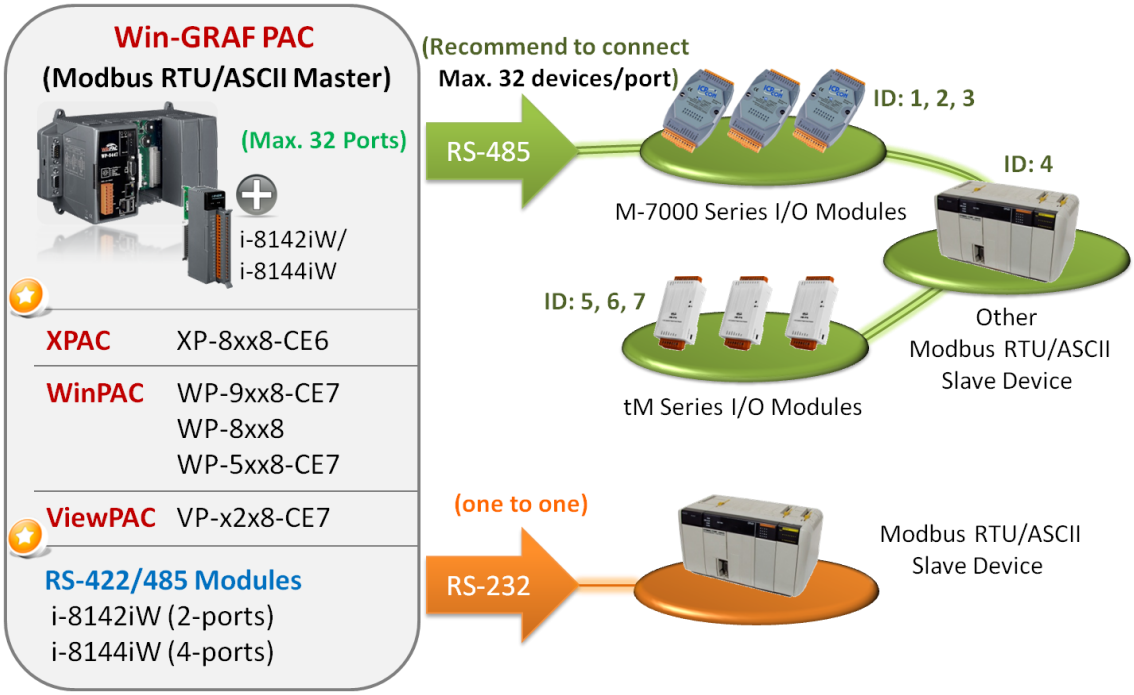
How to Enable the Win-GRAF PAC as the Modbus RTU/ASCII Master to Read/Write data?

Click the link for more Win-GRAF FAQ

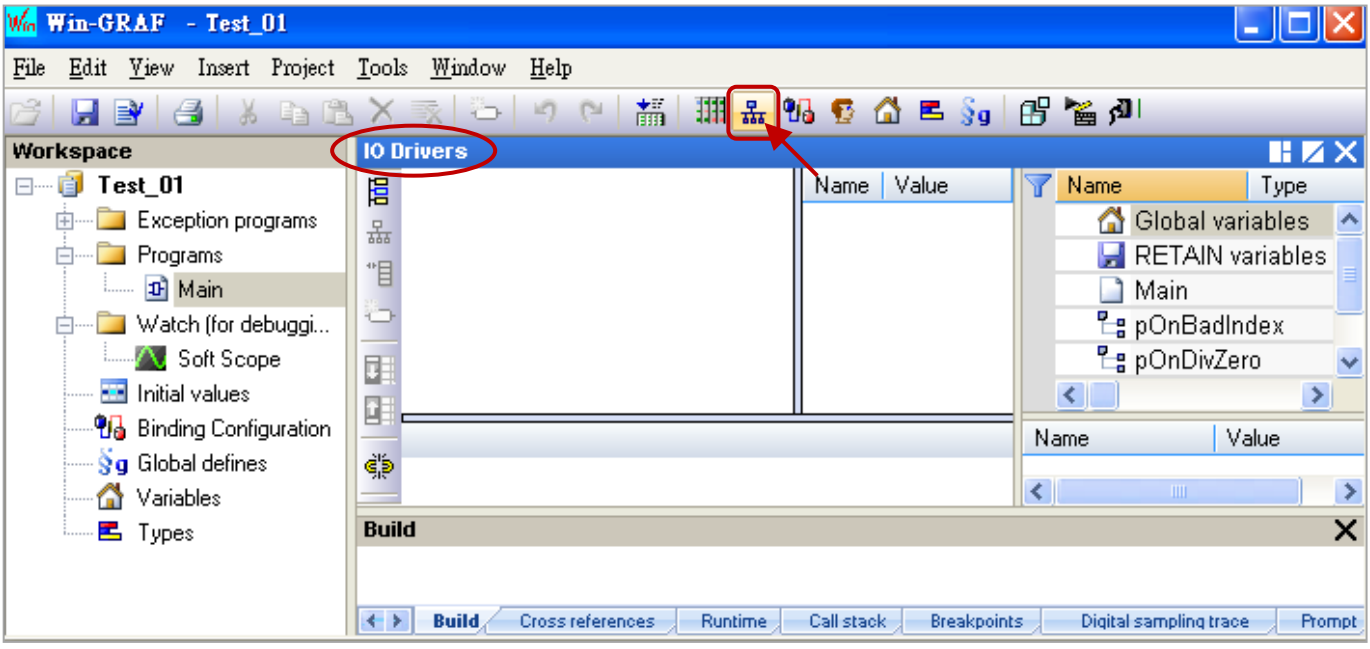
1.1. Enabling the Win-GRAF PAC as a Modbus RTU/ASCII Master

Application Diagram:



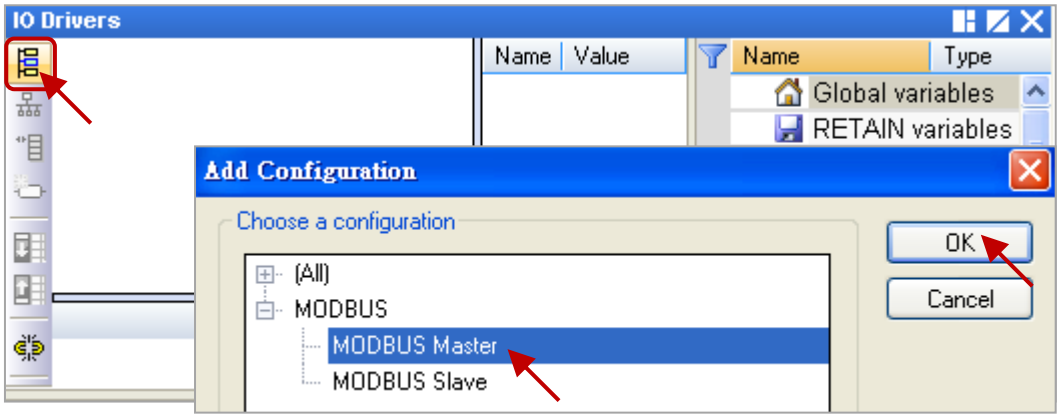
Follow these steps:

1. Click the "Open Fieldbus Configuration" tool button to open "IO Drivers" window.

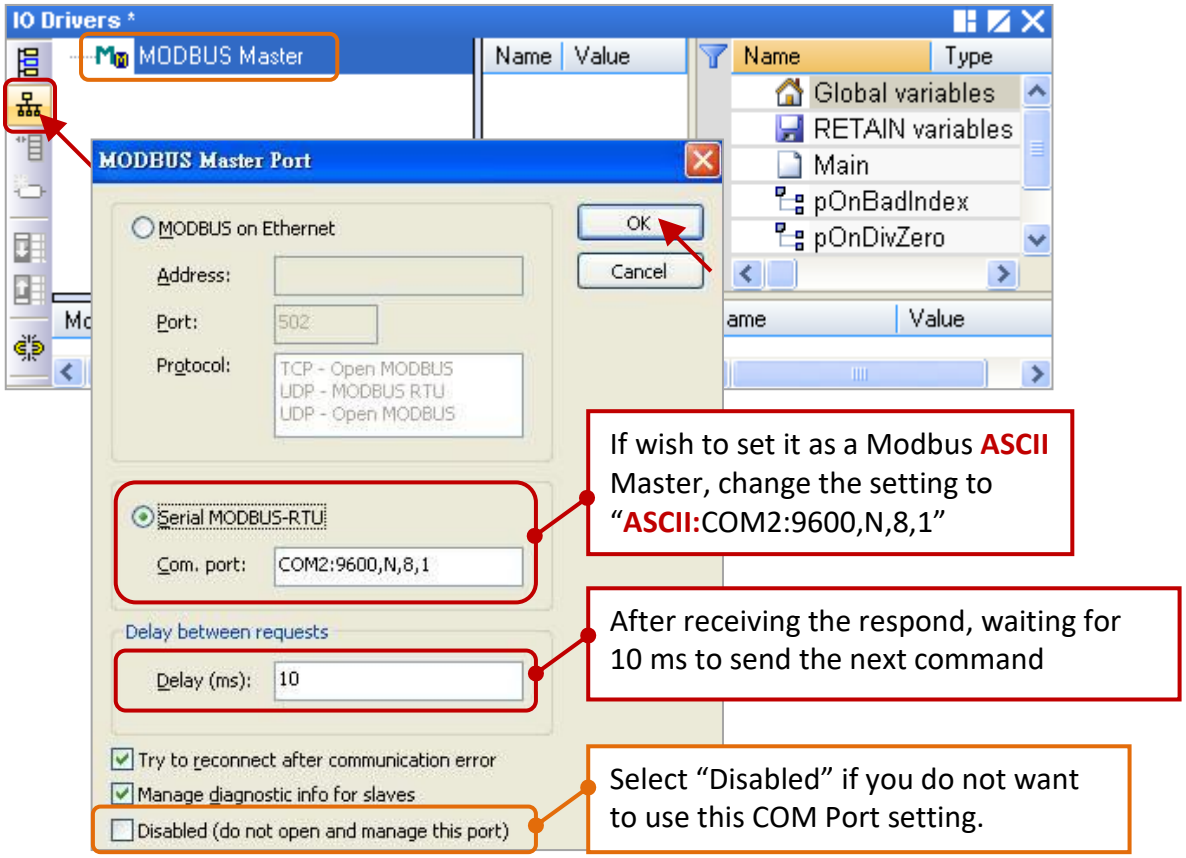


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2. Click the “Insert Configuration” button on the left of the “IO Drivers” window, then click the “MOSBUS Master” and “OK” to enable the Modbus Master setting.

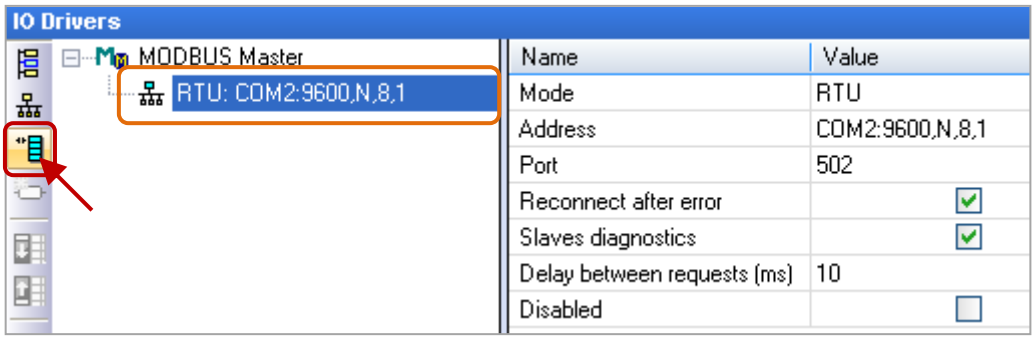


3. Click the “Insert Master/Port” button on the left side to open the setting window. Then, select the “Serial MODBUS-RTU”, set COM Port (e.g., “COM2:9600,N,8,1”) and Delay time (recommended value: 10 ms, it can be 0 to 10000), and then click “OK”.



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4. Click the “Insert Slave/Data Block” button on the left side to create a data block.



This table lists five data blocks, and each data block stands for one Modbus Master Request.

Item	Function Code	Modbus Request	Description
1	2	Read Input-bits	Read DI data
2	5	Write single coil-bit	Write DO data
3	4	Read Input Registers	Read AI data
4	6	Write single holding register	Write one AO data (16-bit)
5	16	Write Holding Registers	Write multiple AO data (16/32 bits)

1.1.1. Read DI data

1. Completing all the following settings in the “MODBUS Master Request” window as the figure below, and then click “OK".

   a. Slave/Unit: Enter the Net-ID of the Slave device. (In this case, the Net-ID is “1”).

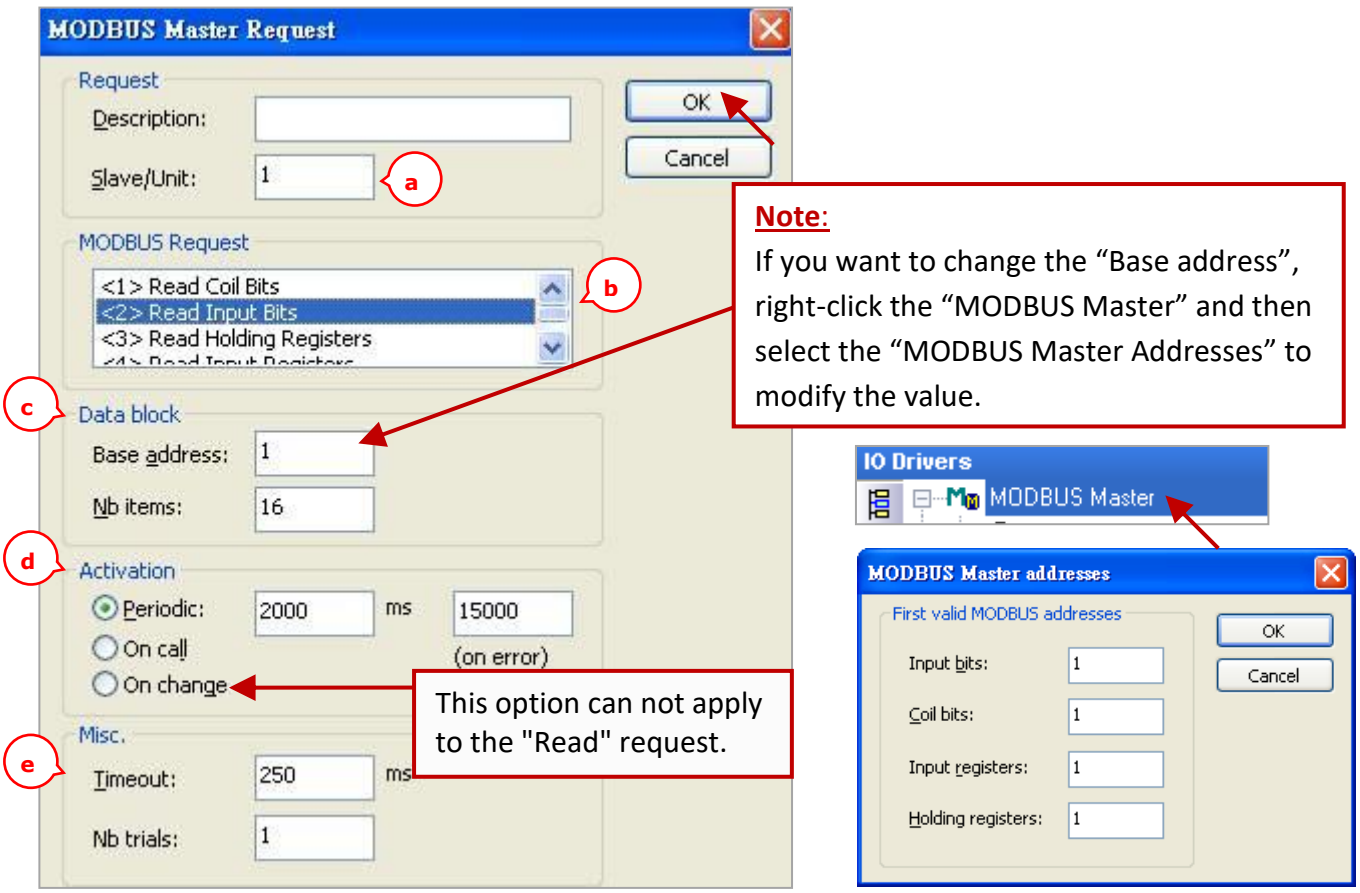
   b. MODBUS Request: Select “<2> Read Input Bits” option.

   c. Base address: Start from “1” by default.
   Nb items: The number of DI signals to read.(In this case, the number is “16”).

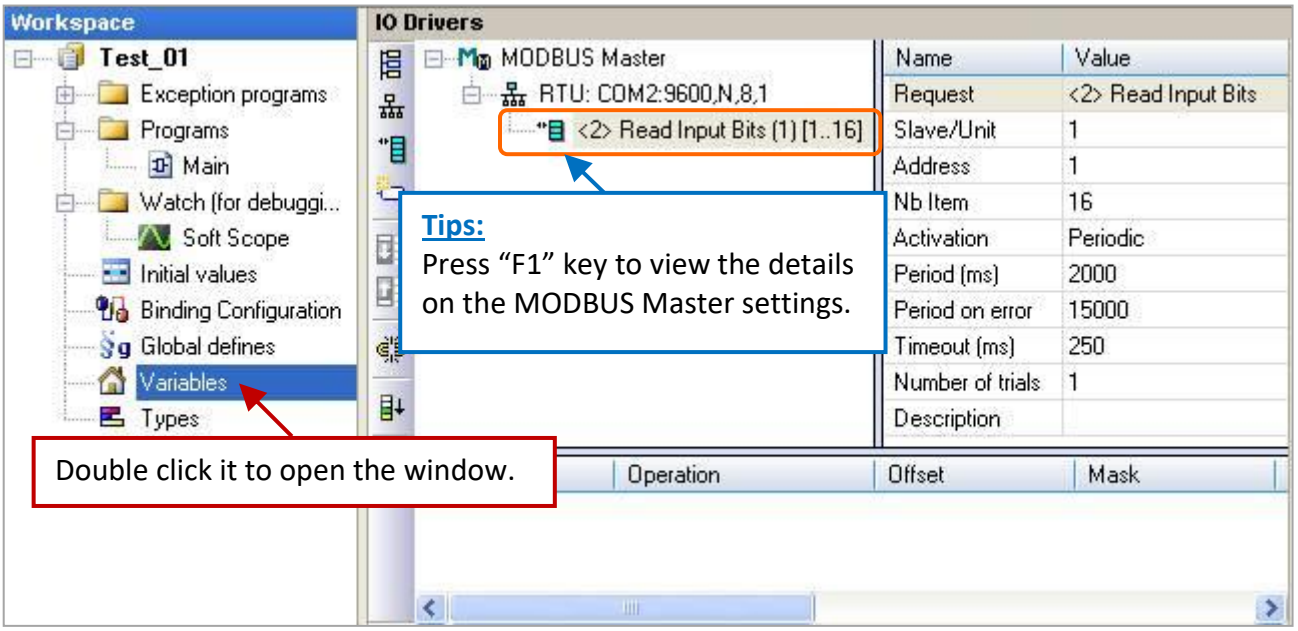
   d. Activation: The way to send the Modbus request.
   Periodic: Sending the request periodically. (In this case, to send once every two seconds.) “on error” means the next sending time when an exception occurred (e.g., 15 seconds).
   On call: The request is activated when a program call to send it.
   On change: In case of a write request, means that the request is activated each time any variable changed.

