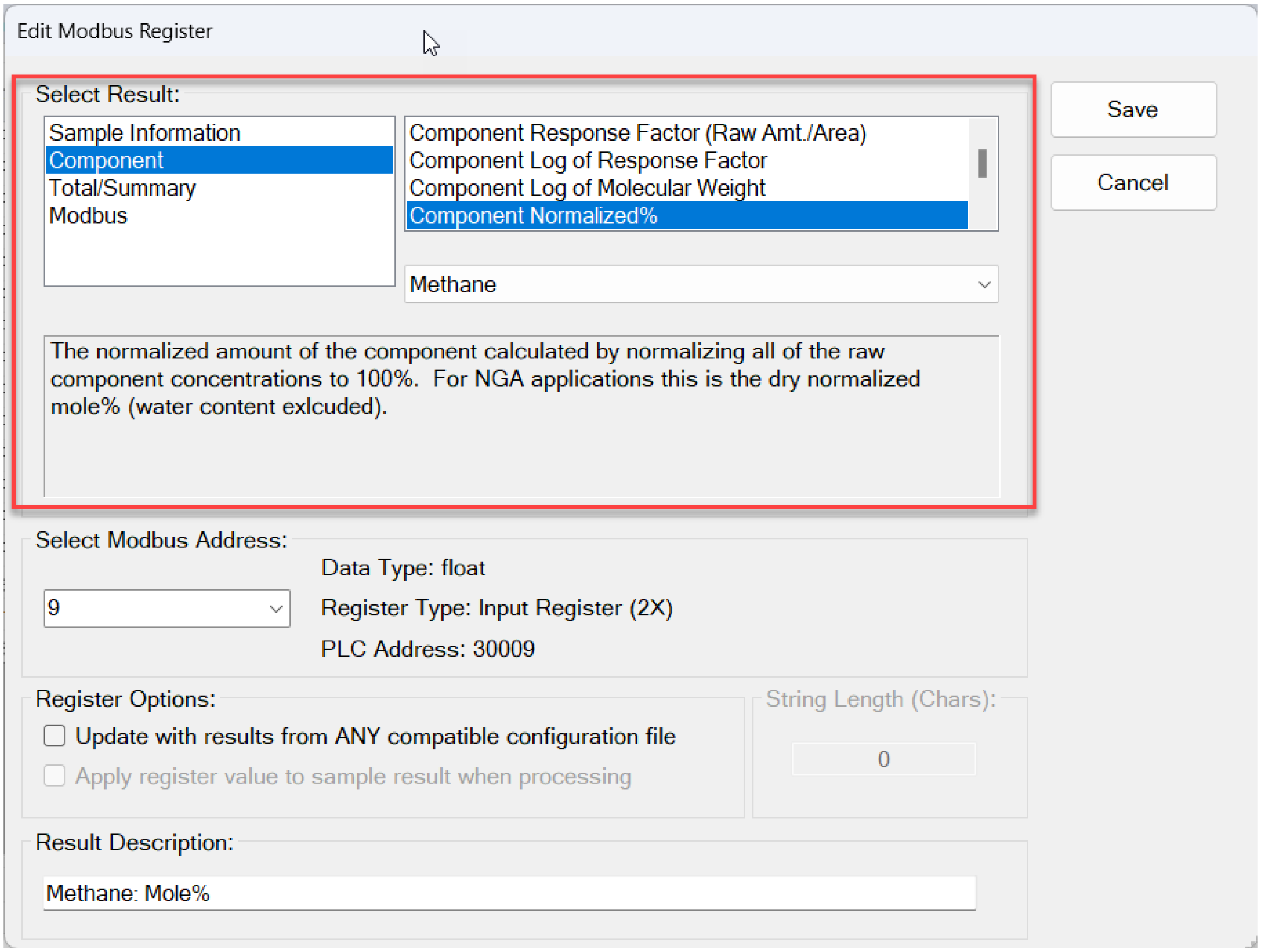
Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.


Stop Modbus Slave Server

There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before editing the Modbus configuration. Do you want to stop the Server now?

Select Result

You first select from a list of supported EZReporter results by first clicking the result type (Sample Information, Component, Total/Summary, Extended Fraction, Modbus, etc.) and then selecting the specific result from the list. A description of each result is also displayed when it is selected. Note that some results require an additional parameter to be selected: for example, if you select a Component result, you must also select the specific component. If an additional parameter is required, a drop-down list box is displayed allowing you to select from a list of items.



Select Result:

Sample Information
Component
Total/Summary
Modbus

Component Response Factor (Raw Amt./Area)
Component Log of Response Factor
Component Log of Molecular Weight
Component Normalized%

Methane

The normalized amount of the component calculated by normalizing all of the raw component concentrations to 100%. For NGA applications this is the dry normalized mole% (water content exlcuded).

Select Modbus Address: 9

Data Type: float

Register Type: Input Register (2X)

PLC Address: 30009

Register Options:

☐ Update with results from ANY compatible configuration file

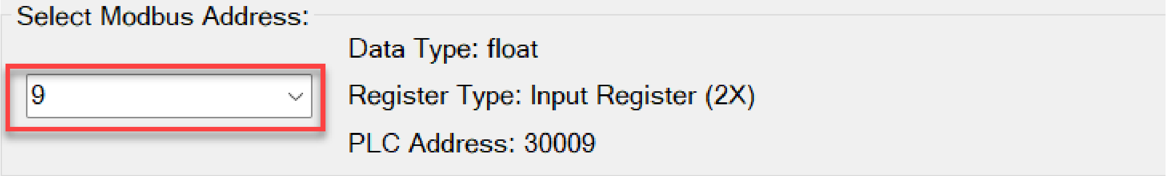
☐ Apply register value to sample result when processing

String Length (Chars): 0

Result Description: Methane: Mole%

Select Modbus Register

After selecting the result for this register, you must next select the address that the Modbus Master will use to access this specific result (see "About Modbus Registers" on page 3 for more information on Modbus registers and addressing).



Select Modbus Address: 9

Data Type: float

Register Type: Input Register (2X)

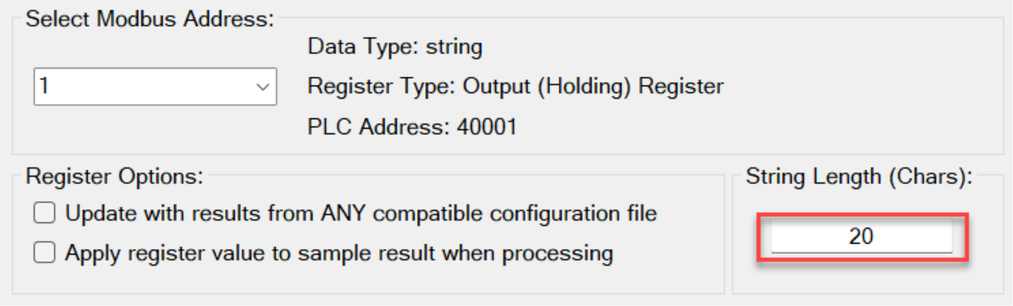
PLC Address: 30009

A list of available register addresses is pre-loaded into the list box. This list will not include addresses that have already been assigned to other registers, and the range of addresses available will depend on the type of addressing you are using (Modicon vs Enron/Daniel). While it is possible to enter a register address manually, it is safer to select from the list so that you don't choose an invalid address.

The Data Type (Boolean, Int16, Int32, Float, or String) for the selected result is displayed along with the corresponding register type/table. If you are using Modicon addressing and the result is either a Float or Int32, then "2X" is also displayed indicating that this result will occupy two sequential registers (at the selected address and the next higher address).

PLCs often use address ranges that are based on the register type/table. The calculated PLC Address for the selected table and address is provided as a convenience. See, "Modbus Addressing" on page 19 for more information.

If the result is a string, then you will also need to specify the string length, which will determine the number of sequential registers required to hold the string characters. The string length is dependent on the encoding you have chosen in the server settings window for text strings. See, "String Register Settings" on page 8 for more information.



Select Modbus Address:

1

Data Type: string

Register Type: Output (Holding) Register

PLC Address: 40001

Register Options:

☐ Update with results from ANY compatible configuration file

☐ Apply register value to sample result when processing

String Length (Chars):

20

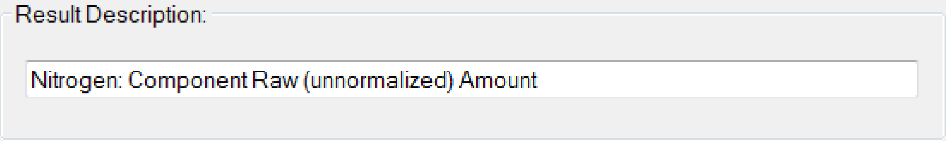
Register Options

By default, Modbus registers are "locked" to the EZReporter configuration file that was loaded when the register was defined. This is to ensure that the selected result is valid - different configuration files often have different component lists, sample information fields, and calculated results. . However, you can choose to update a register with results from ANY compatible configuration file. You need to be careful when enabling this option since registers will only be updated correctly if the current configuration contains the same result as the original configuration file.

If the selected result is defined as an Output/Holding Register (read/write), then you have the option to apply the register value to the corresponding sample result when processing. This allows the Modbus master to set a register value prior to the run and have that register value used in place of the raw result during processing. Currently, only the Sample Name, Operator, and Sample Notes results are enabled for this option.

