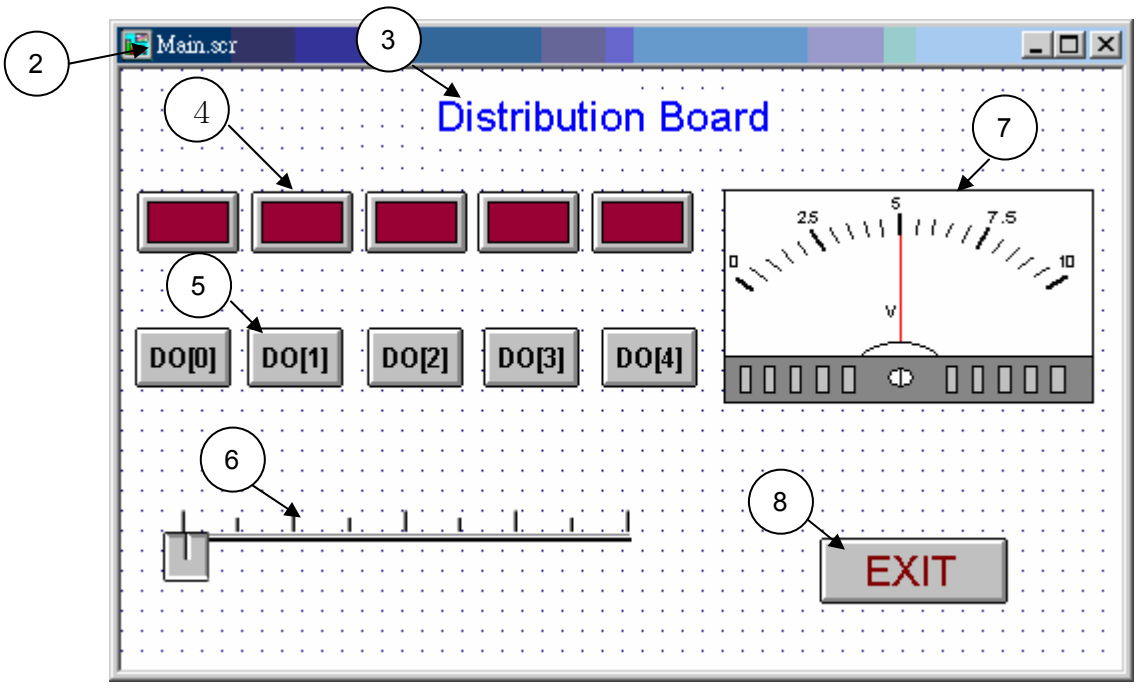
The connection solution of InduSoft with ET-7000 series modules by using Modbus-TCP protocol

This document will introduce how InduSoft software accesses the ET-7000 series using Modbus-TCP protocol.

We will make a HMI page shown as follow for a distribution case, which offers five lamps, five buttons, a slider and a dial voltmeter. The specific lamp will get on depended on pushing the specific button while the application program is running. Furthermore, the specific lamp will off immediately when release the specific lamp button. The AO channel of ET-7000 will output the voltage in accordance with the value of the slider while moving the knob on the slider, and then the voltmeter will show the voltage monitored from the AI channel connect directly to AO channel.

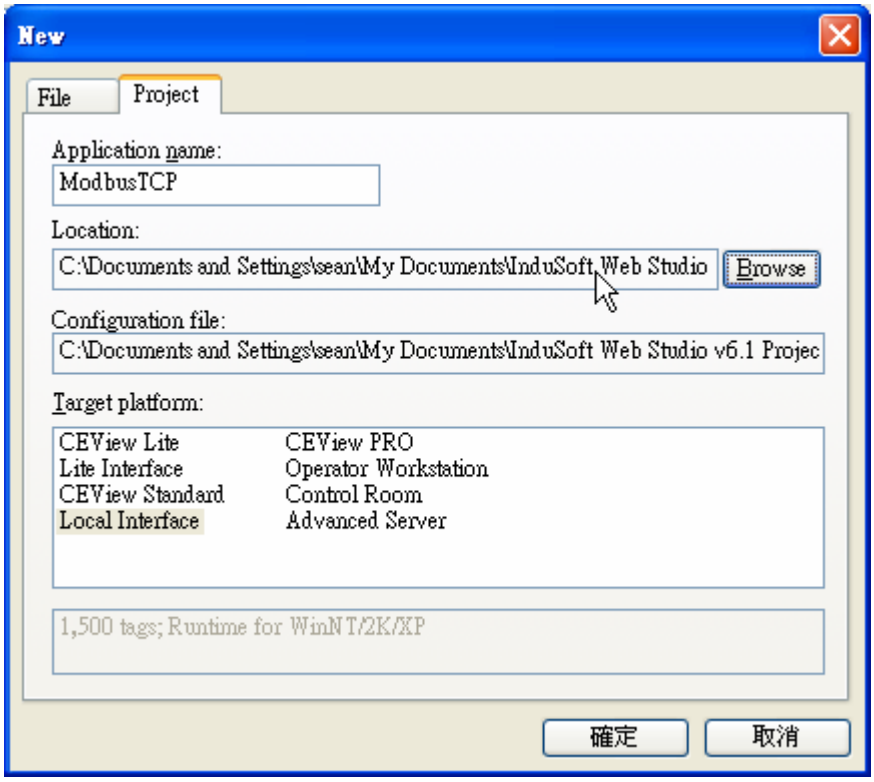


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Follows the steps below to create a distribution board HMI:

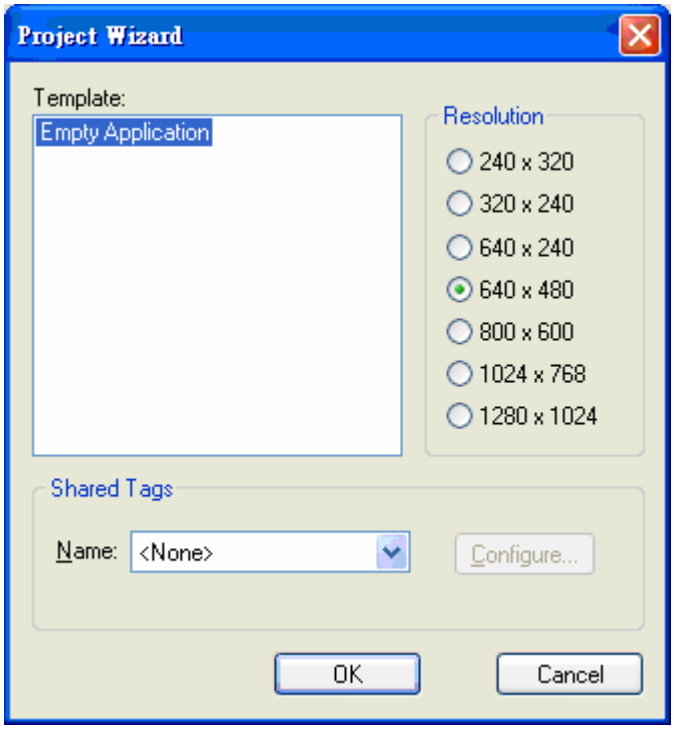
1、Create a Project：

1. From the Studio main menu bar, select **File->New**. The **New** dialog display, and select the Project tab. Input the **ModbusTCP** in the **Application name** text box and specify a location, a Configuration file and a Target platform. Click OK when you are done.

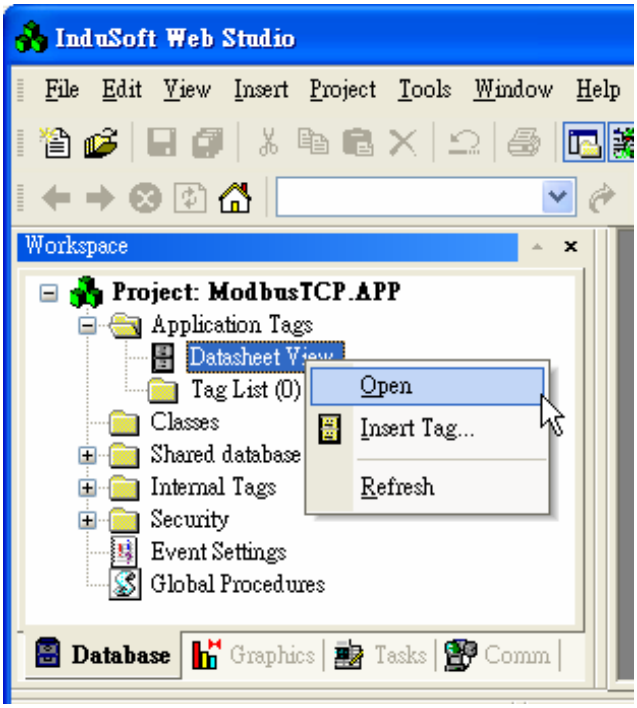


2. When the Project Wizard dialog displays (as follows), select **Empty Application** from the **Template** pane to create a new application. Specify the resolution to 640*480 and select **<None>** from the Shared Tags list. Click OK to close the **New** dialog.

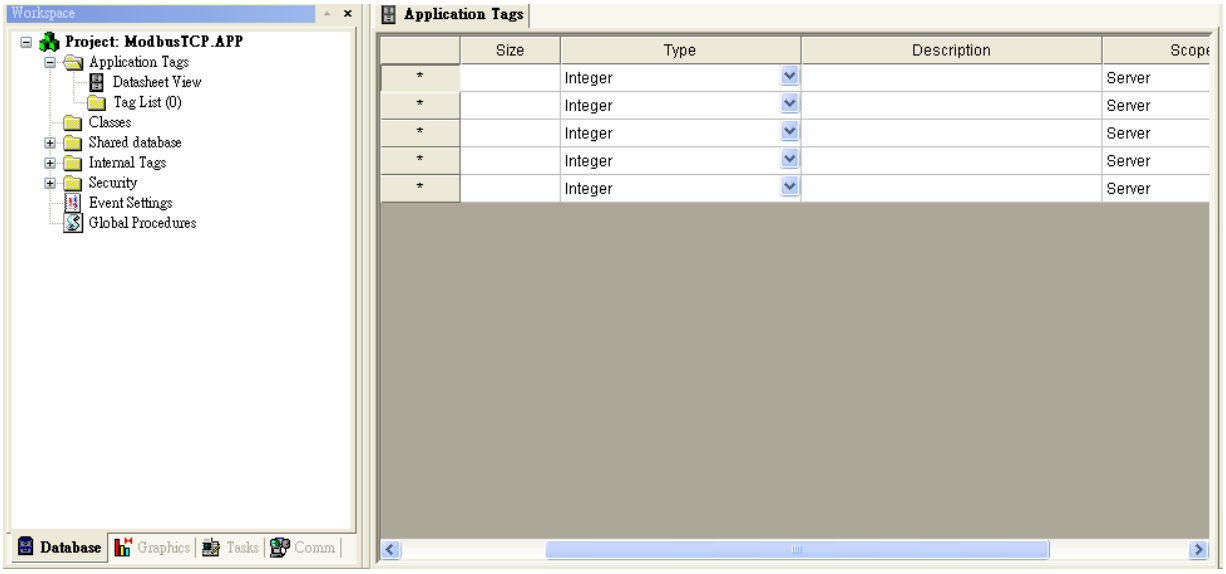
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3. In the Workspace pane, Select the **Database** tab, expand the **Application Tags** folder and right-click the **Datasheet View** icon. The pop-up menu displays, and then selects the **Open** to open the **Application Tags** window. Use the following information to complete the fields on this window.