   e. Timeout: Set a timeout value. (When time-out occurred, it will show the defined error code.) The recommended value for the Modbus RTU/ASCII device is 200 to 1000 ms. E.g., 250 ms.

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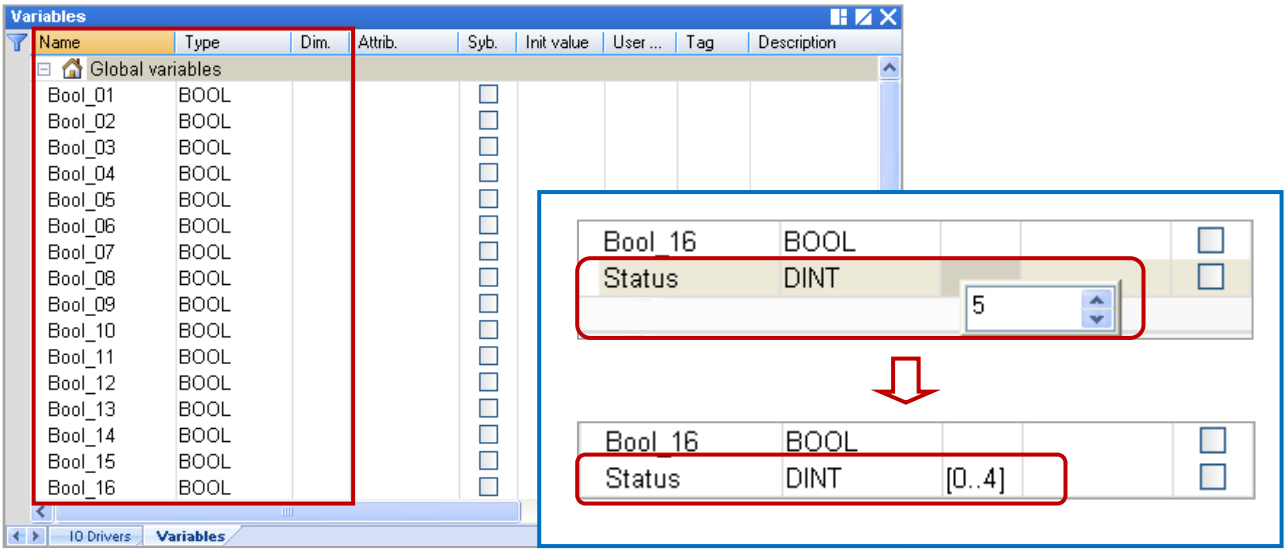


2. Next, open the “Variables” window and then declare variables that are available for the program.



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Declaring 16 variables to read data (Name: “Boo_01 to Boo_16”; Type: BOOL) and one array variable to record the state of data access (Name: “Status"; Dim.: 5; Type: DINT). If not familiar with this, refer the Win-GRAF Getting Started Manual (Section 2.3.1) for the way to declare variables, and the figure below shows defined variables.



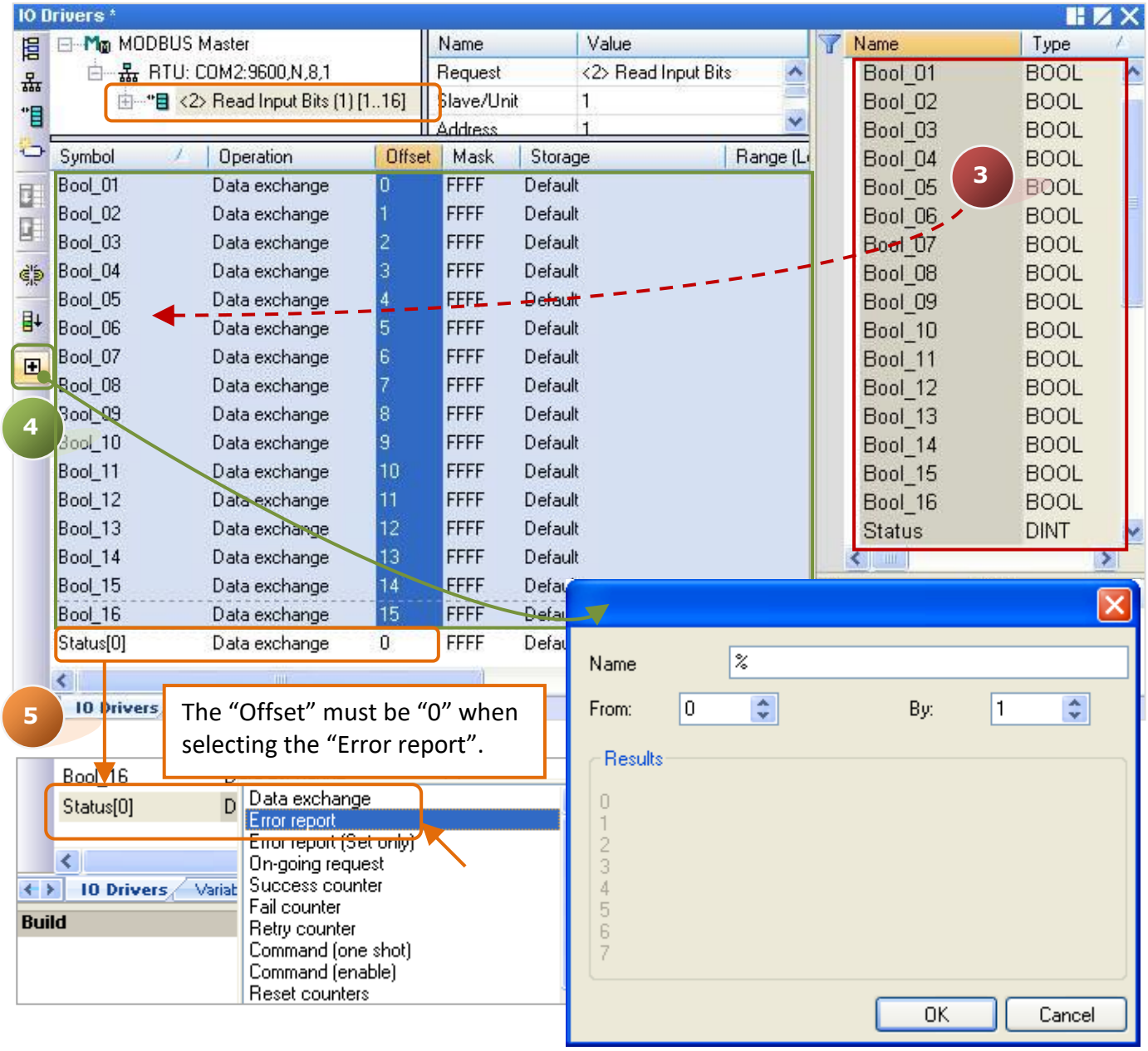
3. In the "IO Drivers" window like the figure below, drag all required variables in the Variables Area (i.e., “Bool_01” to “Bool_16” and “Status”) and drop them to the “Symbol” area in the first data block.

   Note: The “Status” is an array variable, so, the Status[0] to Status[4] will show on the “Symbol” area. **Click the “Del” key to delete the Status[1] to Status[4].**

4. Next, select “Offset” field from “Boo_01” to “Boo_16” and then click the “Iterate Property” button on the left side to set the “Offset” value (From: “0” ； By: “1”). Refer the Win-GRAF Getting Started Manual (Section 3.1 – Step8).

5. In the “Operation” field, set the “Status[0]” as “Error report” which means the return value is an “Error Code” if a read error occurred and the value will be reset to “0” if read successfully.