Result Description

Finally, you can enter a description for this register/result. This description is displayed in the register table to help identify each register:



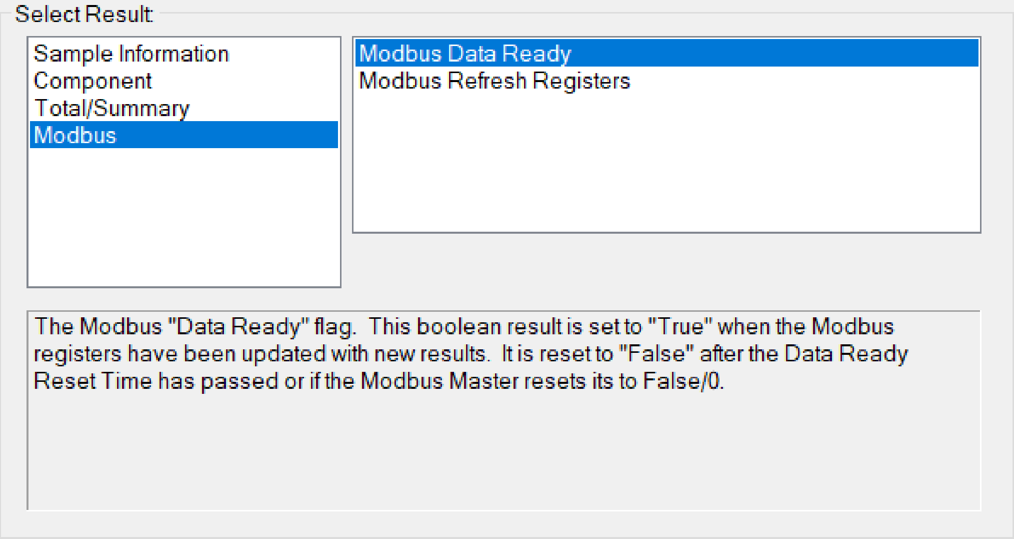
Result Description:

Nitrogen: Component Raw (unnormalized) Amount

After setting up the register, click the "Save" button to add the new register to the end of the Register Table.

Special Modbus Results

There are additional special results that provide additional Modbus functionality. You access these results by selecting the "Modbus" result type:



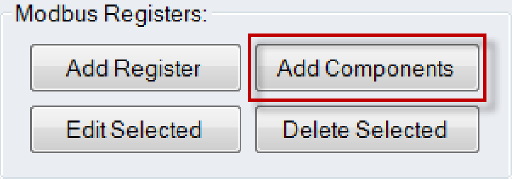
The Modbus "Data Ready" flag. This boolean result is set to "True" when the Modbus registers have been updated with new results. It is reset to "False" after the Data Ready Reset Time has passed or if the Modbus Master resets its to False/0.

Modbus Data Ready: This result is defined as a Boolean output coil (read/write). It is set to "True" (1) when the calculations are complete and all of the Modbus registers have been updated during sample processing. It is reset to False (0) after the Data Ready Reset Interval specified in the Server Settings. The Modbus Master can also reset this output coil to False (0) manually.

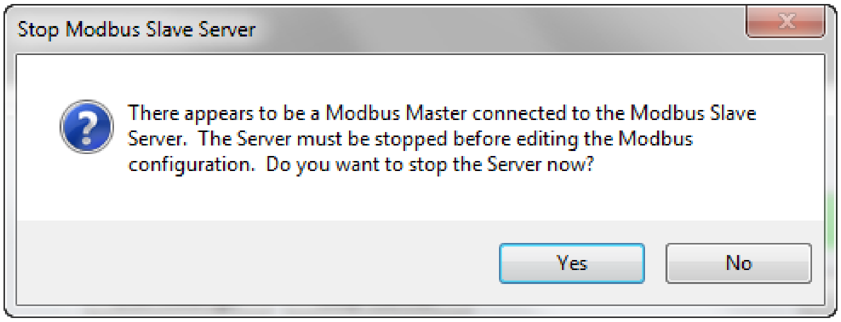
Modbus Refresh Registers: This result is defined as a Boolean output coil (read/write). If this output coil is set to 1/True by the Modbus Master, then the EZReporter Modbus Register table will be refreshed to reflect any new values written to holding/output registers by the Modbus Master. It is reset to 0/False after the register table has been refreshed.

Add Component Registers

If you want to add a component result for multiple components to the register table, click the "Add Components" button (or right click the register table and choose "Add Component Registers" from the pop-up menu).

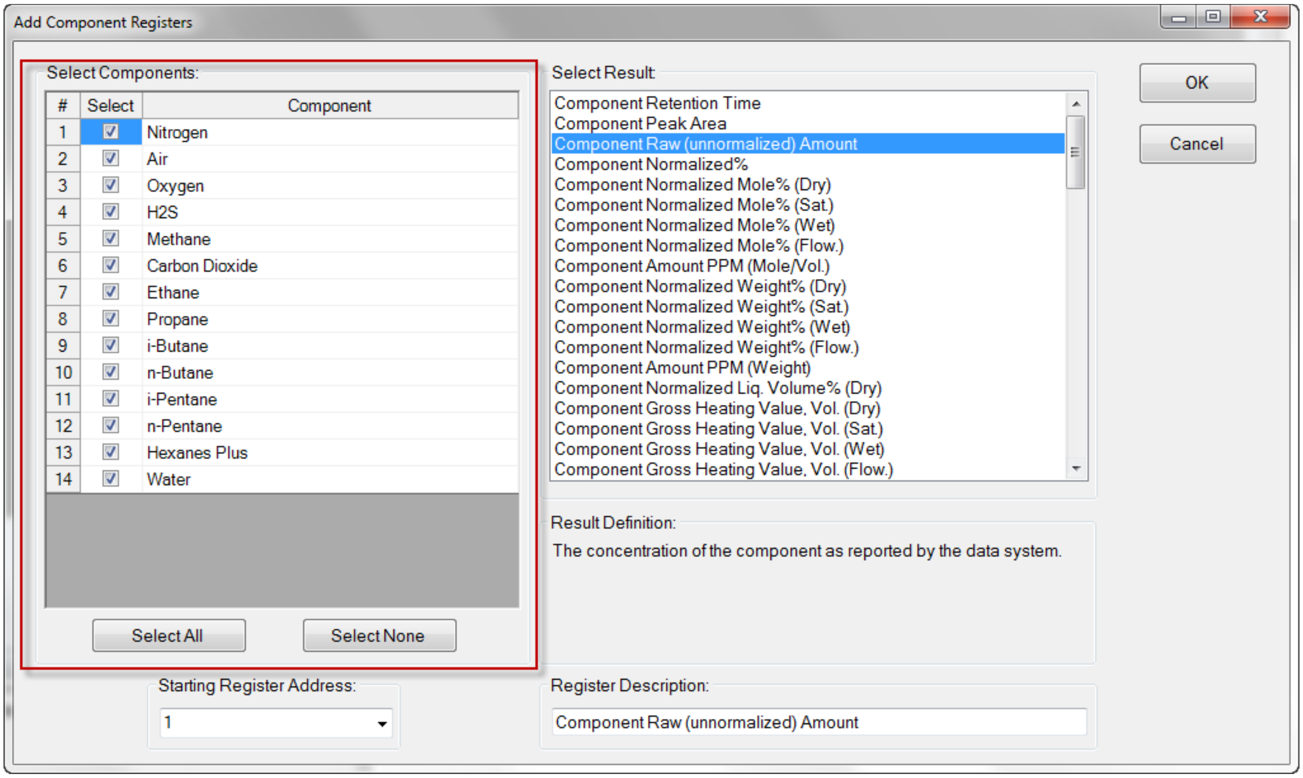


Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.



There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before editing the Modbus configuration. Do you want to stop the Server now?

First, choose from the list of components defined in the configuration file that is currently loaded – the components that are checked will each be assigned to an individual register. You can click “Select All” button to check all of the components or “Select None” to uncheck all of the components. Next, choose the specific component result you want to assign to these registers from the list.



Select Components:

#	Select	Component
1	☑	Nitrogen
2	☑	Air
3	☑	Oxygen
4	☑	H2S
5	☑	Methane
6	☑	Carbon Dioxide
7	☑	Ethane
8	☑	Propane
9	☑	i-Butane
10	☑	n-Butane
11	☑	i-Pentane
12	☑	n-Pentane
13	☑	Hexanes Plus
14	☑	Water

Select Result:

Component Retention Time
Component Peak Area
Component Raw (unnormalized) Amount
Component Normalized%
Component Normalized Mole% (Dry)
Component Normalized Mole% (Sat.)
Component Normalized Mole% (Wet)
Component Normalized Mole% (Flow.)
Component Amount PPM (Mole/Vol.)
Component Normalized Weight% (Dry)
Component Normalized Weight% (Sat.)
Component Normalized Weight% (Wet)
Component Normalized Weight% (Flow.)
Component Amount PPM (Weight)
Component Normalized Liq. Volume% (Dry)
Component Gross Heating Value, Vol. (Dry)
Component Gross Heating Value, Vol. (Sat.)
Component Gross Heating Value, Vol. (Wet)
Component Gross Heating Value, Vol. (Flow.)

Result Definition:

The concentration of the component as reported by the data system.