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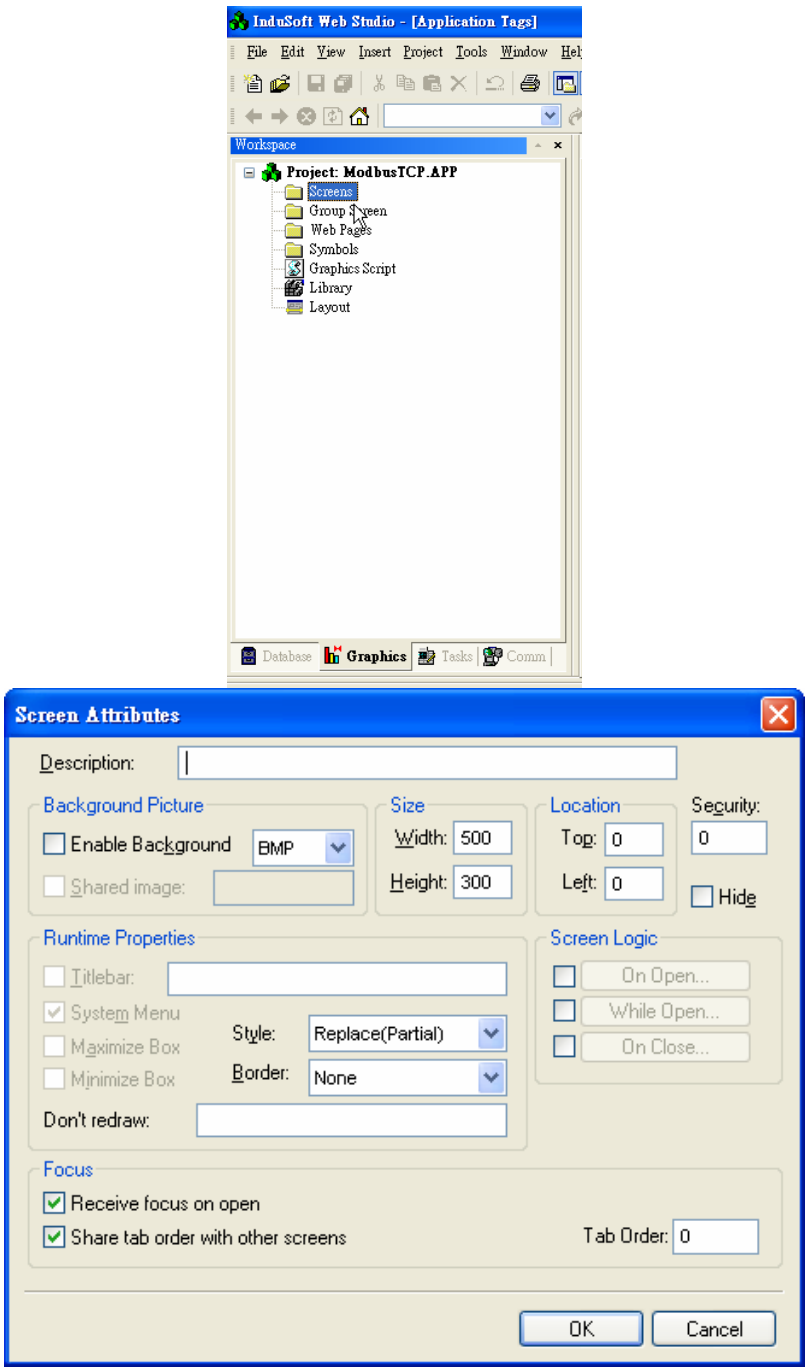


	Name	Array Size	Type	Description
1.	AI	7	Real	Monitor the voltage from AO channel
2.	AO	3	Real	Output the voltage
3.	ModbusToAI	0	Integer	Modbus data converts to AI value
4.	AOToModbus	0	Integer	AO value converts to Modbus data.
5.	DI	15	Boolean	Digital input
6.	DO	15	Boolean	Digital output

2、Create a display screen：

1. In the Workspace pane, Select **Graphics** tab, and right-click the **Screens** folder. When the pop-up menu displays, selects the **Insert** to open the **Screen Attribute** dialog. Set the Screen size to 500*300 and click OK.

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3、Create the Text：

1. Click **Text** icon to create a Text object on the screen. Input the “Distribution Board” on this object and click the Fonts button to specify font settings (Font Color is Blur and size is 16)

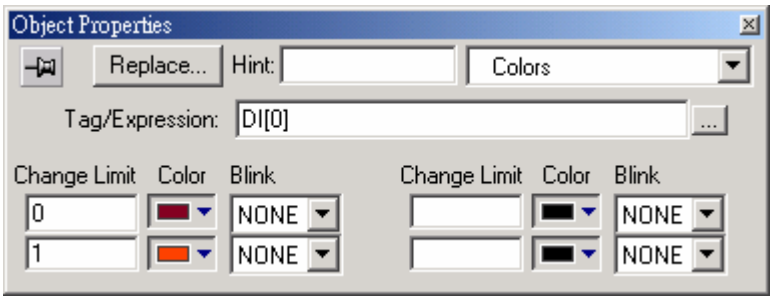
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4、Create the Lamp：

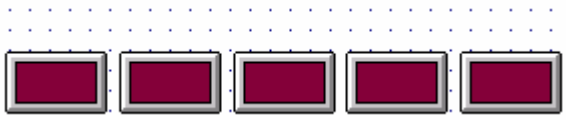
1. Click the Button icon to create a Button object on the left-upper of the Screen. Right-click the button to open the **Object Properties** dialog and remove the text from the Caption field.

2. Click the **Rectangle** object to make a rectangle on the Lamp (Button), and open the **Object Properties** dialog to change the **fill** color to Maroon.

3. Apply the Colors dynamic property to this rectangle. Open the **Object Properties** dialog. Type “DI[0]” into the Tag/Expression filed, and change the color to Maroon on first **Color** field, change the color to Red on second **Color** field.



4. Group the **Button** and **Rectangle** object, and use Copy and Paste action to duplicate four 3-D Lamps. Rename the Tag Name of Lamp as DI[1] /DI[2]/DI[3]/DI[4] separately, the finished map is shown as follows.



5、Create the Button object：

1. Create a button on bottom of the Lamp. Right-click the button to open the **Object Properties** dialog and type the “DO[0]” text on the **Caption** field.

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Select this Button object and click on the **Command** icon to apply this dynamic to the object. Double-Click the Button to open the Command **Object Properties** dialog and add the following information on the dialog.