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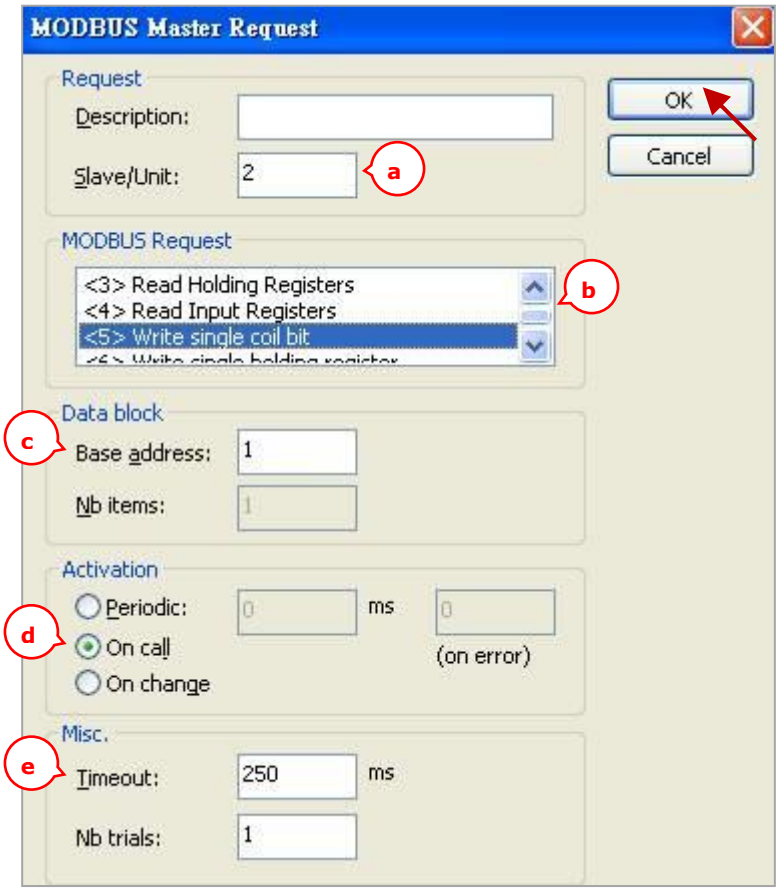
You can also press “F1” in this “IO Drivers” window to see details on Modbus Master Configuration.

Error Code	Description	Error Code	Description
0	The communication is OK.	8	Data Parity Error.
1	MODBUS function not supported.	10	Invalid gateway path.
2	Invalid MODBUS address.	11	Gateway target failed.
3	Invalid MODBUS value.	128	Communication timeout.
4	MODBUS Server failure.	129	Bad CRC16.
6	Server is busy.	130	RS-232 communication error.

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1.1.2. Write DO Data

1. Using the same way in the Section 1.1 - Step 4 to create the second data block and completing all the following settings in the “MODBUS Master Request” window, and then click “OK".



In this example

a. Slave/Unit:
Enter the Net-ID of the Slave device. (e.g., the Net-ID is “2”).

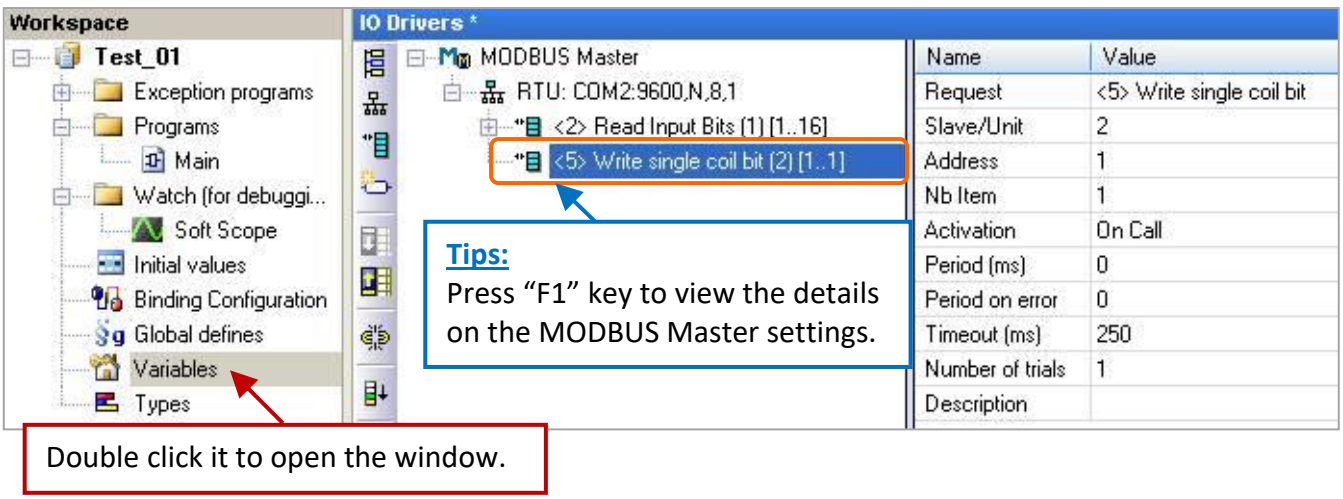
b. MODBUS Request:
Select “<5> Write single coil bit”.

c. Base address:
Start from “1” by default.
(Refer the Section 1.1.1 to change it.)

d. On call:
The request is activated when a program call to send it
(Refer the Section 1.1.1 for details)

e. Timeout: Set a timeout value.
When time-out occurred, it will show the defined error code. (The recommended value for the Modbus RTU/ASCII device is 200 to 1000 ms. In this case the value is 250 ms.)

2. Next, open the “Variables” window and then declare variables that are available for the program.

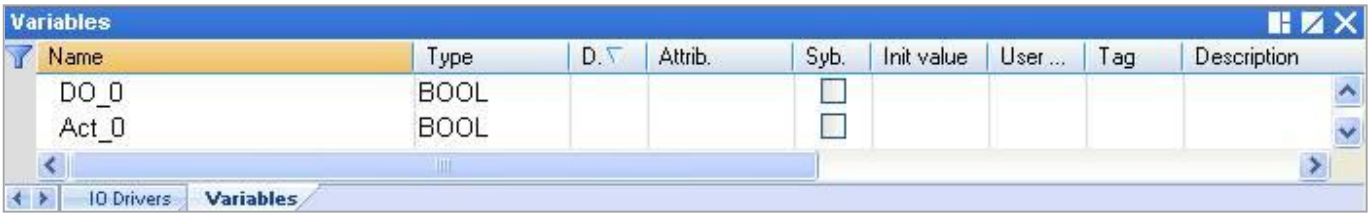


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Add two Boolean variables in the "Variables" window (If not familiar with this, refer the Win-GRAF Getting Started Manual - Section 2.3.1 for declaring variables).

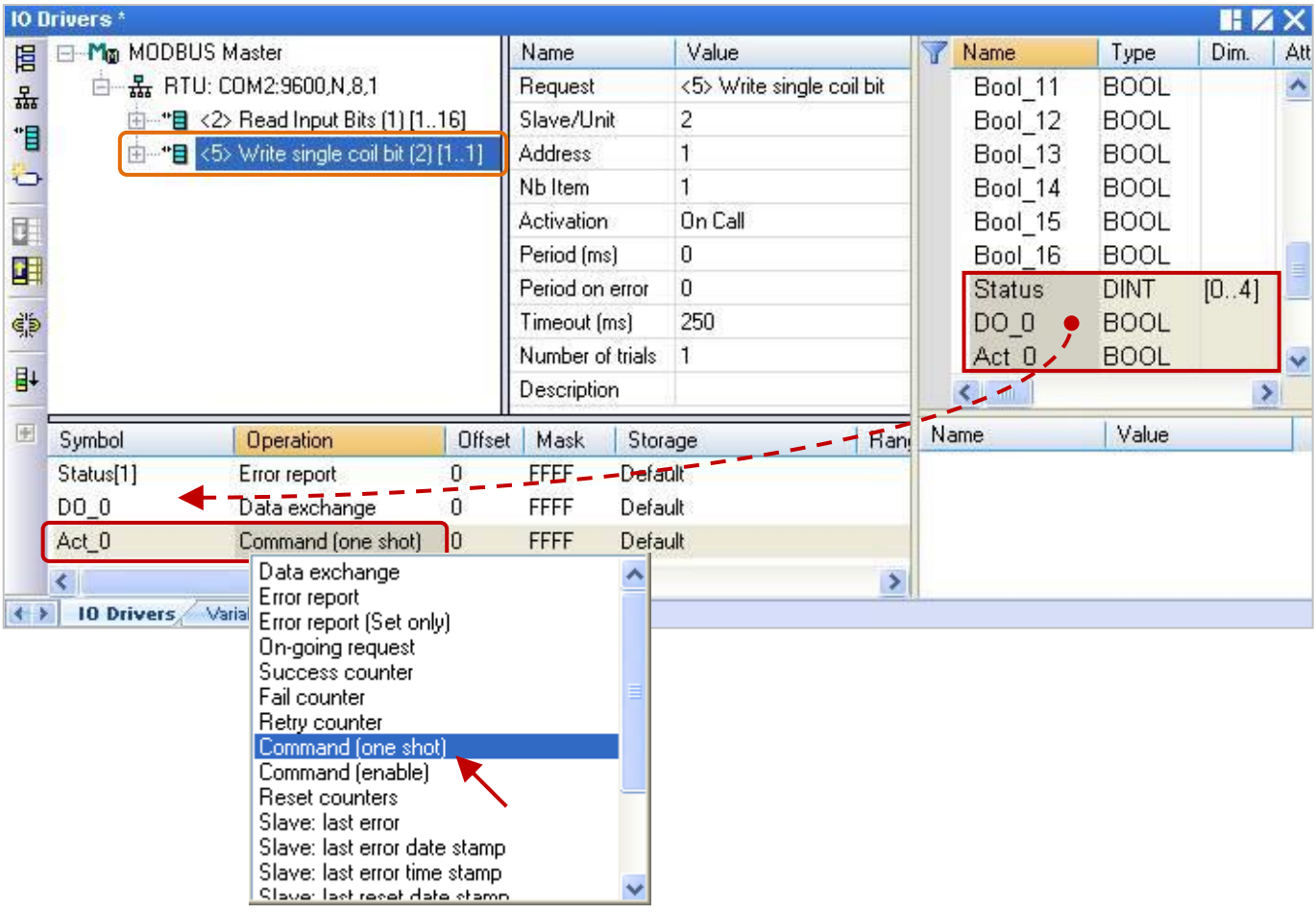
Variable name	Data type	Description
DO_0	BOOL	Used to Write digital output data.
Act_0	BOOL	In this case, choose the “On call” way to write data that means using a variable to call it.

