



AGC 200



Option H2 Modbus communication



1. General information

1.1 Warnings, legal information and safety	3
1.1.1 Warnings and notes.....	3
1.1.2 Legal information and disclaimer.....	3
1.1.3 Safety issues.....	3
1.1.4 Electrostatic discharge awareness.....	3
1.1.5 Factory settings.....	4

2. Hardware information

2.1 Terminal and configuration	5
2.1.1 Terminal description.....	5
2.1.2 Hardware settings.....	5
2.2 Wiring	5

3. Parameters

3.1 Parameters related to Modbus communication	6
---	----------

4. Data tables

4.1 Configurable area (Read input registers (04))	7
4.1.1 Modbus configurator.....	7
4.2 Reference tables	8
4.3 Data scaling	8

5. Parameter setting

5.1 Introduction	10
5.2 Address areas	10
5.2.1 Read coil (Function code 01).....	10
5.2.2 Read discrete inputs (Function code 02).....	10
5.2.3 Read holding registers (Function code 03).....	10
5.2.4 Read input registers (Function code 04).....	11
5.2.5 Write single/multiple coils (Function code 05/15).....	11
5.2.6 Write single/multiple holding registers (Function code 06/16).....	11
5.3 Parameter Modbus addresses	12
5.4 Modbus address offset for alarms on CIO modules	13
5.4.1 Modbus alarm offset addresses for CIO 116.....	14
5.4.2 Modbus alarm offset addresses for CIO 208.....	14
5.4.3 Modbus alarm offset addresses for CIO 308.....	15

1. General information

1.1 Warnings, legal information and safety

1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

Warnings



DANGER!

Warnings indicate a potentially dangerous situation, which could result in death, personal injury or damaged equipment, if certain guidelines are not followed.

Notes



INFO

Notes provide general information, which will be helpful for the reader to bear in mind.

1.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the Multi-line 2 unit, the company responsible for the installation or the operation of the set must be contacted.



DANGER!

The Multi-line 2 unit is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

1.1.3 Safety issues

Installing and operating the Multi-line 2 unit may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.



DANGER!

Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

1.1.4 Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

1.1.5 Factory settings

The Multi-line 2 unit is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the engine/generator set in question. Precautions must be taken to check the settings before running the engine/generator set.

2. Hardware information

2.1 Terminal and configuration

2.1.1 Terminal description

All the AGC 200 variants use the same terminals for Modbus communication.

Terminal	Function	Description
4	DATA + (A)	Modbus RTU (RS-485)
5	DATA GND	
6	DATA - (B)	

2.1.2 Hardware settings

These are the RS-485 hardware settings:

1. 9600 or 19200 bps
2. 8 data bits
3. None parity
4. 1 stop bit
5. No flow control

2.2 Wiring



MORE INFORMATION

Refer to the Installation instructions for further information regarding wiring.

3. Parameters

3.1 Parameters related to Modbus communication

The option H2 relates to the parameters 7500-7520.



MORE INFORMATION

Refer to the Parameter list for further information, document number 4189340605.