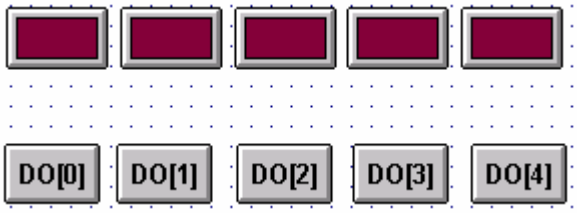
At **On Down** tab

Tag	Expression
DO[0]	Not DO[0]

At **On Up** tab

Tag	Expression
DO[0]	Not DO[0]

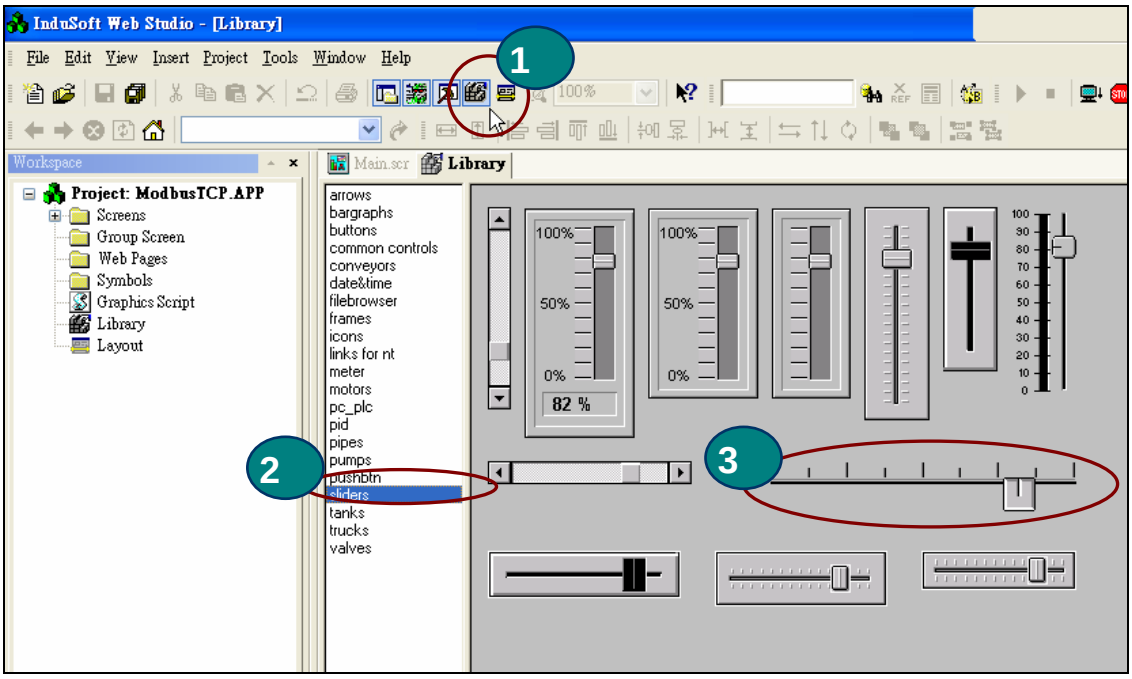
2. Use Copy and Paste action to duplicate four same Buttons. Rename the Tag Name of Button as DO[1]/DO[2]/DO[3]/DO[4] separately, the finished map is show as follows.



6、Create the Slider object：

1. Click the **Library** icon to open the symbols library. Select **Slider** from the list then double-click on the slider icon to open the object on the screen. Apply the **Position** dynamic property to this slider. Open the **Object**

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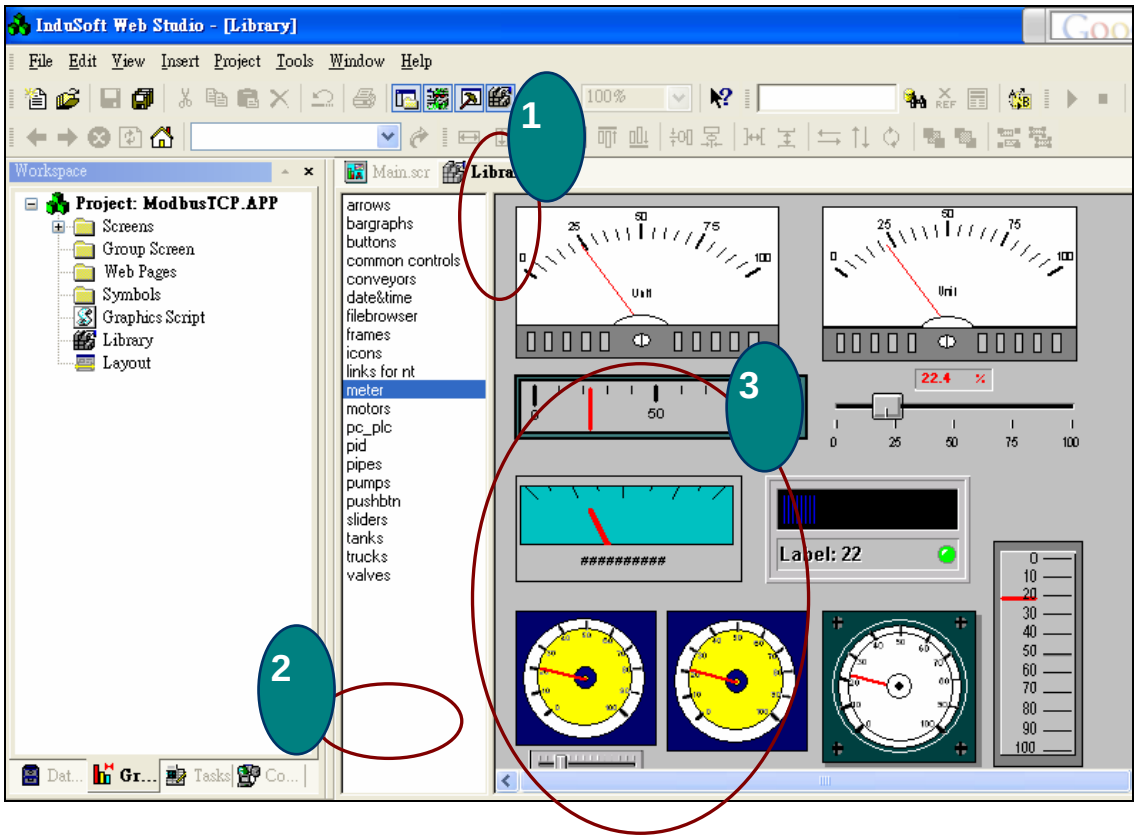
2. **Properties** dialog. Type “AO[0]” into the **Horz** filed, and input 0 and 10 value on the **Range** field.