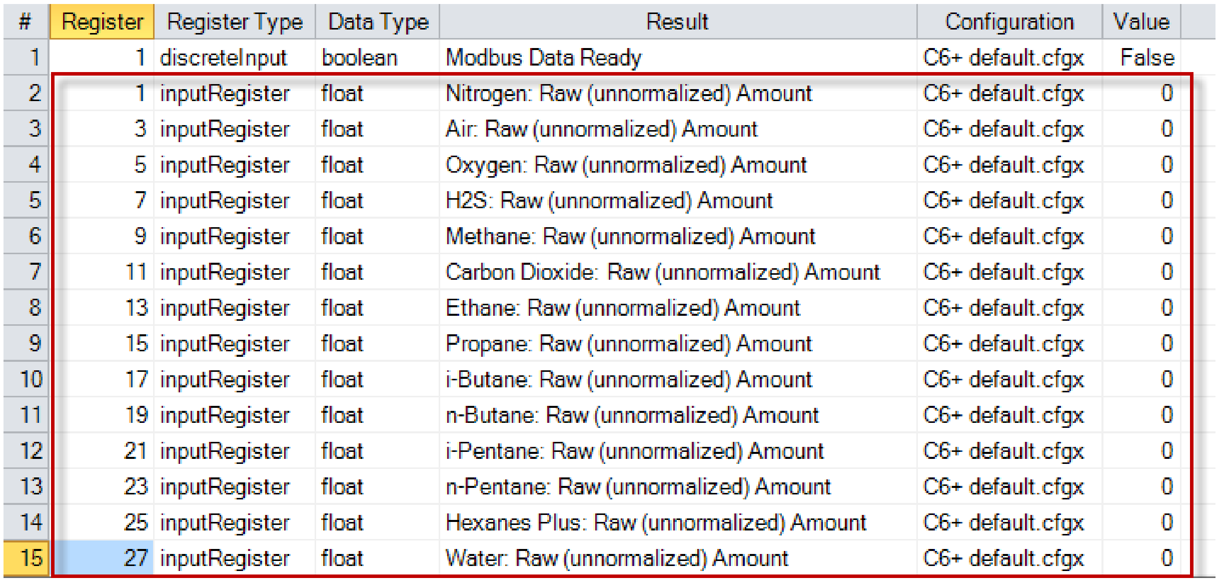
Starting Register Address: 1

Register Description: Component Raw (unnormalized) Amount

The registers will be assigned sequential addresses starting with the address specified as the “Starting Register Address”. The address list box is pre-filled with available starting addresses. Note that if the selected result is a Float or Int32 and you have specified Modicon addressing, then each result will occupy two sequential addresses.

Finally, you can enter a Register Description. This description will be appended to the component name to identify the register/result in the register table.

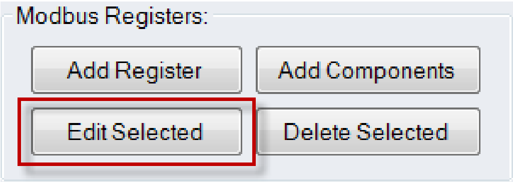
After making your selections, click the “Save” button. A new register will be added to the end of the register table for each of the components that were checked:



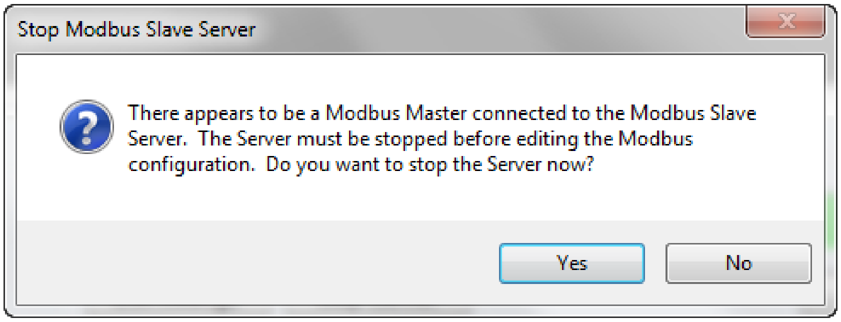
#	Register	Register Type	Data Type	Result	Configuration	Value
1	1	discreteInput	boolean	Modbus Data Ready	C6+ default.cfgx	False
2	1	inputRegister	float	Nitrogen: Raw (unnormalized) Amount	C6+ default.cfgx	0
3	3	inputRegister	float	Air: Raw (unnormalized) Amount	C6+ default.cfgx	0
4	5	inputRegister	float	Oxygen: Raw (unnormalized) Amount	C6+ default.cfgx	0
5	7	inputRegister	float	H2S: Raw (unnormalized) Amount	C6+ default.cfgx	0
6	9	inputRegister	float	Methane: Raw (unnormalized) Amount	C6+ default.cfgx	0
7	11	inputRegister	float	Carbon Dioxide: Raw (unnormalized) Amount	C6+ default.cfgx	0
8	13	inputRegister	float	Ethane: Raw (unnormalized) Amount	C6+ default.cfgx	0
9	15	inputRegister	float	Propane: Raw (unnormalized) Amount	C6+ default.cfgx	0
10	17	inputRegister	float	i-Butane: Raw (unnormalized) Amount	C6+ default.cfgx	0
11	19	inputRegister	float	n-Butane: Raw (unnormalized) Amount	C6+ default.cfgx	0
12	21	inputRegister	float	i-Pentane: Raw (unnormalized) Amount	C6+ default.cfgx	0
13	23	inputRegister	float	n-Pentane: Raw (unnormalized) Amount	C6+ default.cfgx	0
14	25	inputRegister	float	Hexanes Plus: Raw (unnormalized) Amount	C6+ default.cfgx	0
15	27	inputRegister	float	Water: Raw (unnormalized) Amount	C6+ default.cfgx	0

Edit a Register

To edit a register that has already been defined in the register table, select the desired row in the register table and the click "Edit Selected" (or right click the row in the register table and choose "Edit Selected Register" from the pop-up menu).



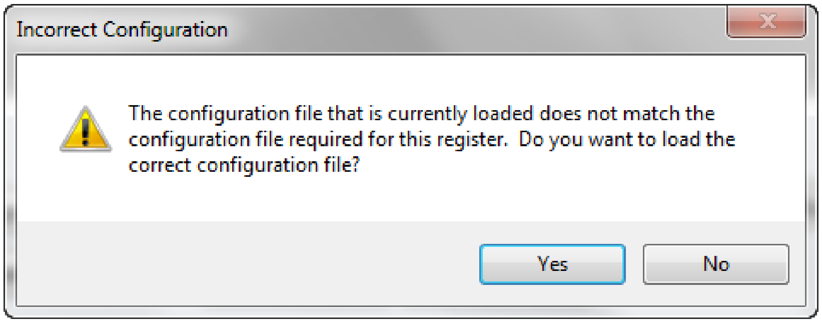
Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.



Stop Modbus Slave Server

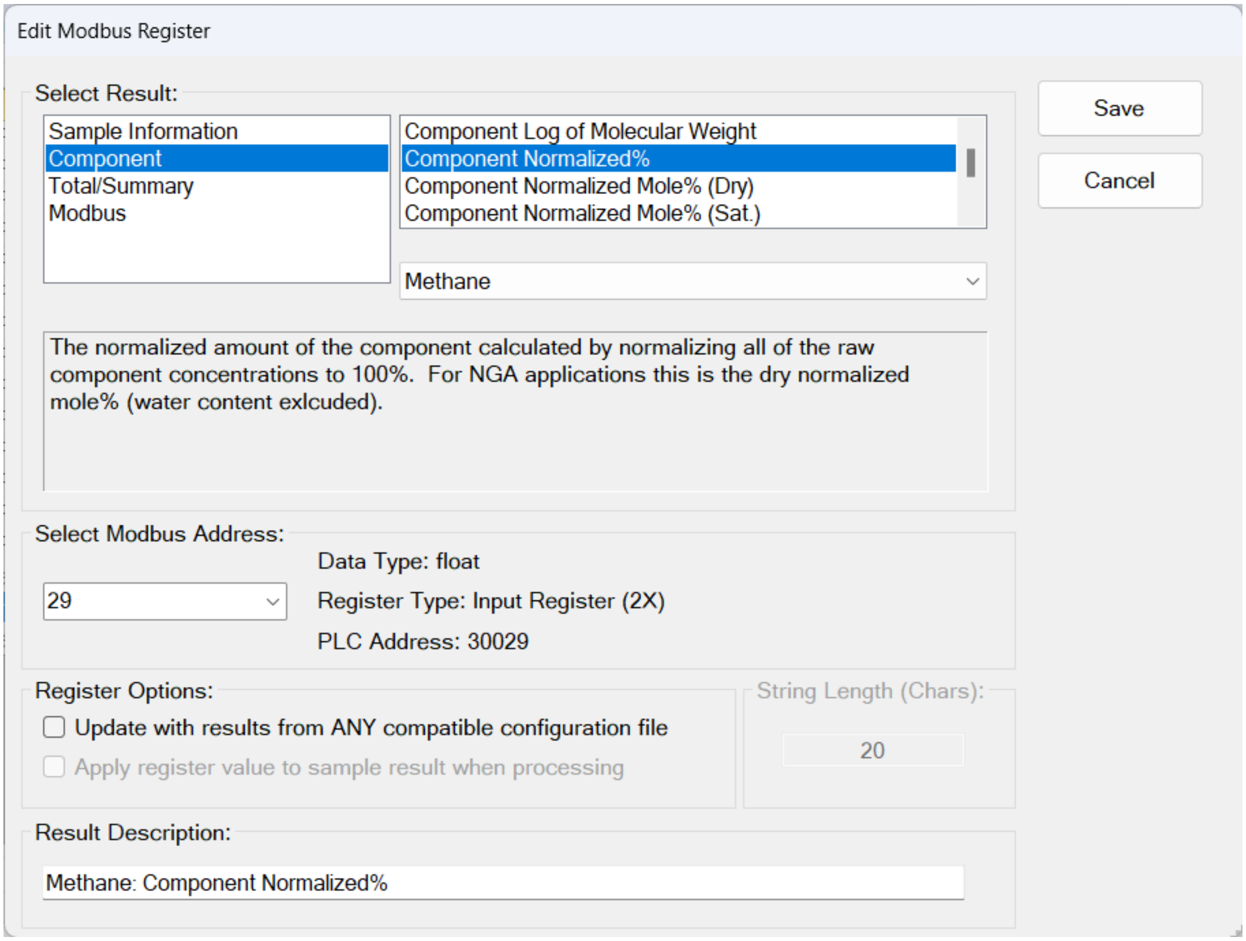
There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before editing the Modbus configuration. Do you want to stop the Server now?

If the configuration file defined for the selected register does not match the configuration file currently loaded in EZReporter, you will be prompted whether the correct configuration file should be loaded:



The configuration file that is currently loaded does not match the configuration file required for this register. Do you want to load the correct configuration file?

You can then make any desired changes to the settings for the selected register, and then click the “Save” button.



Select Result:

Sample Information
Component
Total/Summary
Modbus

Component Log of Molecular Weight
Component Normalized%
Component Normalized Mole% (Dry)
Component Normalized Mole% (Sat.)