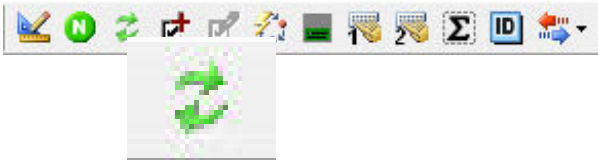
4. Data tables

4.1 Configurable area (Read input registers (04))

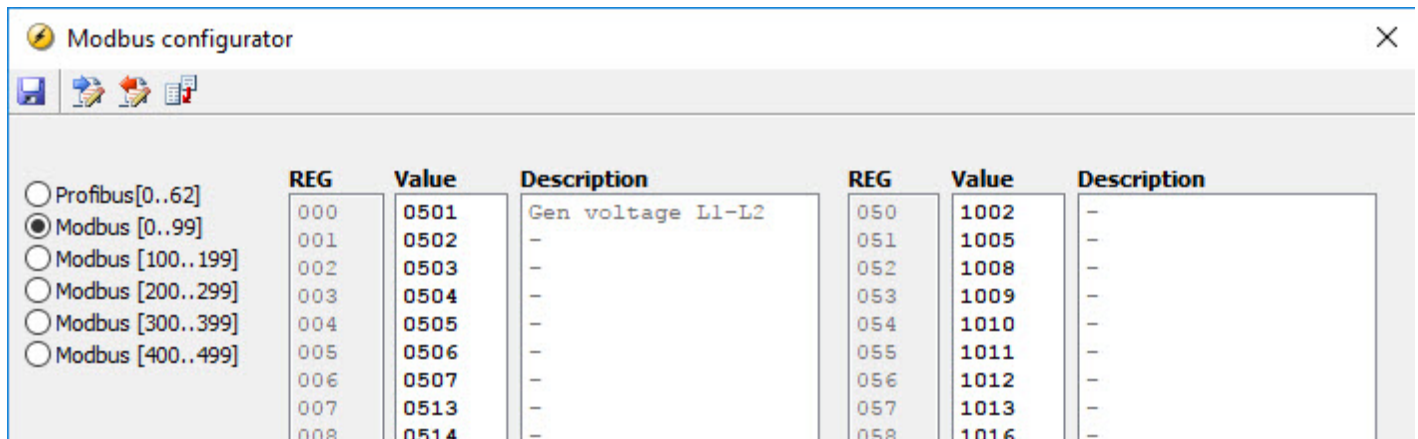
4.1.1 Modbus configurator

The Modbus configurator gives the user the possibility to select which data should be available for the first 500 Modbus addresses with the Modbus function 04.

Open the Modbus configurator from the toolbar in the utility software by clicking the icon shown below.



It is possible to configure the Modbus addresses 0 to 499 to any of the Modbus addresses from 500 to 1999 through the Modbus configurator, as shown below.



The window has four different columns that are described below:

Range: Each Modbus range contains 100 Modbus addresses. In the screenshot above, the Modbus address range 0 to 99 is selected. Note that Profibus is not supported in AGC 200.

REG: The information in the specific address REG is duplicated from the Modbus address configured in Value. The number changes when another range is selected (0 to 499).

Value: The Modbus address of the information that will be copied to the corresponding REG Modbus address.

Description: Free text for the user to fill in. The text is only saved in the parameter file. In the screenshot, it is configured via the Modbus configurator that the Modbus address 000 duplicates the information of Modbus address 501, which displays the generator voltage between L1 and L2, as the description shows.



INFO

The pop-up window has its own dedicated "Read/write" and "Copy description" buttons, which must be used for manual configuration.

4.2 Reference tables

The Modbus reference tables can be downloaded from the product page at www.deif.com under **Documentation > Modbus tables**. The Modbus reference tables are stored in an .xml file that contains the following information:

- Command flags (01; 05; 15)
- Status flags (02)
- Digital inputs (02)
- Digital outputs (02)
- Control registers (03; 06; 16)
- Date and time registers (03; 06; 16)
- AC measurements (04)
- Alarms and status (04)
- Power management measurements (04)
- Power management alarms and status (04)

The number in brackets refers to the Modbus function code (as a decimal value) for the information, and corresponds to the sheet names in the spreadsheet.

4.3 Data scaling

Modbus data is processed as data bytes. This data cannot directly process decimal values. Therefore scaling is defined to convert decimal values to a form that can be sent using Modbus, or to correctly interpret values received from Modbus. Data in the *Holding register* and *Input register* is scaled according to the formula:

$$\text{Actual value} = \text{Value in register} * 10^{-\text{Scaling}}$$

The table below lists parameter types and the scaling values that are normally used for them. Parameter types that are not scaled, are not listed in the table.

Table 4.1 Scaling values normally used by specific parameter types

Parameter type	Scaling
Phase angle	1
DC supply voltage	1
Frequency	2
cos phi	2
Power factor	2



Scaling example

Nominal frequency 1 is set to 50.00 Hz. Frequency normally has a scaling value of 2.