7、Create a Voltmeter object：

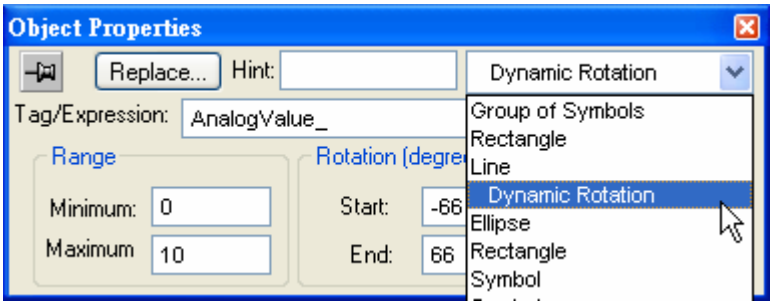
1. Click the **Library** icon to open the symbols library. Select **meter** from the list then double-click on the voltmeter icon to open the object on the screen. Open the **Object Properties** dialog, and click **voltmeter** icon to change the Tag Name on the **To** field of **Whole Tag Name** tab. Switch to **String Value** tab and input the following information on the table.

From	To
Unit	V
100	10
0	0
25	2.5
50	5
75	7.5

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2. Select **Dynamic Rotation** from the list on the **Object Properties** dialog. Add the 0 and 10 to the **Range** fields and close this dialog.



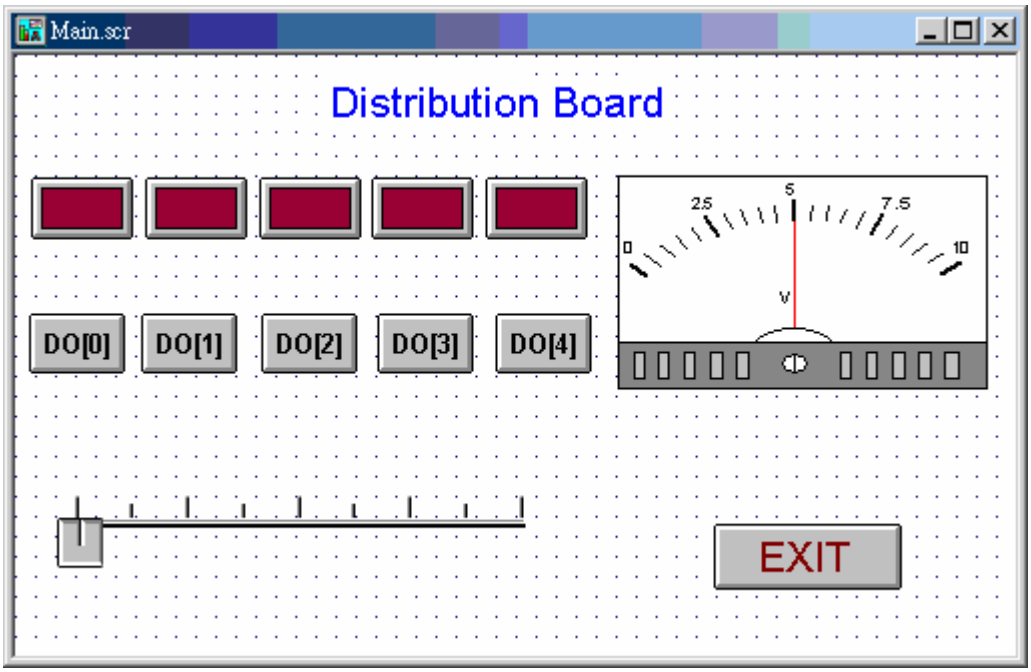
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8、Create a “Exit” Button ：

1. Create a button at the right-bottom of the Screen for exiting the system. Select the **Button** object and click on the Command icon to apply this dynamic to the object.

2. Double-click on the Button object to open the Object Properties dialog and type Shutdown() function on Expression field.

3. Save the screen as a file named as Main.scr. The full screen is show as follows:



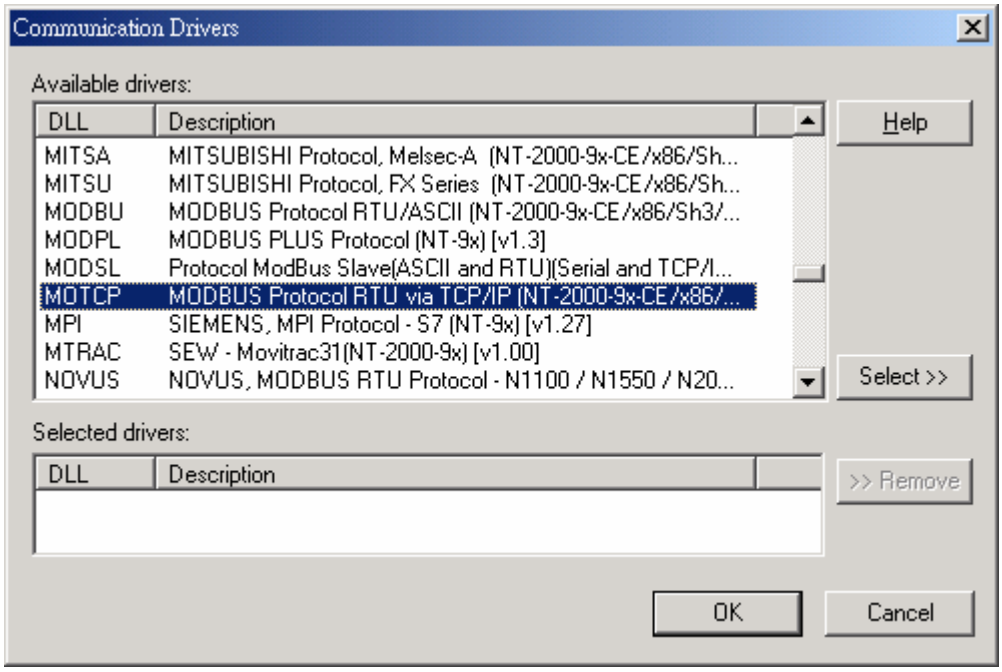
14.1 Create the Modbus TCP worksheet

Perform the following steps to select the Modbus/TCP driver from within the application:

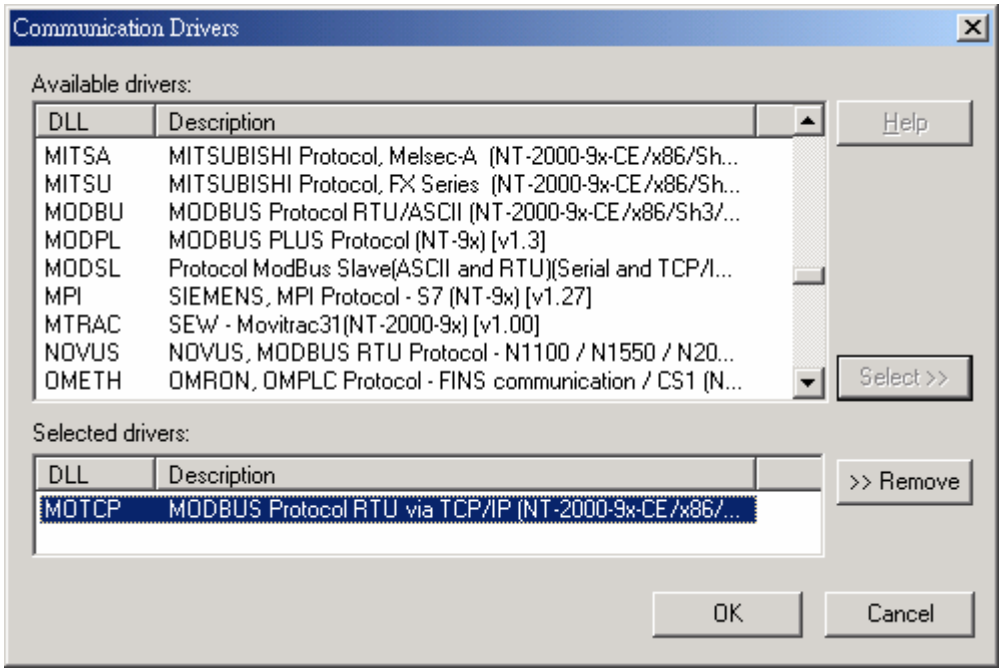
1. In the Workspace pane. Select the **Comm** tab, expand the Drivers folder and right-click the Drivers folder. The pop-up menu displays, and then selects the **Add/Remove driver** to open the **Communication Drivers** dialog.

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2. Select the MOTCP driver from the Available Drivers list, and then click the **Select** button.



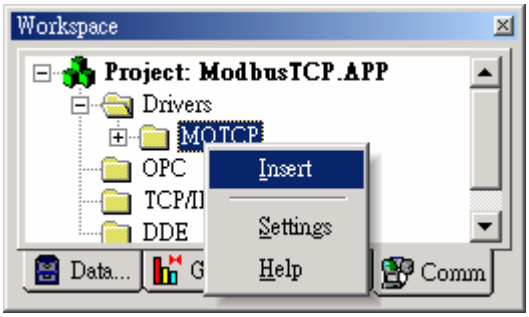
3. When the **MOTCP** driver displays in the **Selected Drivers** list, click the **OK** button to close the dialog.



4. Select the Comm tab, and located below the Workspace pane. Expand the Drivers folder, and right-click the

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MOTCP subfolder. Select the Insert option from the pop-up menu.



5. When MOTCP001.DRV dialog displays, use the following information to complete the fields on this worksheet.

Column Field Name	Content
Description	DI
Enable Read When Idle	1
Station	192.168.0.150:502:1
Header	1X:0

	Tag Name	Address	Div	Add
1	DI[0]	1		
2	DI[1]	2		
3	DI[2]	3		
4	DI[3]	4		
5	DI[4]	5		

The detail information of the Column Field Name:

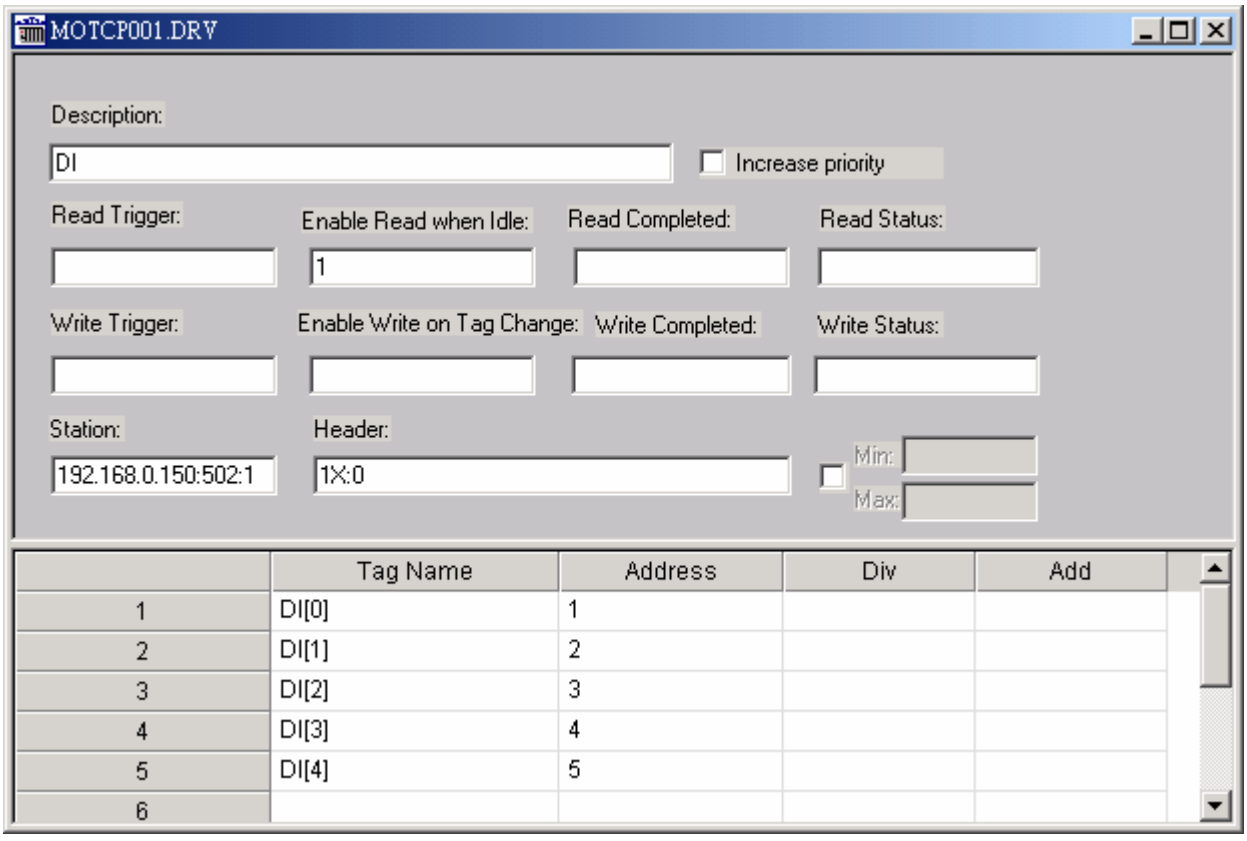
- **Description field**：Type a description of the STANDARD DRIVER SHEET for documentation purposes
- **Read Trigger field**：Type a tag that allows IWS to read the worksheet automatically when you change this tag value