Methane

The normalized amount of the component calculated by normalizing all of the raw component concentrations to 100%. For NGA applications this is the dry normalized mole% (water content exlcuded).

Select Modbus Address:

29

Data Type: float

Register Type: Input Register (2X)

PLC Address: 30029

Register Options:

☐ Update with results from ANY compatible configuration file

☐ Apply register value to sample result when processing

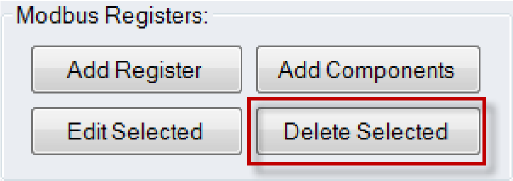
String Length (Chars): 20

Result Description:

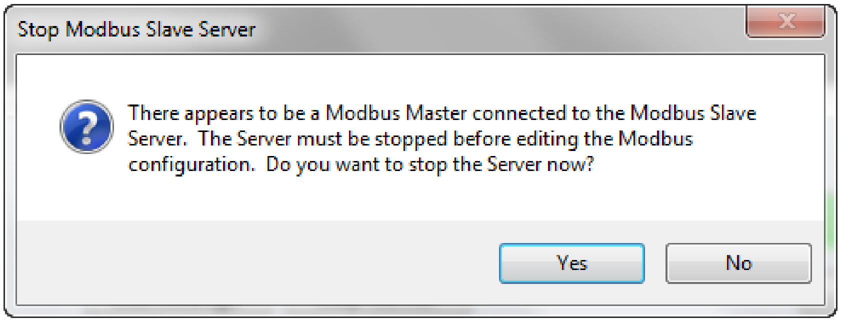
Methane: Component Normalized%

Delete Registers

To delete a register from the register table, select desired row(s) in the register table and the click “Delete Selected” (or right click the row in the register table and choose “Delete Selected Register” from the pop-up menu).

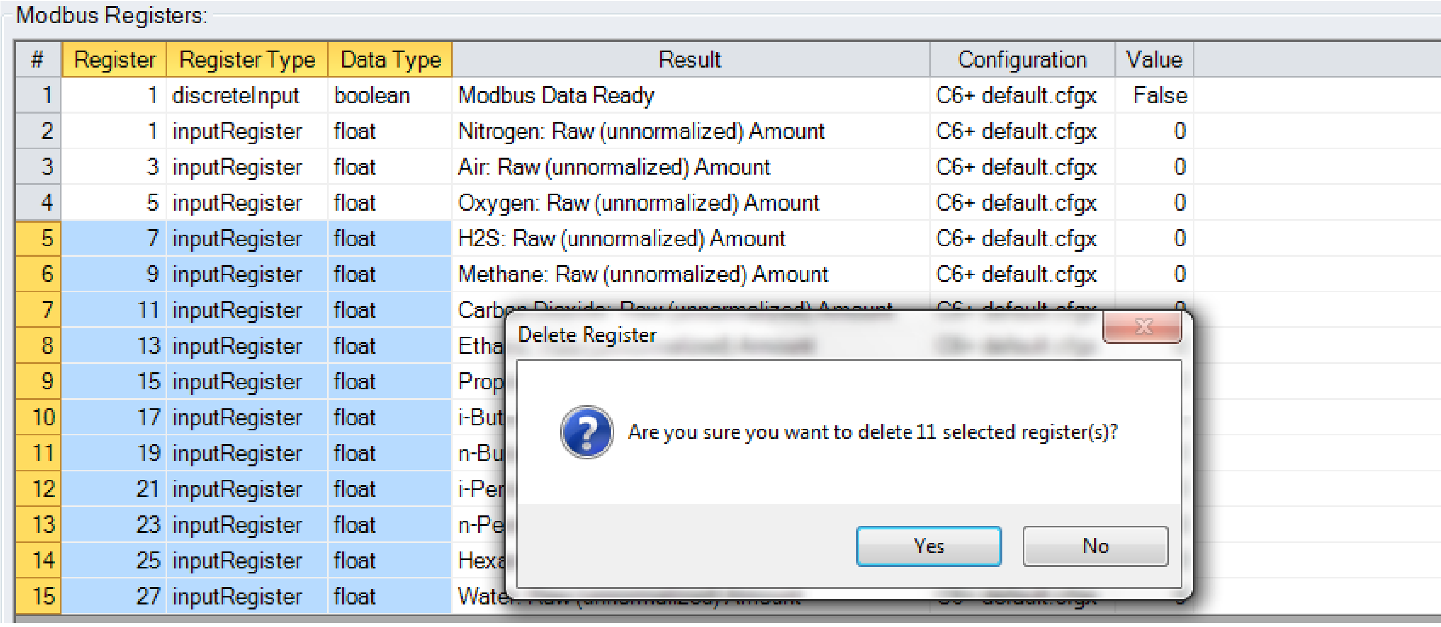


Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.



There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before editing the Modbus configuration. Do you want to stop the Server now?

The “Delete Registers” option allows you to delete multiple registers from the register table at once by selecting the rows of all of the desired registers to be deleted. You will be prompted to confirm the deletion since deletion is not reversible.



#	Register	Register Type	Data Type	Result	Configuration	Value
1	1	discreteInput	boolean	Modbus Data Ready	C6+ default.cfgx	False
2	1	inputRegister	float	Nitrogen: Raw (unnormalized) Amount	C6+ default.cfgx	0
3	3	inputRegister	float	Air: Raw (unnormalized) Amount	C6+ default.cfgx	0
4	5	inputRegister	float	Oxygen: Raw (unnormalized) Amount	C6+ default.cfgx	0
5	7	inputRegister	float	H2S: Raw (unnormalized) Amount	C6+ default.cfgx	0
6	9	inputRegister	float	Methane: Raw (unnormalized) Amount	C6+ default.cfgx	0
7	11	inputRegister	float	Carbon Dioxide: Raw (unnormalized) Amount	C6+ default.cfgx	0
8	13	inputRegister	float	Etha		
9	15	inputRegister	float	Prop		
10	17	inputRegister	float	i-But		
11	19	inputRegister	float	n-Bu		
12	21	inputRegister	float	i-Per		
13	23	inputRegister	float	n-Pe		
14	25	inputRegister	float	Hexa		
15	27	inputRegister	float	Water: Raw (unnormalized) Amount	C6+ default.cfgx	0

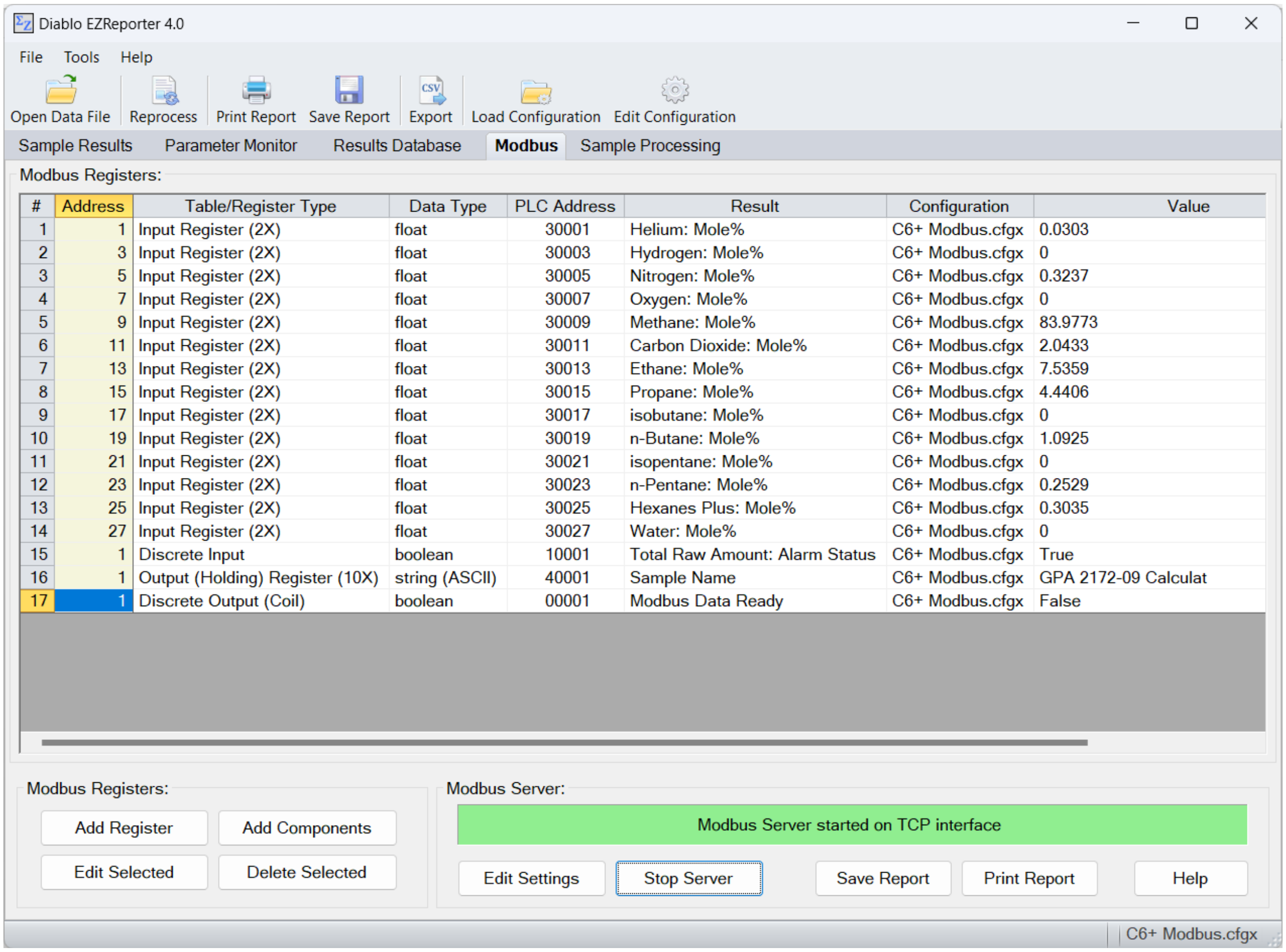
Are you sure you want to delete 11 selected register(s)?