When nominal frequency 1 is read from the controller using Modbus, the Modbus register returns 5000. The actual value is determined by:

$$\begin{aligned}\text{Actual value} &= \text{Value in register} * 10^{-\text{Scaling}} \\ &= 5000 * 10^{-2} \\ &= 50.00\end{aligned}$$

To write a new value of 60.00 Hz to the controller using Modbus, the value that should be written to the register is:

$$\begin{aligned}\text{Value in register} &= \text{Actual value} / 10^{\text{Scaling}} \\ &= 60.00 / 10^{-2} \\ &= 6000\end{aligned}$$

5. Parameter setting

5.1 Introduction

Modbus communication is used to read parameter data from the controller and write parameter data to the controller. The Modbus address for a specific parameter is determined using the "Address" in the Utility Software (USW) and the address area for a specific parameter setting. This chapter lists the different address areas, and describes how to determine the Modbus address for a parameter.

5.2 Address areas

5.2.1 Read coil (Function code 01)

Reads the ON/OFF status of discrete output coils in the slave unit. The controller returns **0** (FALSE) when the coil is not activated, and **1** (TRUE) when the coil is activated.

Address area for reading status flags

Data to request	Address area
Enable	2000-3999

5.2.2 Read discrete inputs (Function code 02)

Reads the ON/OFF status of discrete input contacts in the slave unit. The controller returns **0** (FALSE) when the discrete input is not activated, and **1** (TRUE) when the discrete input is activated.

Address areas for reading status flags

Data to request	Address area
Alarm active	4000-5999
Alarm acknowledge	6000-7999
Timer output	8000-9999
Timer running	10000-11999

5.2.3 Read holding registers (Function code 03)

Reads the data value contained in the holding registers. The data can be signed integers (16 or 32 bit) or boolean values. The controller returns the value stored in the holding register. Ensure that you know the scaling used for the address to interpret the value correctly.

Address areas for reading holding registers

Data to request	Address area
Timers used	2000-3999
Values used	4000-5999
Values minimum	6000-7999
Values maximum	8000-9999
Output A	10000-11999

Data to request	Address area
Output B	12000-13999
Fail class used	14000-15999
Enable	16000-17999
Inhibit	18000-19999

5.2.4 Read input registers (Function code 04)

Reads the data value contained in the input registers. The data can be signed integers (16 or 32 bit) or boolean values. The controller returns the value stored in the input register. Ensure that you know the scaling used for the address to interpret the value correctly.

Address areas for reading input registers

Data to request	Address area
Timers minimum	2000-3999
Timers maximum	4000-5999
Output A minimum	6000-7999
Output A maximum	8000-9999
Output B minimum	10000-11999
Output B maximum	12000-13999
Fail class minimum	14000-15999
Fail class maximum	16000-17999
Timers elapsed time	20000-21999

5.2.5 Write single/multiple coils (Function code 05/15)

Change the ON/OFF status of a single or multiple discrete output coils in the slave unit. Write **0** (FALSE) to deactivate the coil, or **1** (TRUE) to activate the coil.

Address areas for writing status flags

Data to request	Address area
Enable	2000-3999
Acknowledge alarm	6000-7999

5.2.6 Write single/multiple holding registers (Function code 06/16)

Change the value of a single or multiple holding registers in the slave unit. The data can be signed integers (16 or 32 bit) or boolean values. When writing values to holding registers, ensure that you use the correct scaling and data type for the register address.

Address area for writing holding registers

Data to request	Address area
Timers used	2000-3999
Values used	4000-4999
Output A	10000-11999

Data to request	Address area
Output B	12000-13999
Fail class used	14000-15999
Enable	16000-17999
Inhibit	18000-19999

5.3 Parameter Modbus addresses

The Modbus address for a parameter is the sum of the **Address** in the Utility Software (USW) and the first value of the address area of interest. To find the address of a specific parameter, go to the **Parameters** tab in the USW, then find the parameter using the parameter's name or parameter number (**Channel** column). The parameter address is located in the **Address** column.

Examples



Acknowledge alarm

In this example an over-voltage 1 alarm is active and unacknowledged. First we will check if the alarm is already acknowledged, then acknowledge the alarm using Modbus.

- The parameter number for the over-voltage 1 alarm is 1150. Find the parameter in the USW in the **Parameters** tab and note the **Address** value for the parameter (12 for over-voltage 1).
 - The parameter numbers are listed in the **Channel** column.