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- **Enable Read when Idle field**：Type a tag or constant value. Use a tag (or constant) value greater than zero, to enable reading from the equipment
- **Read Completed field**：Type in a tag and the communication driver toggles the tag when it completes a read command.
- **Read Status field**：Type in a tag and the communication driver updates the tag with the status of the last read command.
- **Write Trigger field**：Type a tag value to activate a group reading. Whenever you change this tag value, the program writes an equipment worksheet.
- **Enable Write on Tag Change field**：Type a tag or constant value (not zero) to enable the communication driver to check the worksheet continuously for changes in the tag value. If a change occurs, IWS writes this value to an address in the field equipment.
- **Write Completed field**：Type in a tag and the communication driver toggles the tag in this field when a write command completes.
- **Write Status field**：Type in a tag and the communication driver updates the tag with the status of the last write command.
- **Station field**：Type the equipment station number within the network. The syntax in this field varies with each communication driver. Refer to the appropriate driver documentation for further information.
- **Header field**：Specify the data type and/or initial address to be read or written in the equipment. The syntax in this field varies with each communication driver. Refer to the appropriate driver documentation for further information.

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- **Increase Priority checkbox**：Click (check) to keep the reading and writing commands for this sheet on the top of the communication queue whenever they are triggered.
- **Checkbox**：Click (check) to specify the minimum and maximum values for field equipment data.
- **Min and Max field**：Type a range of values to be converted into an engineering format. These fields determine the minimum and maximum range of values. These values affect all tags in the worksheet.



The complete syntax of Station and Header field parameter are shown as follows

Parameter	Default Value	Valid value	Comments
Station	—	—	Specify the device using the following syntax： *<IP address>：<Port Number>：*

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			<Station No.> where **<IP Address>**：is the ET-7000 IP address in the TCP/IP network. **<Port Number>**：is the port number for the Modbus TCP protocolTCP port number is **502**. **<Station No.>**：is the ET-7000 identification number (0~255)
Header	0X:0	Refer to next table	The variables can be read from or written to the device, and also a reference to the initial address. ◦

Header Field Information			
Type	syntax	Begin Address	Comments
0x	0x:0	Varies according o the equipment	Coil status：Read and write events using Modbus instructions 01, 05 and 15
1x	1x:0	Varies according o the equipment	Input status：Read events using Modbus instructions 02
3x	3x:0	Varies according o the equipment	Input register：Read events using Modbus instructions 02
4x	4x:0	Varies according o the equipment	Holding Register：Read and write events using Modbus instructions 03, 06 and 16

Use the Body area parameters as follows:

- **Tag Name field**：Type a tag name for the communication driver to use.

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- **Address field**：Type a field equipment address (or address offset) related to the application tag. The syntax in this field varies with each communication driver. Refer to the appropriate driver documentation for further information.
- **Div field**：Specify a division constant to use when scale adjustment is required. IWS uses this value as a division factor in a read operation and a multiplication factor in a write operation. Do not use this field if you are already using Min or Max in the configuration body.
- **Add field**：Specify an addition constant to use when scale adjustment is required. IWS uses this value as an addition factor in a read operation and a subtraction factor in a write operation. Do not use this field if you are already using Min or Max in the configuration body.

6. The **Sava As** dialog will display while adding the information to worksheet. Click **OK** to finish.

7. Repeater the Step4~Step6 to add a new Modbus TCP worksheet. When MOTCP002.DRV dialog displays, use the following information to complete the fields on this worksheet.

Column Field Name	Content
Description	DO
Enable Write On Tag Change	1
Station	192.168.0.150:502:1
Header	0X:0

	Tag Name	Address	Div	Add
1	DO[0]	1		
2	DO[1]	2		
3	DO[2]	3		
4	DO[3]	4		

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5	DO[4]	5		

8. Repeater the Step4~Step6 to add a new Modbus TCP worksheet. When MOTCP003.DRV dialog displays, use the following information to complete the fields on this worksheet.

Column Field Name	Content
Description	AI
Enable Read When Idle	1
Station	192.168.0.150:502:1
Header	3X:0

	Tag Name	Address	Div	Add
1	ModbusToAI	1		

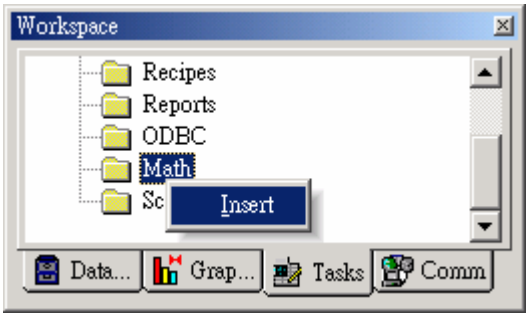
9. Follows the Step4~Step6 to add a new Modbus TCP worksheet again. When MOTCP004.DRV dialog displays, use the following information to complete the fields on this worksheet.

Column Field Name	Content
Description	AO
Enable Write On Tag Change	1
Station	192.168.0.150:502:1
Header	4X:0

	Tag Name	Address	Div	Add
1	AOToModbus	1		

10. The transmit format of Modbus protocol is Hex, and .. Select the **Tasks** tab, and located below the Workspace pane. Right-click the Math folder from the Project tree structure. Select the Insert option from the pop-up menu to open a Math worksheet.