After completing the settings, the defined variables show as below:



3. In the “IO Drivers” window, drag variables - “DO_0”, “Act_0” and “Status” (that created in the Section 1.1.1) from the Variables Area to the Symbol Area in the second data block.

Note: The “Status” is an array variable. When you drag “Status” into the Symbol Area, it will show “Status[0]” to “Status[4]", simply *press “Del” key to delete “Status[0]” and “Status[2] to [4]".*



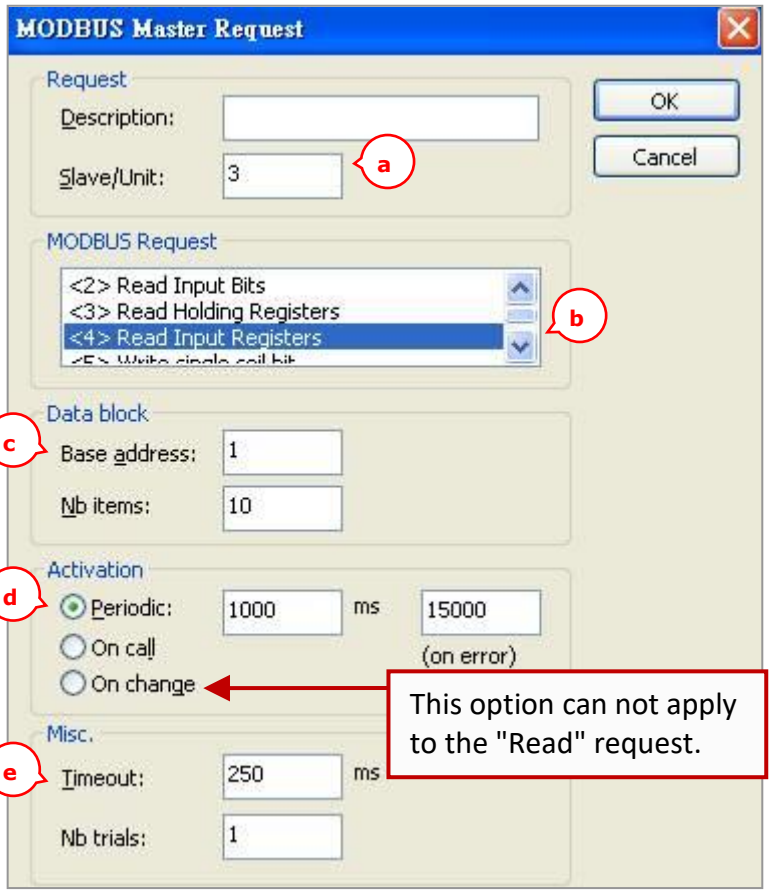
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4. Set the “Operation” field of the “Status[1]” as “Error report” (that means this variable will be set to an error code when a read error occurs, or reset it to “0” when a read request is successful).
   Press the “F1” key to see the description of the Modbus Master Configuration and move to the title “Status and command variables” to know related commands and error codes.

5. Set the “Operation” field of “Act_0” as “Command (one shot)” (that means the request will be sent only once when “Act_0” is set to “TRUE”. Then, this “Act_0” will auto reset to “FALSE”).
   The "Command (Enable)” means the request is sent continuously as long as the “Act_0” is “TRUE”. So, users can set the “Act_0” to “FALSE” to stop sending command.

1.1.3. Read AI Data

1. Using the same way in the Section 1.1 - Step 4 to create the third data block and completing all the following settings in the “MODBUS Master Request” window, and then click “OK".



In this example

a. Slave/Unit:
   Enter the Net-ID of the Slave device.
   (e.g., the Net-ID is “3”).

b. MODBUS Request:
   Select “<4> Read Input Registers”.

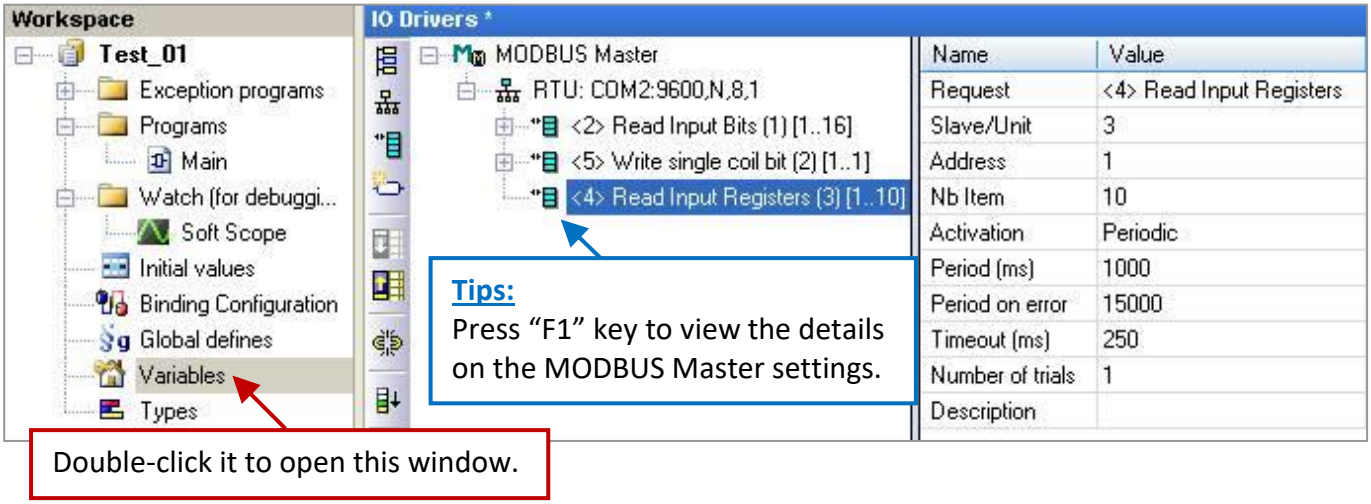
c. Base address:
   Start from “1” by default.
   (Refer the Section 1.1.1 to change it.)
   Nb items:
   The number of AI signals to write.
   (In this case, the number is “10”).

d. Periodic: (Refer the Section 1.1.1)
   Sending the request periodically.
   (In this case, to send once per second.)
   “on error” means the next sending time when an exception occurred (e.g., 15 seconds).

e. Timeout: Set a timeout value.
   When time-out occurred, it will show the defined error code. (The recommended value for the Modbus RTU/ASCII device is 200 to 1000 ms. In this case the value is 250 ms.)

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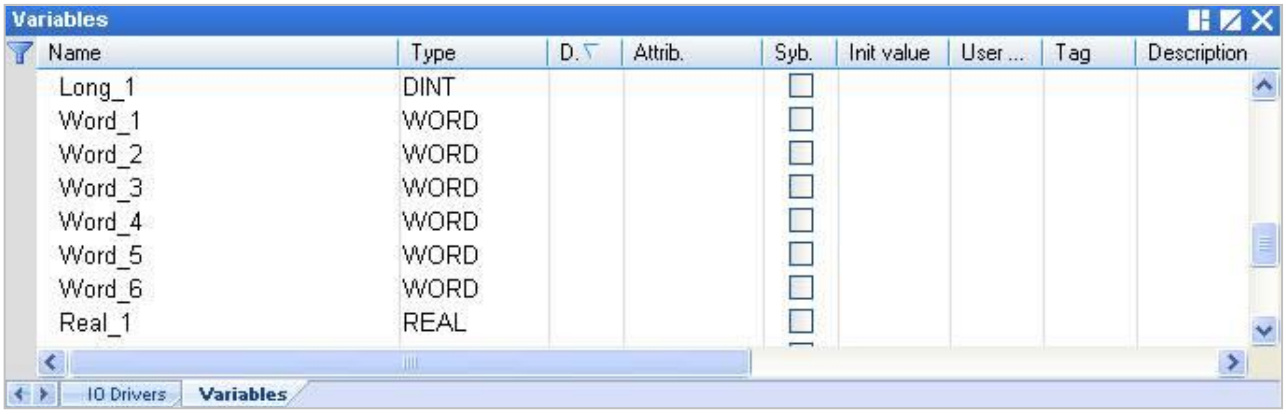
2. Next, open the “Variables” window and then declare variables that are available for the program.