Category	Channel	Text	Address	Value	Unit	Timer	OutputA	OutputB	Enabled	HighAlarm
Protection	1150	G U> 1	12	103	%	10	Not used	Not used	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protection	1160	G U> 2	13	105	%	5	Not used	Not used	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protection	1170	G U< 1	14	97	%	10	Not used	Not used	<input type="checkbox"/>	<input type="checkbox"/>
Protection	1180	G U< 2	15	95	%	5	Not used	Not used	<input type="checkbox"/>	<input type="checkbox"/>
Protection	1190	G U< 3	16	95	%	5	Not used	Not used	<input type="checkbox"/>	<input type="checkbox"/>

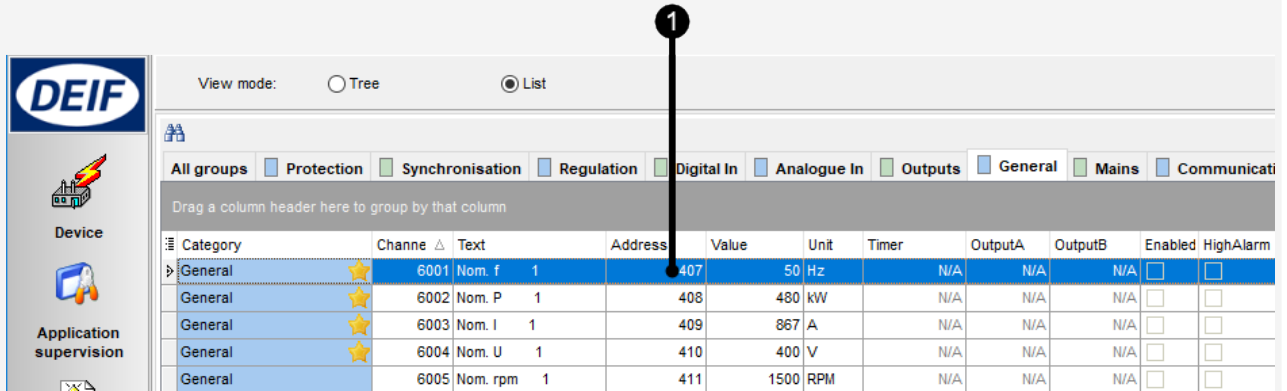
- To read if the alarm is acknowledged, go to the table in **Address areas > Read discrete input (Function code 02)**. The address area for *Alarm acknowledge* starts at 6000.
- The Modbus address to read the parameter is: Parameter **Address** + Address area start = 12 + 6000 = 6012.
- Use function code 02 to read address 6012.
 - For this example when the address is read, the controller returns **0** (FALSE). This means that the alarm is not acknowledged.
- To acknowledge the alarm, go to the table in **Address areas > Write single/multiple coils (Function code 05/15)**. The address area for *Acknowledge alarm* starts at 6000.
- The Modbus address to read the parameter is: Parameter **Address** + Address area start = 12 + 6000 = 6012.
- Use function code 05 to write **1** (TRUE) to address 6012.
 - The alarm is now acknowledged and reading address 6012 using function code 02 returns **1** (TRUE). This means the alarm is acknowledged.



Change nominal frequency

In this example nominal frequency 1 is changed from 50 Hz to 60 Hz.

1. The parameter number for the nominal frequency 1 is 6001. Find the parameter in the USW in the **Parameters** tab and note the **Address** value for the parameter (407 for nominal frequency 1).



View mode: Tree List

All groups Protection Synchronisation Regulation Digital In Analogue In Outputs General Mains Communicati

Drag a column header here to group by that column

Category	Channe	Text	Address	Value	Unit	Timer	OutputA	OutputB	Enabled	HighAlarm
General	6001	Nom. f 1	407	50	Hz		N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
General	6002	Nom. P 1	408	480	kW		N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
General	6003	Nom. I 1	409	867	A		N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
General	6004	Nom. U 1	410	400	V		N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
General	6005	Nom. rpm 1	411	1500	RPM		N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>

2. To change the nominal frequency, go to the table in **Address areas > Write single/multiple holding registers (Function code 06/16)**. The address area for *Values used* starts at 4000.
3. The Modbus address to write the new value to is: Parameter **Address** + Address area start = 407 + 4000 = 4407.
4. The nominal frequency has a scaling of 2. To write 60 Hz to the address a value of 6000 must be written to the address. Use function code 06 to write 6000 to address 4407.
 - Nominal frequency 1 is now 60.00 Hz. To confirm the change use function code 03 to read address 4407. The address returns 6000. (Also scaled by a factor of 2.)