Using the Modbus Slave Server

The Modbus Module Panel

The Modbus Module is controlled entirely through the Modbus Module Panel that is displayed when you select the “Modbus” tab on the main EZReporter window.

Important: The Modbus Module is configured separately from the EZReporter configuration editor so that it can support result from multiple configuration files.



Modbus Registers:

#	Address	Table/Register Type	Data Type	PLC Address	Result	Configuration	Value
1	1	Input Register (2X)	float	30001	Helium: Mole%	C6+ Modbus.cfgx	0.0303
2	3	Input Register (2X)	float	30003	Hydrogen: Mole%	C6+ Modbus.cfgx	0
3	5	Input Register (2X)	float	30005	Nitrogen: Mole%	C6+ Modbus.cfgx	0.3237
4	7	Input Register (2X)	float	30007	Oxygen: Mole%	C6+ Modbus.cfgx	0
5	9	Input Register (2X)	float	30009	Methane: Mole%	C6+ Modbus.cfgx	83.9773
6	11	Input Register (2X)	float	30011	Carbon Dioxide: Mole%	C6+ Modbus.cfgx	2.0433
7	13	Input Register (2X)	float	30013	Ethane: Mole%	C6+ Modbus.cfgx	7.5359
8	15	Input Register (2X)	float	30015	Propane: Mole%	C6+ Modbus.cfgx	4.4406
9	17	Input Register (2X)	float	30017	isobutane: Mole%	C6+ Modbus.cfgx	0
10	19	Input Register (2X)	float	30019	n-Butane: Mole%	C6+ Modbus.cfgx	1.0925
11	21	Input Register (2X)	float	30021	isopentane: Mole%	C6+ Modbus.cfgx	0
12	23	Input Register (2X)	float	30023	n-Pentane: Mole%	C6+ Modbus.cfgx	0.2529
13	25	Input Register (2X)	float	30025	Hexanes Plus: Mole%	C6+ Modbus.cfgx	0.3035
14	27	Input Register (2X)	float	30027	Water: Mole%	C6+ Modbus.cfgx	0
15	1	Discrete Input	boolean	10001	Total Raw Amount: Alarm Status	C6+ Modbus.cfgx	True
16	1	Output (Holding) Register (10X)	string (ASCII)	40001	Sample Name	C6+ Modbus.cfgx	GPA 2172-09 Calculat
17	1	Discrete Output (Coil)	boolean	00001	Modbus Data Ready	C6+ Modbus.cfgx	False

Modbus Server started on TCP interface

C6+ Modbus.cfgx

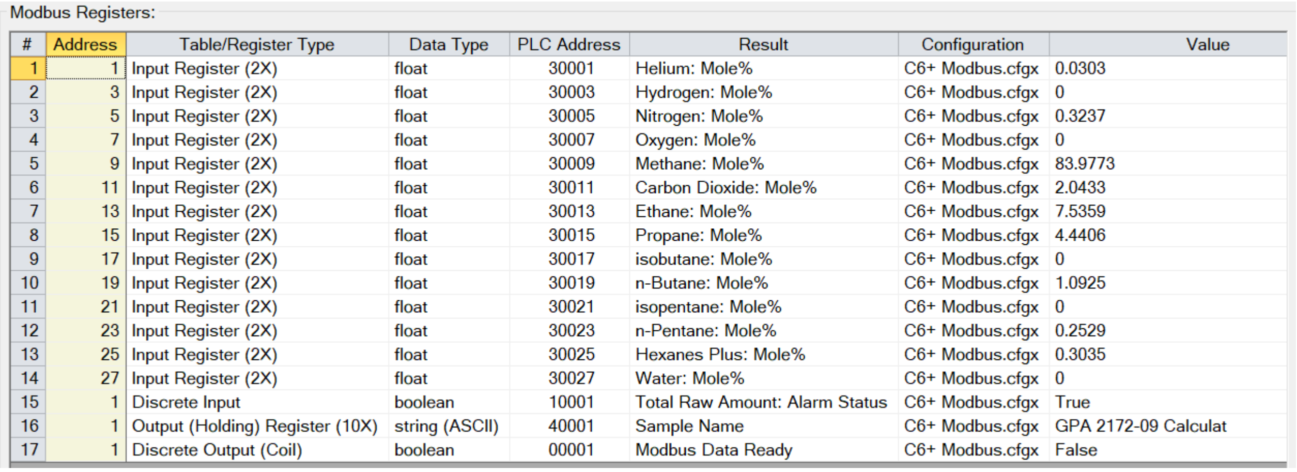
The “Modbus” tab is visible in Trial mode and also after you have activated the software if the Modbus Module is included in your license.

The Modbus panel contains three sections:

1) The Modbus Registers table, which contains a list of the registers that have been defined.
2) The Modbus Registers controls, which allow you to Add, Edit, and Delete registers from the Registers table
3) The Modbus Server controls, which allow you to edit the server settings, start and stop the server, and print the current server configuration.

The Modbus Register Table

The Modbus Registers table contains the list of registers that are currently defined.



Modbus Registers:

#	Address	Table/Register Type	Data Type	PLC Address	Result	Configuration	Value
1	1	Input Register (2X)	float	30001	Helium: Mole%	C6+ Modbus.cfgx	0.0303
2	3	Input Register (2X)	float	30003	Hydrogen: Mole%	C6+ Modbus.cfgx	0
3	5	Input Register (2X)	float	30005	Nitrogen: Mole%	C6+ Modbus.cfgx	0.3237
4	7	Input Register (2X)	float	30007	Oxygen: Mole%	C6+ Modbus.cfgx	0
5	9	Input Register (2X)	float	30009	Methane: Mole%	C6+ Modbus.cfgx	83.9773
6	11	Input Register (2X)	float	30011	Carbon Dioxide: Mole%	C6+ Modbus.cfgx	2.0433
7	13	Input Register (2X)	float	30013	Ethane: Mole%	C6+ Modbus.cfgx	7.5359
8	15	Input Register (2X)	float	30015	Propane: Mole%	C6+ Modbus.cfgx	4.4406
9	17	Input Register (2X)	float	30017	isobutane: Mole%	C6+ Modbus.cfgx	0
10	19	Input Register (2X)	float	30019	n-Butane: Mole%	C6+ Modbus.cfgx	1.0925
11	21	Input Register (2X)	float	30021	isopentane: Mole%	C6+ Modbus.cfgx	0
12	23	Input Register (2X)	float	30023	n-Pentane: Mole%	C6+ Modbus.cfgx	0.2529
13	25	Input Register (2X)	float	30025	Hexanes Plus: Mole%	C6+ Modbus.cfgx	0.3035
14	27	Input Register (2X)	float	30027	Water: Mole%	C6+ Modbus.cfgx	0
15	1	Discrete Input	boolean	10001	Total Raw Amount: Alarm Status	C6+ Modbus.cfgx	True
16	1	Output (Holding) Register (10X)	string (ASCII)	40001	Sample Name	C6+ Modbus.cfgx	GPA 2172-09 Calculat
17	1	Discrete Output (Coil)	boolean	00001	Modbus Data Ready	C6+ Modbus.cfgx	False

The Register Table includes the following columns:

#:	The ID/Index number for the register.
Address:	The address of the register that the Modbus Master will use to access this specific result. Register addresses are linked to the Modbus table associated with the Register Type for each result (see below). **Note**: In Modicon addressing mode, Float and Int32 data types will occupy two sequential registers (Register and Register +1). Strings also occupy sequential registers. The number of registers required depends on the string length and encoding.
Table/Register Type:	The Modbus table where the data for this result is stored. The Modbus Module stores results in four types of data tables: Input Register, Output (Holding) Register, Input Discrete, and Output Coil. The register type used is determined by the data type of the result. EZReporter maintains separate address spaces for each table.
Data Type:	The data type defined for the result. Options include Boolean (bit/discrete), Int16 (short, 16-bit integer), Int32 (long, 32-bit integer), Float (single-precision floating point), and String (ASCII or UNICODE).
PLC Address	PLCs often use address ranges that are based on the table/register type. See, “Modbus Addressing” on page 19 for more information.
Result:	The result description for the register.

Configuration:	The configuration file that was used to create the register. The register will only be updated when results are processed with this configuration file loaded.
Value:	The current value of the register.

Rearranging the Register Table

You can rearrange the rows in the register table by left-clicking the index column of the desired row, and dragging it to the desired new location. You can also sort the table based on the contents of a column by clicking the header text at the top of the desired column.

Note: Rearranging the order of rows in the register table has no effect on how the Modbus Master accesses the registers. It simply allows you to change the display order.