Follow the table below to add six Word (16-bit), one Double integer (32-bit) and one Real (32-bit) variables.

Variable name	Data type	Description
Word_1 to Word_6	WORD	Used to Read AI data (16-bit).
Long_1	DINT	Used to Read AI data (32-bit).
Real_1	REAL	Used to Read AI data (32-bit).

After completing the settings, the defined variables show as below:



Note:

The user can refer the Win-GRAF Getting Started Manual - Section 2.3.1 for declaring variables. Refer the Appendix A for details on data type and ranges.

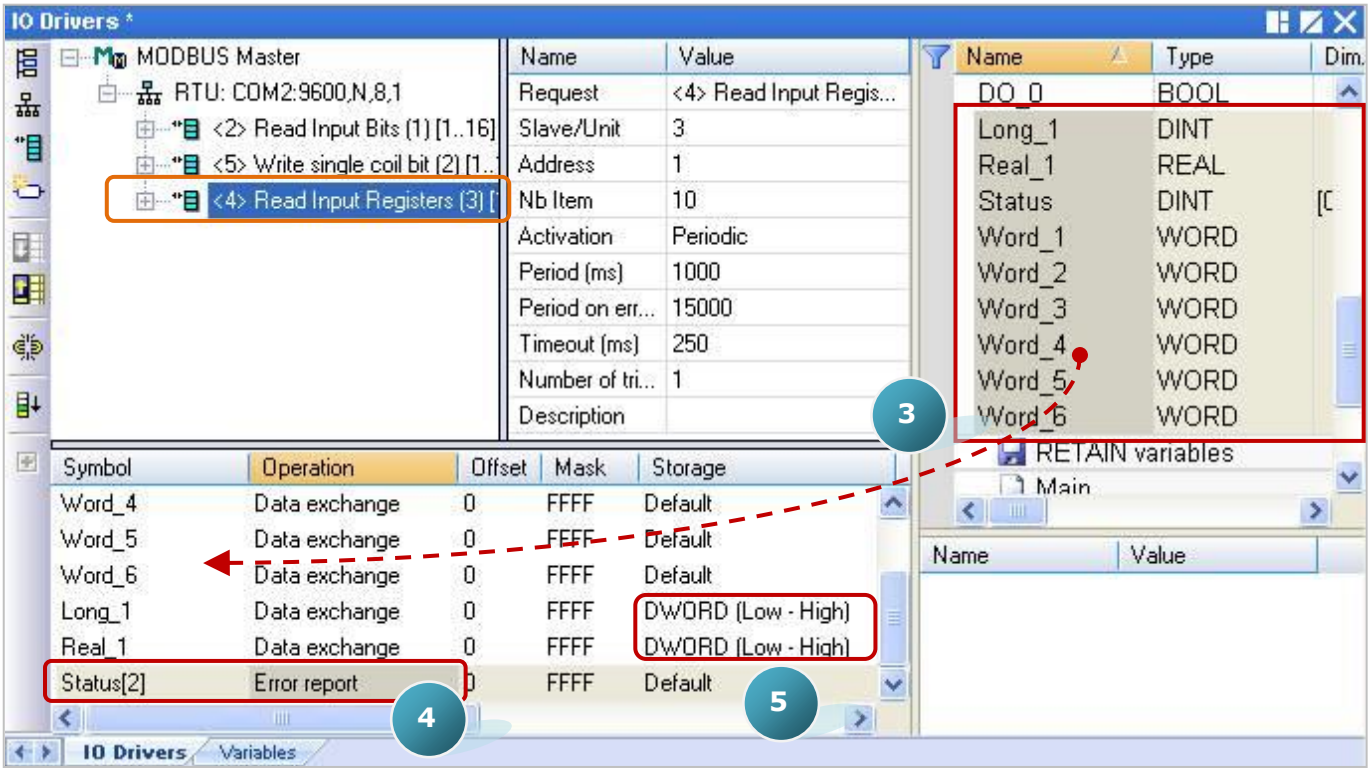
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3. In the “IO Drivers” window, drag variables - “Word_1 to Word_6”, “Long_1”, “Real_1” and “Status” (that created in the Section 1.1.1) from the Variables Area to the Symbol Area in the third data block.

   Note: The “Status” is an array variable. When you drag “Status” into the Symbol Area, it will show “Status[0]” to “Status[4]", simply *press “Del” key to delete “Status[0] to [1]” and “Status[3] to [4]".*

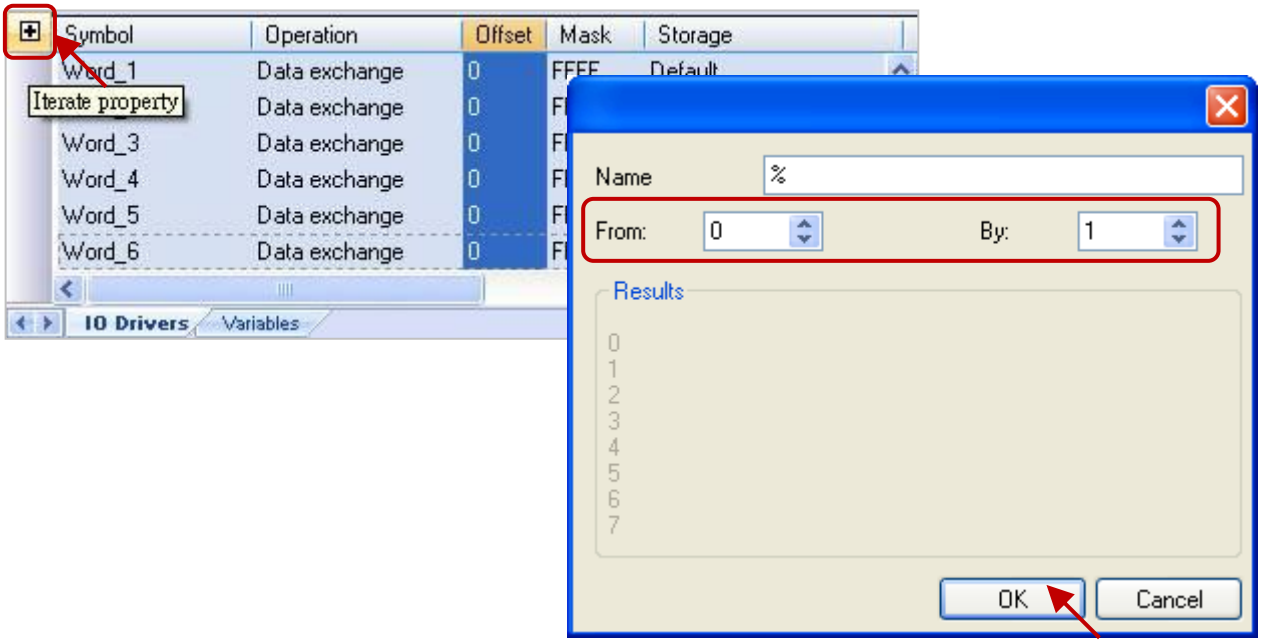
4. Set the “Operation” field of the “Status[2]” as “Error report” (that means this variable will be set to an error code when a read error occurs, or reset it to “0” when a read request is successful).
   Press the “F1” key to see the description of the Modbus Master Configuration and move to the title “Status and command variables” to know related commands and error codes.

5. Both the “Long_1” and the “Real_1” are 32-bit variables and require two Modbus addresses. So, set their “Storage” column as “DWORD (Low – High)”.



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6. As the figure below, select the "Word_1" to "Word_6" and then click "Iterate property" to set their Offset value (From: 0 ; By: 1).



7. Next, double click the Offset field of "Long_1" and "Real_1" items and set their values as "6" and "8", then press "Enter" key to complete the settings.

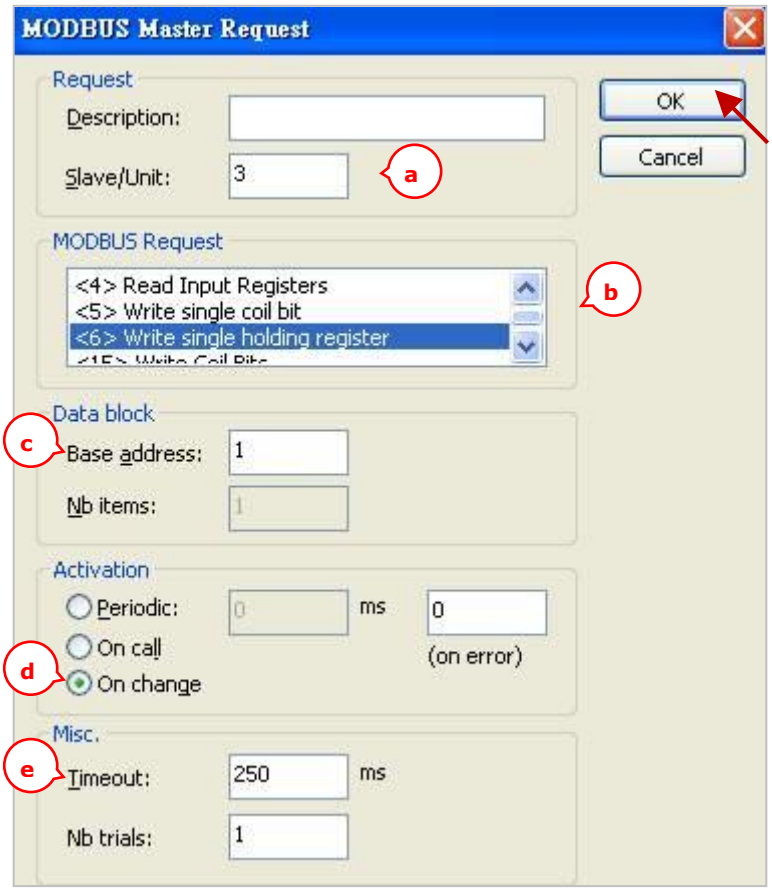
Note: One 32-bit data requires two Modbus addresses. For instance, the Offset value of "Long_1" is "6" and the next Offset value must be set to "8" (i.e., "Real_1").