5.4 Modbus address offset for alarms on CIO modules

The Modbus offset addresses related to the CIO modules are not listed in the USW like all other offset addresses. The tables in the following pages show the CIO modules' Modbus offset addresses. The procedure for reading/writing in Modbus is still the same as previously described.



INFO

DEIF recommends using the USW to configure the CIO modules.

5.4.1 Modbus alarm offset addresses for CIO 116

Description	Address offset	Description	Address offset
CIO 116 no. 1. Input 10	1047	CIO 116 no. 2. Input 21	1260
CIO 116 no. 1. Input 11	1048	CIO 116 no. 2. Input 22	1261
CIO 116 no. 1. Input 12	1049	CIO 116 no. 2. Input 23	1264
CIO 116 no. 1. Input 13	1050	CIO 116 no. 2. Input 24	1266
CIO 116 no. 1. Input 14	1051	CIO 116 no. 2. Input 25	1267
CIO 116 no. 1. Input 15	1052	CIO 116 no. 2. Input 26	1272
CIO 116 no. 1. Input 16	1053	CIO 116 no. 3. Input 10	1296
CIO 116 no. 1. Input 17	1054	CIO 116 no. 3. Input 11	1316
CIO 116 no. 1. Input 19	1055	CIO 116 no. 3. Input 12	1323
CIO 116 no. 1. Input 20	1056	CIO 116 no. 3. Input 13	1324
CIO 116 no. 1. Input 21	1057	CIO 116 no. 3. Input 14	1325
CIO 116 no. 1. Input 22	1058	CIO 116 no. 3. Input 15	1327
CIO 116 no. 1. Input 23	1059	CIO 116 no. 3. Input 16	1328
CIO 116 no. 1. Input 24	1060	CIO 116 no. 3. Input 17	1329
CIO 116 no. 1. Input 25	1061	CIO 116 no. 3. Input 19	1330
CIO 116 no. 1. Input 26	1062	CIO 116 no. 3. Input 20	1331
CIO 116 no. 2. Input 10	1194	CIO 116 no. 3. Input 21	1332
CIO 116 no. 2. Input 11	1195	CIO 116 no. 3. Input 22	1333
CIO 116 no. 2. Input 12	1196	CIO 116 no. 3. Input 23	1334
CIO 116 no. 2. Input 13	1197	CIO 116 no. 3. Input 24	1362
CIO 116 no. 2. Input 14	1198	CIO 116 no. 3. Input 25	1363
CIO 116 no. 2. Input 15	1199	CIO 116 no. 3. Input 26	1364
CIO 116 no. 2. Input 16	1200	CIO 116 no. 1 missing	957
CIO 116 no. 2. Input 17	1237	CIO 116 no. 2 missing	960
CIO 116 no. 2. Input 19	1238	CIO 116 no. 3 missing	963
CIO 116 no. 2. Input 20	1257		



INFO

Address offset 957, 960 and 963 are read only addresses.

5.4.2 Modbus alarm offset addresses for CIO 208

Description	Address offset
CIO 208 no. 1 missing	958
CIO 208 no. 2 missing	961
CIO 208 no. 3 missing	964



INFO

Address offset 958, 961 and 964 are read only addresses.