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- Formula translator of the Analog Input：

  AI value = tag value / 32767 * Span

  Span = Maximum value of AI – 0

- Formula translator of the Analog Output：

  Tag value = AO value / Span * 32767

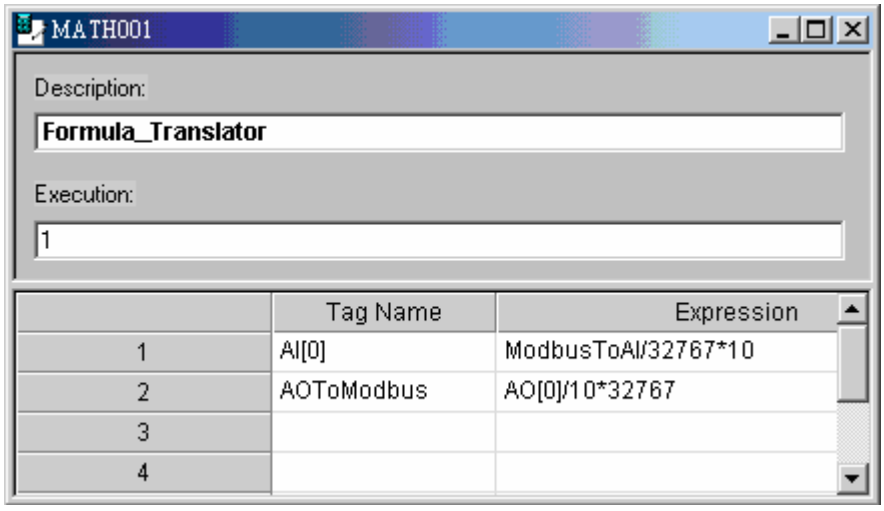
  Span = Maximum value of AO – 0

11. When MATH001 dialog displays, use the following information to complete the fields on this worksheet.

Column Field Name	Content
Description	Formula_Translator
Execution	1

	Tag Name	Expression
1	AI[0]	ModbusToAI/32767*10
2	AOToModbus	AO[0]/10*32767

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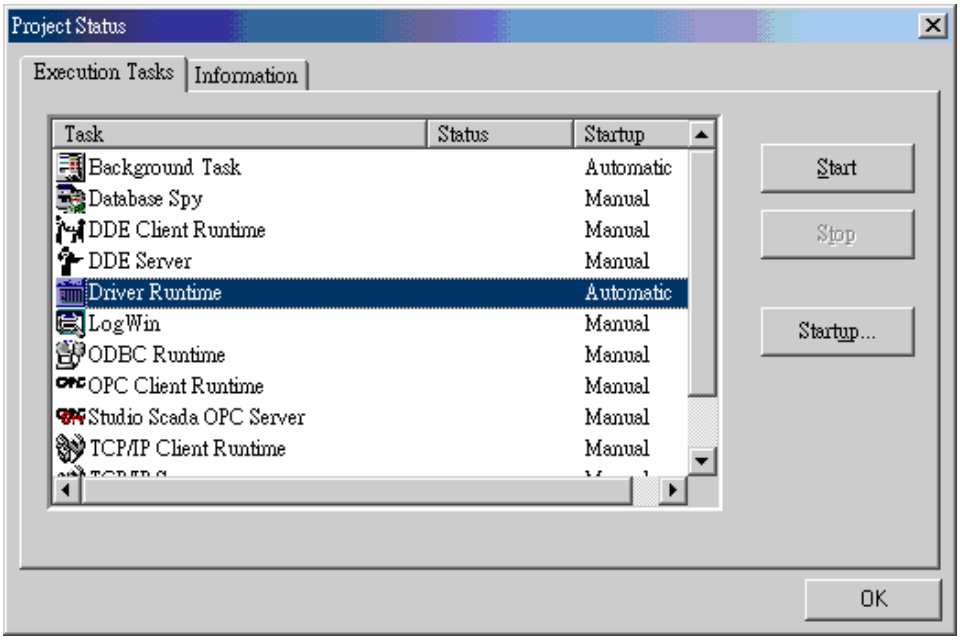


12. Select Project→Status from the main menu bar. The Project Status dialog displays:

13. Verify that the Driver Runtime task is set to **Automatic**.

- If the setting is correct, click **OK** to close the dialog.
- If the **Driver Runtime** task is set to Manual, select the **Driver Runtime** line. When the **Startup** button becomes active, click the button to toggle the Startup mode to **Automatic**.

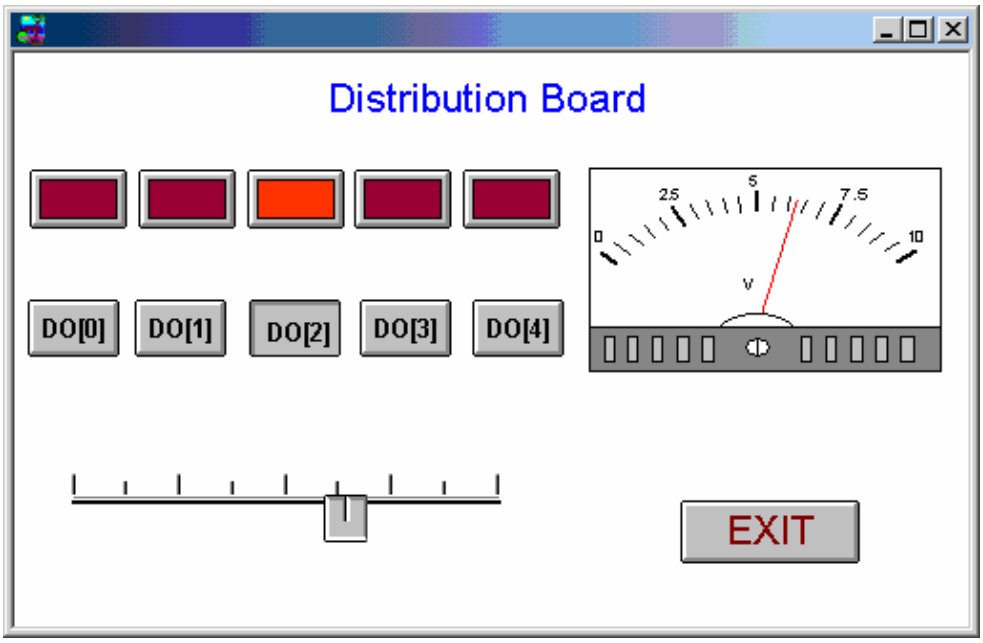
Click **OK** to close the Project Status dialog.



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14. Start the application to run the driver while the setting is finished.

- Push DO[2] button, and the lamp on the top of this button will get on, and the lamp will off immediately when release the DO[2] button.
- While moving the knob on the slider, and then the voltmeter will show the voltage monitored from the AI channel connect directly to AO channel



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