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1.1.4. Write AO Data (16-bit)

1. Using the same way in the Section 1.1 - Step 4 to create the 4th data block and completing all the following settings in the "MODBUS Master Request" window, and then click "OK".



In this example

a. Slave/Unit:
   Enter the Net-ID of the Slave device. (e.g., the Net-ID is "3").

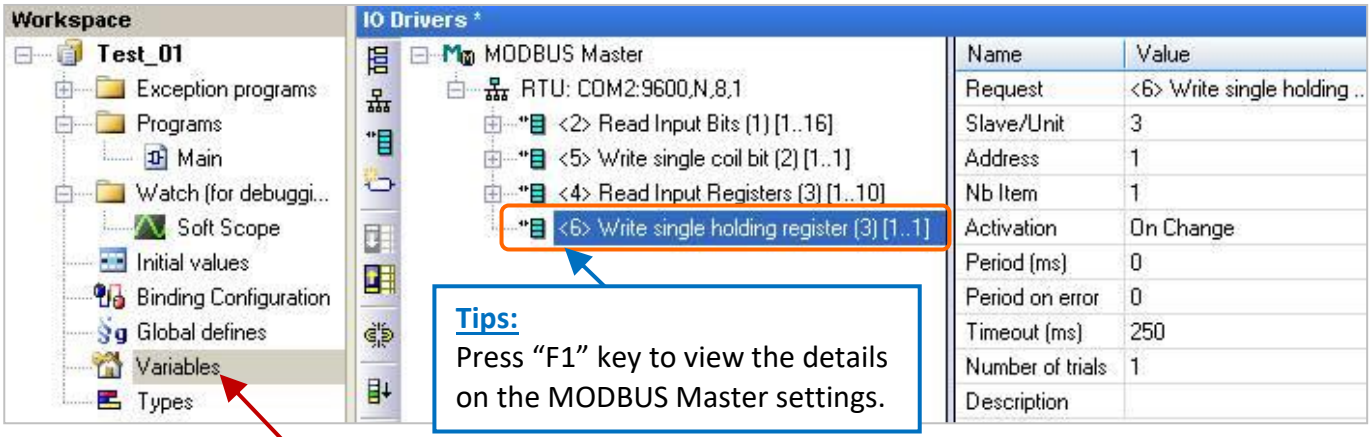
b. MODBUS Request: Select "<6> Write single holding register".

c. Base address:
   Start from "1" by default.
   (Refer the Section 1.1.1 to change it.)

d. On change: In case of a write request, means that the request is activated each time any variable changed.
   (Refer the Section 1.1.1 for derails.)

e. Timeout: Set a timeout value.
   When time-out occurred, it will show the defined error code. (The recommended value for the Modbus RTU/ASCII device is 200 to 1000 ms. In this case the value is 250 ms.)

2. Next, open the "Variables" window and then declare variables that are available for the program.



Tips:
Press "F1" key to view the details on the MODBUS Master settings.

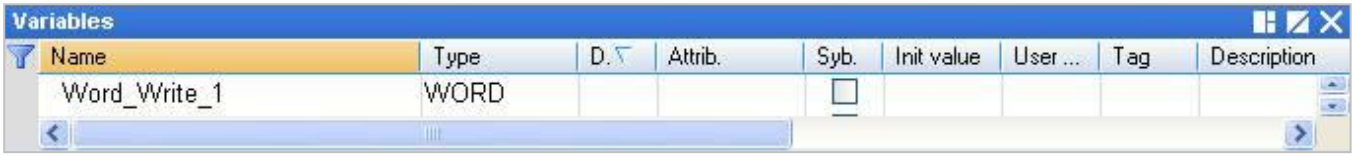
Double-click it to open this window.

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Declaring a "WORD" variable. (If not familiar with this, refer the Win-GRAF Getting Started Manual - Section 2.3.1 and Appendix A for details on declaring variables, data types and ranges.

Variable name	Data type	Description
Word_Write_1	WORD	Used to write AO data (16-bit).

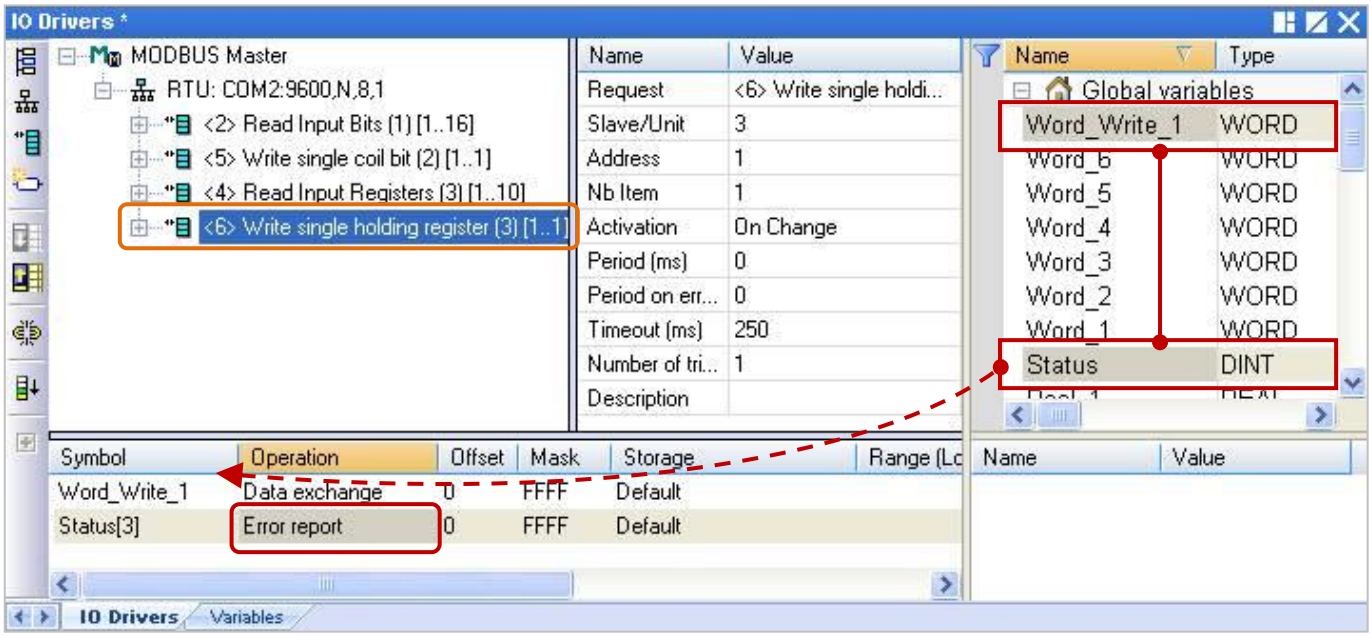
After completing the settings, the defined variables show as below:



3. In the “IO Drivers” window, drag variables - “Word_Write_1” and “Status” (that created in the Section 1.1.1) from the Variables Area to the Symbol Area in the 4th data block.