Modbus Addressing

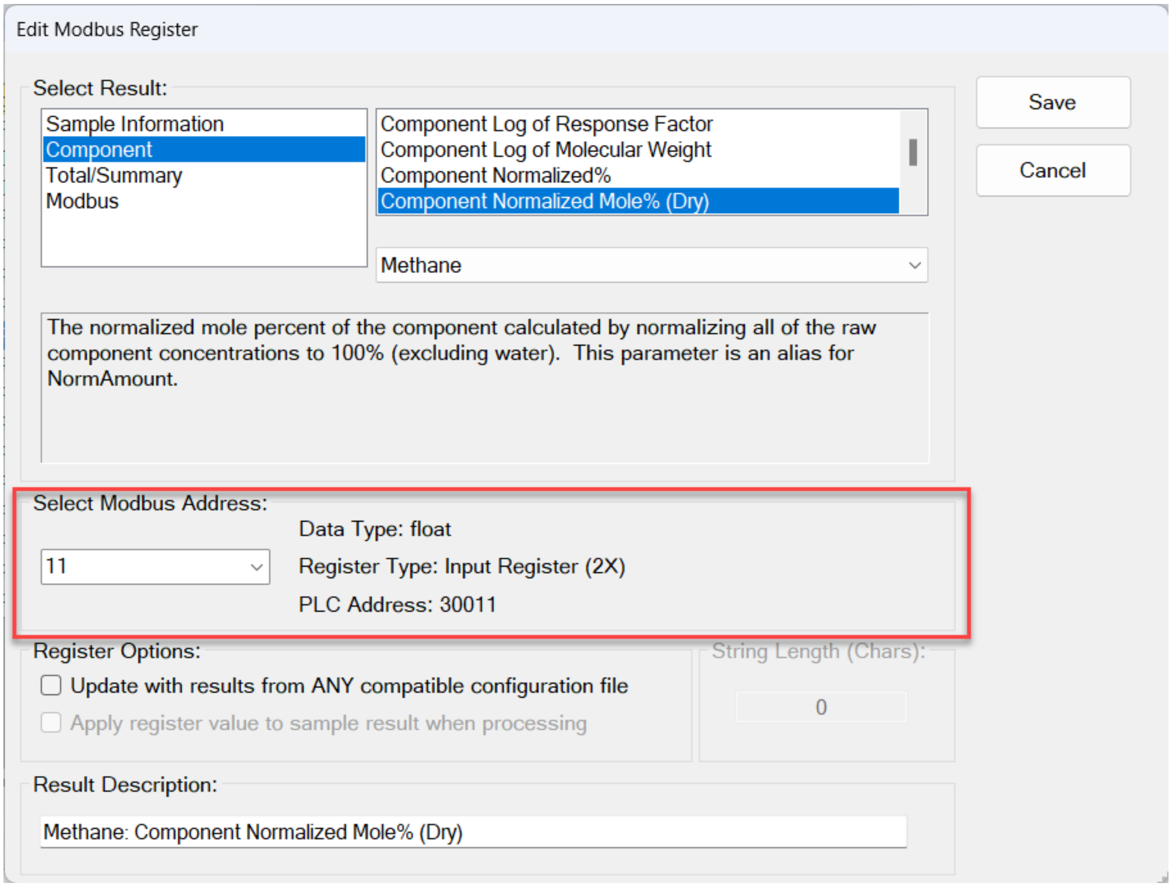
The Modbus protocol defines four different tables from which data can be read or written. Some devices will combine all four tables into a single address space. However, to maintain flexibility, the EZReporter Modbus slave server maintains all four tables with independent addresses.

Data Table/Register Type	PLC Address Range	Read-Write Status	Data Storage
Discrete Outputs (Coils)	00001-09999	Read-Write	Single Bit (Boolean)
Discrete Inputs (Inputs)	10001-19999	Read-Only	Single Bit (Boolean)
Input Registers	30001-39999	Read-Only	16-bit (Integer)
Output (Holding) Registers	40001-49999	Read-Write	16-bit (Integer)

Consequently, when programming your PLC or other Modbus master, you must make sure you are selecting the correct data table and address.

Important: Most of the numeric GC results that are accessed using the EZReporter Modbus Slave server are read-only, float values that are stored in the Input Register data table. PLCs will typically access these addresses in the range 30001 to 39999.

You can determine which data table/register a particular result is stored in the “Edit Modbus Register” window:



Edit Modbus Register

Select Result:

Sample Information
Component
Total/Summary
Modbus

Component Log of Response Factor
Component Log of Molecular Weight
Component Normalized%
Component Normalized Mole% (Dry)

Methane

The normalized mole percent of the component calculated by normalizing all of the raw component concentrations to 100% (excluding water). This parameter is an alias for NormAmount.

Select Modbus Address: 11

Data Type: float
Register Type: Input Register (2X)
PLC Address: 30011

Register Options:

□ Update with results from ANY compatible configuration file
□ Apply register value to sample result when processing

String Length (Chars): 0

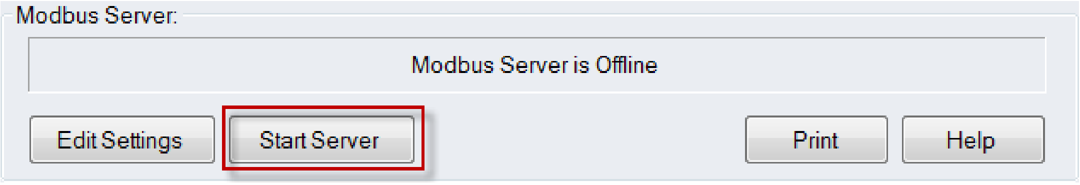
Result Description: Methane: Component Normalized Mole% (Dry)

In this example, The Methane Component Mole% is stored in the read-only, Input Register table. It is a float data type, so it will use two successive registers (thus, the “2X” that is displayed): in this case Input Table addresses 11 and 12 (or PLC addresses 30011 and 30012).

Additional note regarding PLC Addressing: PLCs often number addresses starting from a base of 1, while other Modbus Masters may start numbering from a base of 0 (which is the default). See “Modbus Address Shift” on page 8 for information on shifting the base address from 0 to 1 as needed.

Starting the Server

In order for a Modbus Master to access the results in your Modbus register table via a TCP connection, the Modbus Slave Server must be started. To start the Server click the “Start Server” button on the main Modbus Module panel.



Modbus Server:

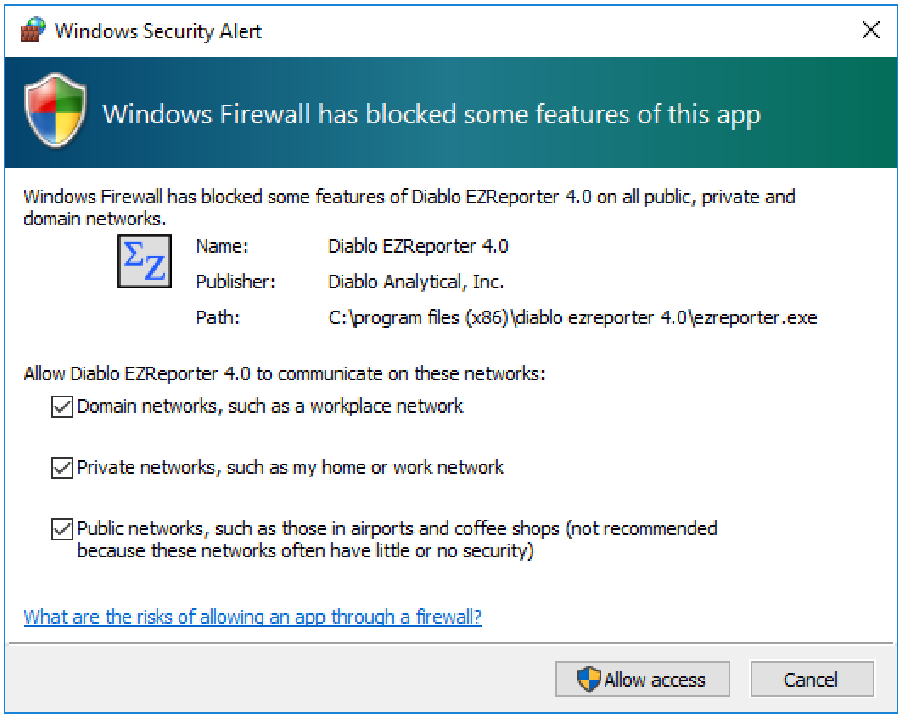
Modbus Server is Offline

Note: You can also configure the Server to start automatically whenever EZReporter starts.

Windows Firewall Exceptions

If the Windows firewall is enabled on your system, you should see the following Windows Security Alert the first time you start the server. Make sure you check the appropriate networks, and then "Allow Access" to add exceptions for the Modbus Slave Server to the firewall.

Important: If you are using a third-party firewall you will need to add exceptions manually for the EZReporter program and TCP Port you have selected (502 by default). Please refer to your firewall documentation for instructions.


Windows Security Alert
Windows Firewall has blocked some features of this app
What are the risks of allowing an app through a firewall?
Allow access
Cancel

Windows Firewall has blocked some features of Diablo EZReporter 4.0 on all public, private and domain networks.

Name: Diablo EZReporter 4.0

Publisher: Diablo Analytical, Inc.

Path: C:\program files (x86)\diablo ezreporter 4.0\ezreporter.exe

Allow Diablo EZReporter 4.0 to communicate on these networks:

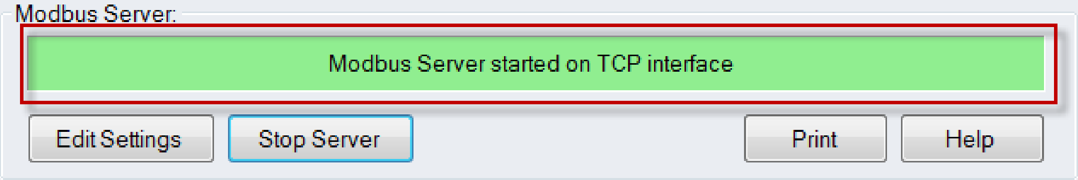
☑ Domain networks, such as a workplace network

☑ Private networks, such as my home or work network

☑ Public networks, such as those in airports and coffee shops (not recommended because these networks often have little or no security)

Modbus Server Status

The current status of the Modbus Slave Server is displayed on a color coded panel on the main Modbus Module Panel:



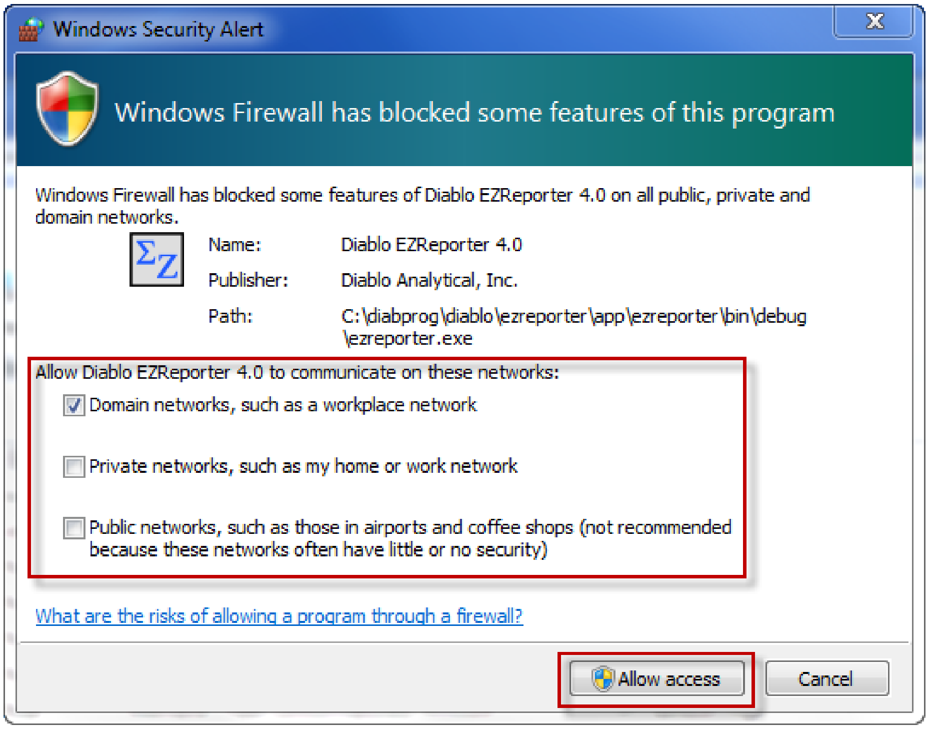
Modbus Server started on TCP interface

The Modbus Server status will display one of the following status messages:

Status	Color	Description
Offline	Gray	"Modbus Server is Offline" or "Modbus Server stopped by user"
Starting	Yellow	"Starting up Modbus Server …"
Started	Green	"Modbus Server started on TCP interface"
Shutting down	Yellow	"Shutting down Modbus Server …"
Error	Red	Details of the error message will be displayed

Network and Firewall Considerations

If a firewall is running on the computer, you may have to add exceptions to the firewall settings in order to allow the Modbus Master to establish a TCP connection to the Modbus Slave Server. If you are running the Windows firewall, the first time you start the Modbus Slave Server, you may be presented with the following security window:



Windows Security Alert

Windows Firewall has blocked some features of this program

Windows Firewall has blocked some features of Diablo EZReporter 4.0 on all public, private and domain networks.

Name: Diablo EZReporter 4.0

Publisher: Diablo Analytical, Inc.

Path: C:\diabprog\diablo\ezreporter\app\ezreporter\bin\debug \ezreporter.exe

Allow Diablo EZReporter 4.0 to communicate on these networks:

☑ Domain networks, such as a workplace network

☐ Private networks, such as my home or work network

☐ Public networks, such as those in airports and coffee shops (not recommended because these networks often have little or no security)

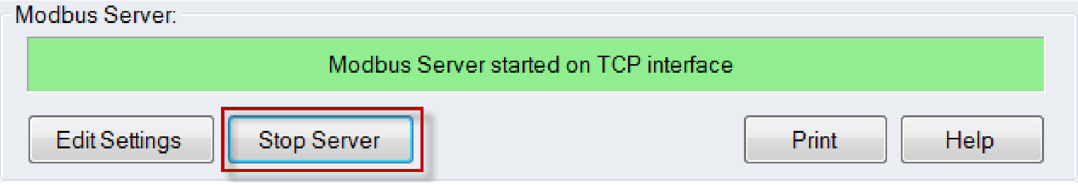
What are the risks of allowing a program through a firewall?

Make sure to select “Allow Access”. This will add an exception to the Windows firewall settings for EZReporter for the specified networks.

If you don’t see this window, or you are using a different firewall, you may need to consult with your networking or security professional.

Stopping the Server

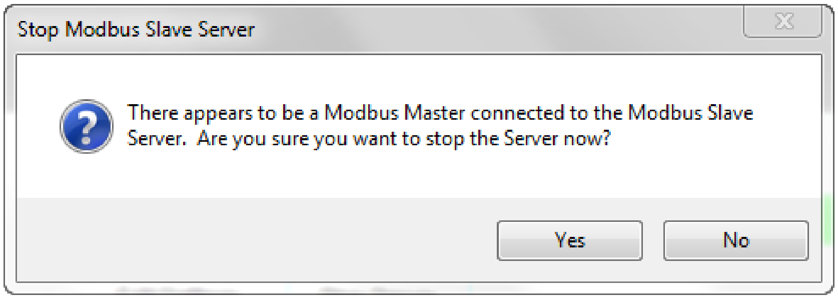
If you want to stop the Modbus Slave server, click the “Stop Server” button on the main Modbus Module panel:



Modbus Server:

Modbus Server started on TCP interface

Note: If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to stop the Server. If you stop the Server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.

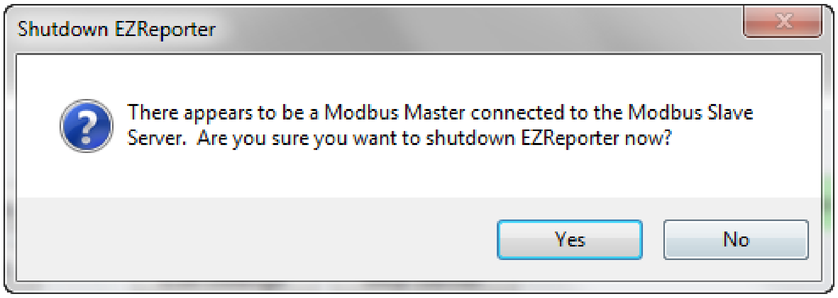


Stop Modbus Slave Server

There appears to be a Modbus Master connected to the Modbus Slave Server. Are you sure you want to stop the Server now?

Exiting EZReporter

When you exit the main EZReporter application with the Modbus Module active, EZReporter will try to stop the Modbus Slave Server before shutting down. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to exit. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.

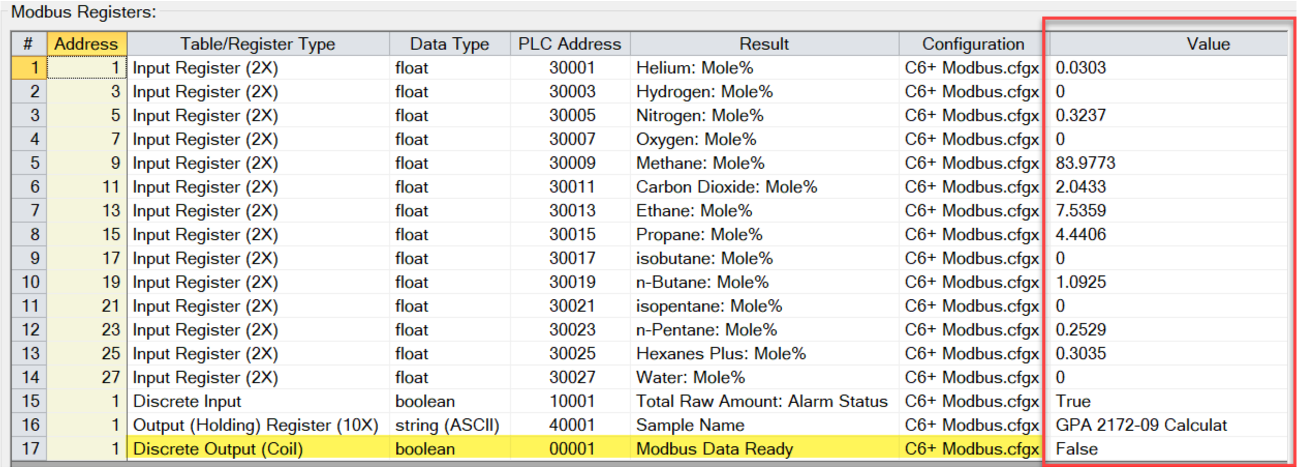


Shutdown EZReporter

There appears to be a Modbus Master connected to the Modbus Slave Server. Are you sure you want to shutdown EZReporter now?

Updating Register Results

If the Modbus module is active, then the numeric values for each of the registers in the Modbus Register table will be updated whenever results are processed by EZReporter. The current value of each register is displayed in the “Value” column of the register table. If you have added the “Modbus Data Ready” result to the register table, then after all of the registers have been updated it will change to a value of “True” (1) for the duration of the “Data Ready Reset Interval” defined in the server settings, after which it will return to “False” (0).