5.4.3 Modbus alarm offset addresses for CIO 308

Description	Address offset	Description	Address offset
CIO 308 no. 1. Input 8 alarm 1	999	CIO 308 no. 3. Input 17 alarm 1	1567
CIO 308 no. 1. Input 8 alarm 2	1000	CIO 308 no. 3. Input 17 alarm 2	1568
CIO 308 no. 1. Input 11 alarm 1	1001	CIO 308 no. 3. Input 20 alarm 1	1569
CIO 308 no. 1. Input 11 alarm 2	1002	CIO 308 no. 3. Input 20 alarm 2	1570
CIO 308 no. 1. Input 14 alarm 1	1003	CIO 308 no. 3. Input 23 alarm 1	1571
CIO 308 no. 1. Input 14 alarm 2	1004	CIO 308 no. 3. Input 23 alarm 2	1572
CIO 308 no. 1. Input 17 alarm 1	1005	CIO 308 no. 3. Input 26 alarm 1	1573
CIO 308 no. 1. Input 17 alarm 2	1006	CIO 308 no. 3. Input 26 alarm 2	1574
CIO 308 no. 1. Input 20 alarm 1	1007	CIO 308 no. 3. Input 29 alarm 1	1575
CIO 308 no. 1. Input 20 alarm 2	1008	CIO 308 no. 3. Input 29 alarm 2	1576
CIO 308 no. 1. Input 23 alarm 1	1009	CIO 308 no. 1 missing	959
CIO 308 no. 1. Input 23 alarm 2	1010	CIO 308 no. 1 missing	962
CIO 308 no. 1. Input 26 alarm 1	1011	CIO 308 no. 1 missing	965
CIO 308 no. 1. Input 26 alarm 2	1012	CIO 308 no. 1. Input 8 wire fail	1031
CIO 308 no. 1. Input 29 alarm 1	1013	CIO 308 no. 1. Input 11 wire fail	1032
CIO 308 no. 1. Input 29 alarm 2	1014	CIO 308 no. 1. Input 14 wire fail	1033
CIO 308 no. 2. Input 8 alarm 1	1015	CIO 308 no. 1. Input 17 wire fail	1034
CIO 308 no. 2. Input 8 alarm 2	1016	CIO 308 no. 1. Input 20 wire fail	1035
CIO 308 no. 2. Input 11 alarm 1	1017	CIO 308 no. 1. Input 23 wire fail	1036
CIO 308 no. 2. Input 11 alarm 2	1018	CIO 308 no. 1. Input 26 wire fail	1037
CIO 308 no. 2. Input 14 alarm 1	1019	CIO 308 no. 1. Input 29 wire fail	1038
CIO 308 no. 2. Input 14 alarm 2	1020	CIO 308 no. 2. Input 8 wire fail	1039
CIO 308 no. 2. Input 17 alarm 1	1021	CIO 308 no. 2. Input 11 wire fail	1040
CIO 308 no. 2. Input 17 alarm 2	1022	CIO 308 no. 2. Input 14 wire fail	1041
CIO 308 no. 2. Input 20 alarm 1	1023	CIO 308 no. 2. Input 17 wire fail	1042
CIO 308 no. 2. Input 20 alarm 2	1024	CIO 308 no. 2. Input 20 wire fail	1043
CIO 308 no. 2. Input 23 alarm 1	1025	CIO 308 no. 2. Input 23 wire fail	1044
CIO 308 no. 2. Input 23 alarm 2	1026	CIO 308 no. 2. Input 26 wire fail	1045
CIO 308 no. 2. Input 26 alarm 1	1027	CIO 308 no. 2. Input 29 wire fail	1046
CIO 308 no. 2. Input 26 alarm 2	1028	CIO 308 no. 3. Input 8 wire fail	1083
CIO 308 no. 2. Input 29 alarm 1	1029	CIO 308 no. 3. Input 11 wire fail	1085
CIO 308 no. 2. Input 29 alarm 2	1030	CIO 308 no. 3. Input 14 wire fail	1086
CIO 308 no. 3. Input 8 alarm 1	1531	CIO 308 no. 3. Input 17 wire fail	1110
CIO 308 no. 3. Input 8 alarm 2	1532	CIO 308 no. 3. Input 20 wire fail	1391
CIO 308 no. 3. Input 11 alarm 1	1560	CIO 308 no. 3. Input 23 wire fail	1392
CIO 308 no. 3. Input 11 alarm 2	1563	CIO 308 no. 3. Input 26 wire fail	1427
CIO 308 no. 3. Input 14 alarm 1	1565	CIO 308 no. 3. Input 29 wire fail	1529
CIO 308 no. 3. Input 14 alarm 2	1566		



INFO

Address offset 959, 962 and 965 are read only addresses.