   Note: The “Status” is an array variable. When you drag “Status” into the Symbol Area, it will show “Status[0]” to “Status[4]", *simply press “Del” key to delete “Status[0] to [2]” and “Status[4]".*

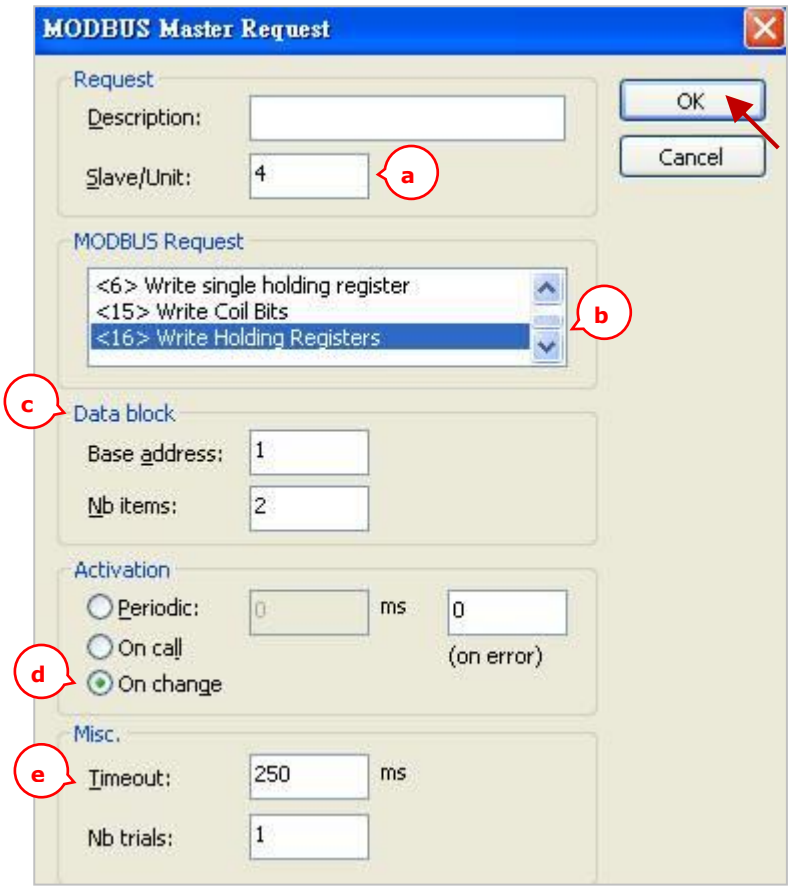
4. Set the “Operation” field of the “Status[3]” as “Error report” (that means this variable will be set to an error code when a read error occurs, or reset it to “0” when a read request is successful).
   Press the “F1” key to see the description of the Modbus Master Configuration and move to the title “Status and command variables” to know related commands and error codes.



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1.1.5. Write AO Data (32-bit)

1. Using the same way in the Section 1.1 - Step 4 to create the 5th data block and completing all the following settings in the "MODBUS Master Request" window, and then click "OK".



In this example

a. Slave/Unit:
Enter the Net-ID of the Slave device.
(e.g., the Net-ID is "4").

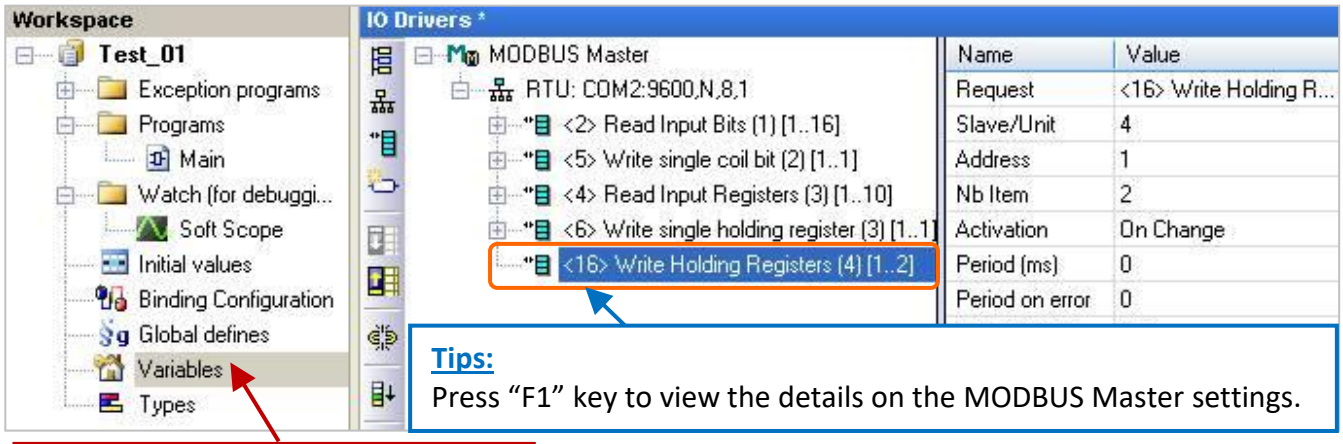
b. MODBUS Request:
Select "<16> Write Holding Registers".

c. Base address:
Start from "1" by default.
(Refer the Section 1.1.1 to change it.)
Nb items:
The number of AO signals to write.
(In this case, the number is "2" because the REAL type requires two Modbus address).

d. On change: In case of a write request, means that the request is activated each time any variable changed.
(Refer the Section 1.1.1 for details)

e. Timeout: Set a timeout value. When time-out occurred, it will show the defined error code. (The recommended value for the Modbus RTU/ASCII device is 200 to 1000 ms. In this case the value is 250 ms.)

2. Next, open the "Variables" window and then declare variables that are available for the program.

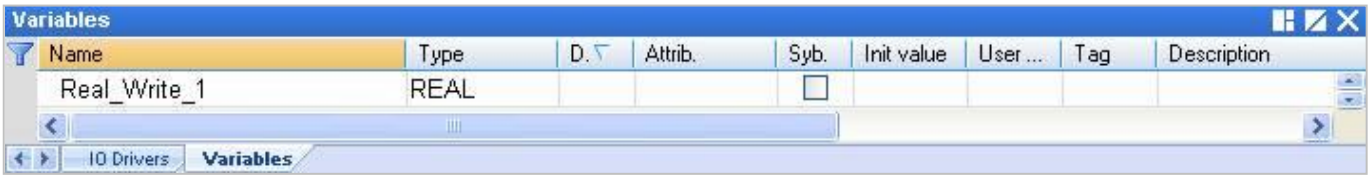


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Declaring a "Real" variable. (If not familiar with this, refer the Win-GRAF Getting Started Manual - Section 2.3.1 and Appendix A for details on declaring variables, data types and ranges.

Variable name	Data type	Description
Real_Write_1	REAL	Used to write AO data (32-bit).

After completing the setting, the defined variable shows as below:

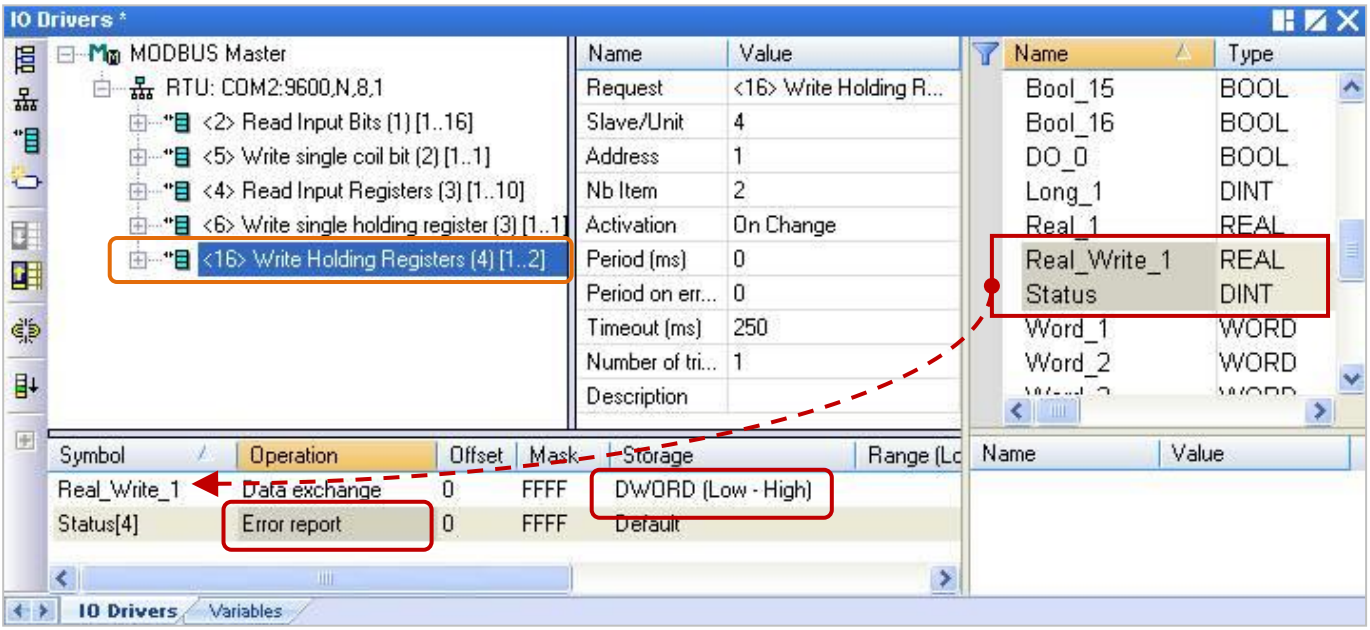


3. In the “IO Drivers” window, drag variables - “Real_Write_1” and “Status” (that created in the Section 1.1.1) from the Variables Area to the Symbol Area in the 5th data block.

   Note: The “Status” is an array variable. When you drag “Status” into the Symbol Area, it will show “Status[0]” to “Status[4]", simply *press “Del” key to delete “Status[0] to [3]”.*

4. Set the “Operation” field of the “Status[4]” as “Error report” (that means this variable will be set to an error code when a read error occurs, or reset it to “0” when a read request is successful). Press the “F1” key to see the description of the Modbus Master Configuration and move to the title “Status and command variables” to know related commands and error codes.

5. The “Real_Write_1” is a 32-bit data and required two Modbus addresses. So, set its “Storage” field as “DWORD (Low – High)”.



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