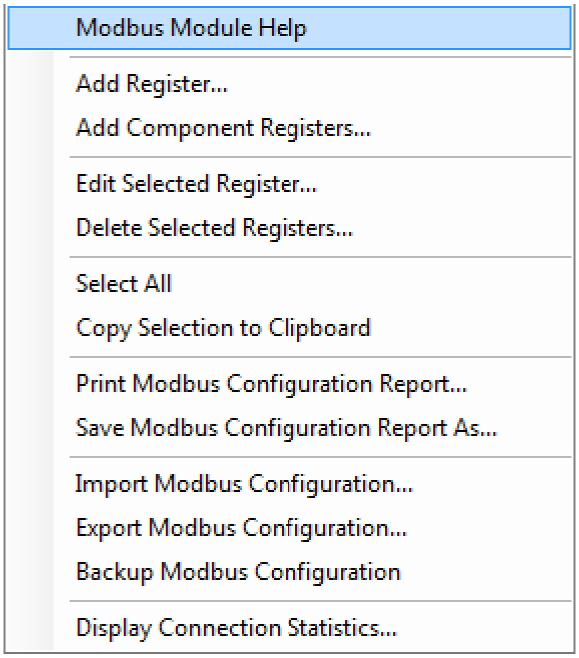


Modbus Registers:

#	Address	Table/Register Type	Data Type	PLC Address	Result	Configuration	Value
1	1	Input Register (2X)	float	30001	Helium: Mole%	C6+ Modbus.cfgx	0.0303
2	3	Input Register (2X)	float	30003	Hydrogen: Mole%	C6+ Modbus.cfgx	0
3	5	Input Register (2X)	float	30005	Nitrogen: Mole%	C6+ Modbus.cfgx	0.3237
4	7	Input Register (2X)	float	30007	Oxygen: Mole%	C6+ Modbus.cfgx	0
5	9	Input Register (2X)	float	30009	Methane: Mole%	C6+ Modbus.cfgx	83.9773
6	11	Input Register (2X)	float	30011	Carbon Dioxide: Mole%	C6+ Modbus.cfgx	2.0433
7	13	Input Register (2X)	float	30013	Ethane: Mole%	C6+ Modbus.cfgx	7.5359
8	15	Input Register (2X)	float	30015	Propane: Mole%	C6+ Modbus.cfgx	4.4406
9	17	Input Register (2X)	float	30017	isobutane: Mole%	C6+ Modbus.cfgx	0
10	19	Input Register (2X)	float	30019	n-Butane: Mole%	C6+ Modbus.cfgx	1.0925
11	21	Input Register (2X)	float	30021	isopentane: Mole%	C6+ Modbus.cfgx	0
12	23	Input Register (2X)	float	30023	n-Pentane: Mole%	C6+ Modbus.cfgx	0.2529
13	25	Input Register (2X)	float	30025	Hexanes Plus: Mole%	C6+ Modbus.cfgx	0.3035
14	27	Input Register (2X)	float	30027	Water: Mole%	C6+ Modbus.cfgx	0
15	1	Discrete Input	boolean	10001	Total Raw Amount: Alarm Status	C6+ Modbus.cfgx	True
16	1	Output (Holding) Register (10X)	string (ASCII)	40001	Sample Name	C6+ Modbus.cfgx	GPA 2172-09 Calculat
17	1	Discrete Output (Coil)	boolean	00001	Modbus Data Ready	C6+ Modbus.cfgx	False

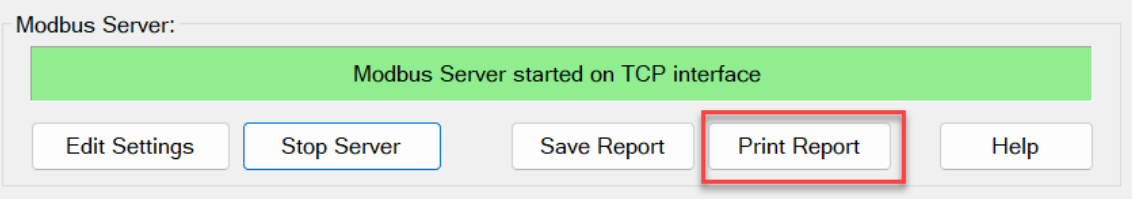
Additional Options

The following additional options are available either via buttons on the main Modbus Module panel, or via the pop-up menu that is displayed when you right click on the Modbus Register table:


Modbus Module Help
Add Register...
Add Component Registers...
Edit Selected Register...
Delete Selected Registers...
Select All
Copy Selection to Clipboard
Print Modbus Configuration Report...
Save Modbus Configuration Report As...
Import Modbus Configuration...
Export Modbus Configuration...
Backup Modbus Configuration
Display Connection Statistics...

Print Modbus Configuration Report

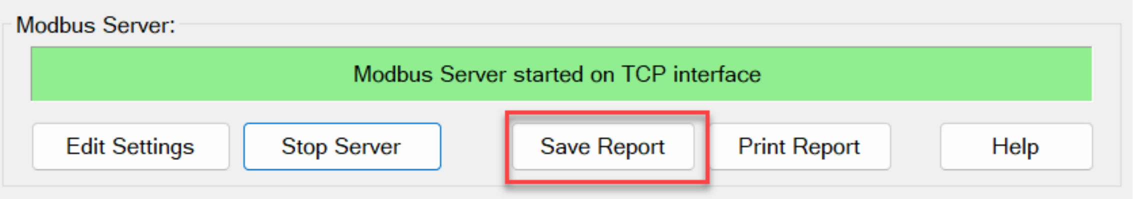
You can print a report of the current Modbus configuration (Server settings and Register Table) either by clicking the “Print” button in the “Modbus Server” section of the Modbus Module panel, or by right-clicking the register table and selecting “Print Modbus Configuration Report” from the pop-up menu.



Modbus Server started on TCP interface

Save Modbus Configuration Report

You can save a report of the current Modbus configuration (Server settings and Register Table) to a PDF file either by clicking the “Save Report” button in the “Modbus Server” section of the Modbus Module panel, or by right-clicking the register table and selecting “Save Modbus Configuration Report As…” from the pop-up menu.



Modbus Server started on TCP interface

Copy Modbus Table to Clipboard

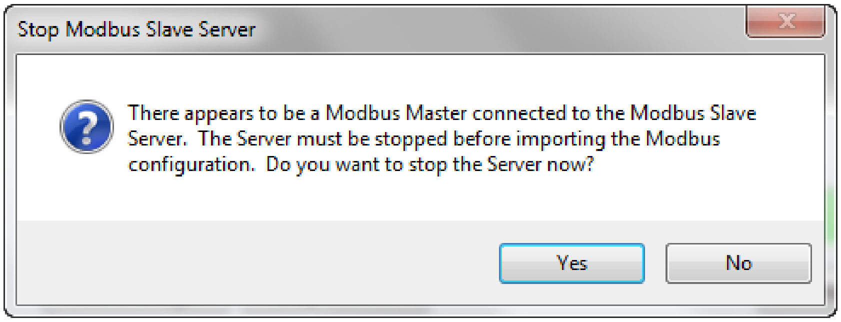
This option will copy the rows and columns that are currently selected in the register table to the Windows clipboard. This can be useful if you want to past the register table into Word or Excel for other reporting or documentation purposes.

Note: You can click “Select All” from the pop-up menu to select the entire register table.

Import Modbus Configuration

This option allows you to import a Modbus configuration from another system.

Note: The Modbus Slave Server must be stopped before you can make changes to the Modbus configuration. If the server detects that a Modbus Master is connected, you will be prompted whether or not you want to continue. If you stop the server with a Modbus Master connected, the Master will experience errors since the Slave will no longer respond.


Stop Modbus Slave Server

There appears to be a Modbus Master connected to the Modbus Slave Server. The Server must be stopped before importing the Modbus configuration. Do you want to stop the Server now?

Important: Since each Modbus register is linked to a specific configuration file, you will need to make sure that each configuration file specified in the register table is present on the system in order for the Modbus configuration to work as expected.

Export Modbus Configuration

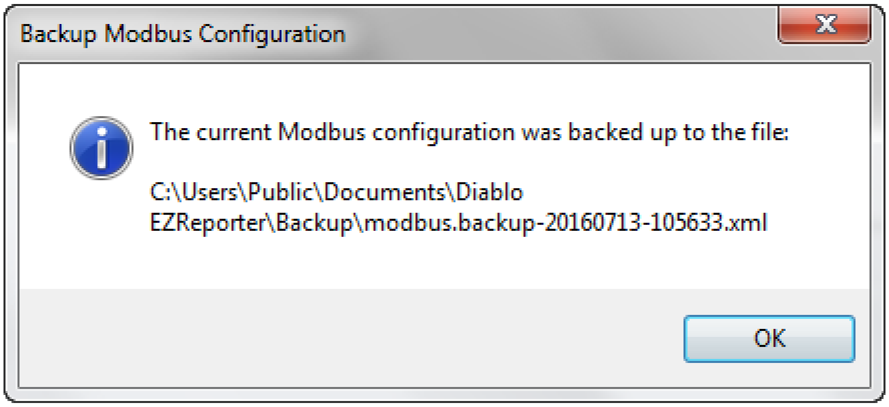
This option will save the current Modbus configuration to an XML file so that it can be transferred to another system.

Backup Modbus Configuration

This option allows you to back up the current configuration to the EZReporter backup folder:

C:\Users\Public\Documents\Diablo EZReporter\Backup

The backup file is named “Modbus.backup-YYYYMMDD-HHMMSS.xml” where YYYYMMDD-HHMMSS is the date and time that the backup file was created.

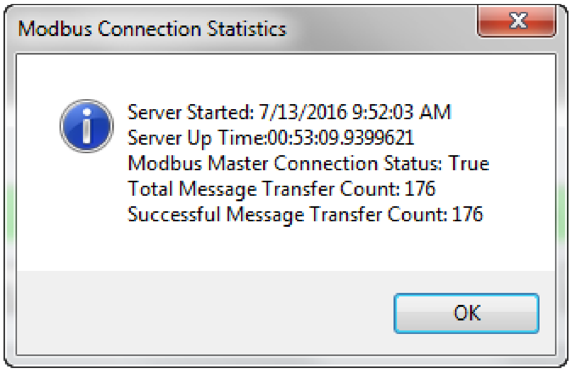


The current Modbus configuration was backed up to the file:

C:\Users\Public\Documents\Diablo EZReporter\Backup\modbus.backup-20160713-105633.xml

Display Connection Statistics

This option displays information about the Modbus server and connection statistics:



Server Started: 7/13/2016 9:52:03 AM
Server Up Time:00:53:09.9399621
Modbus Master Connection Status: True
Total Message Transfer Count: 176
Successful Message Transfer Count: 176

Server Started

Displays the date and time that the Modbus Slave Server was started.

Server Up Time

Displays the amount of time that has elapsed since the Modbus Slave Server was started (Days:Hours:Mintues:Seconds)

Modbus Master Connection Status

The Modbus Master Connection Status will be “True” if the Modbus Slave Server detects that a Modbus Master is currently connected to the server and has performed a message transfer within the server timeout period. Otherwise the status will be “False”.

Message Transfer Count

Displays the Total and Successful number of messages transferred between the Modbus Master and Modbus Slave since the server was last started.

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