LESSON 1

CREATING PANEL APPLICATIONS

3.1. Setting up the Panel Application

You can set up the panel application with the General Setup dialog box. There are five ways to open the dialog box:

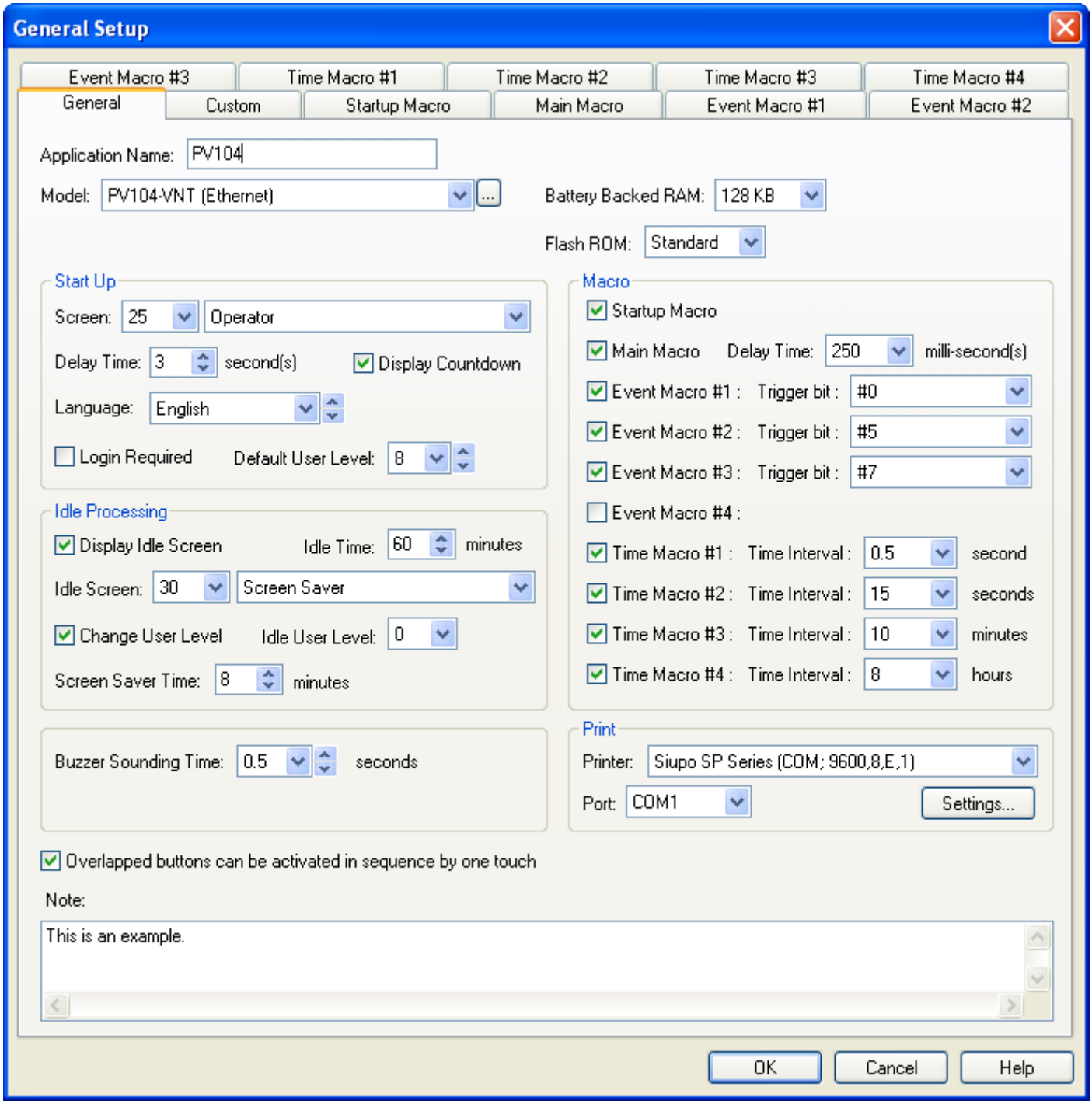
1) In the Project Manager window, double-click the panel application node ( ).
2) In the Project Manager window, right-click the panel application node ( ) to bring up the pop-up menu and select General Setup.
3) In the Project Manager window, double-click the General Setup node ( ) under Setup node of the panel application
4) In the Project Manager window, right-click the General Setup node ( ) under Setup node of the panel application to bring out the pop-up menu and select Properties.
5) In the menu bar, click Panel | Setup | General Setup….

The General Setup dialog box contains the following pages. Some of the pages appear only when they are needed.

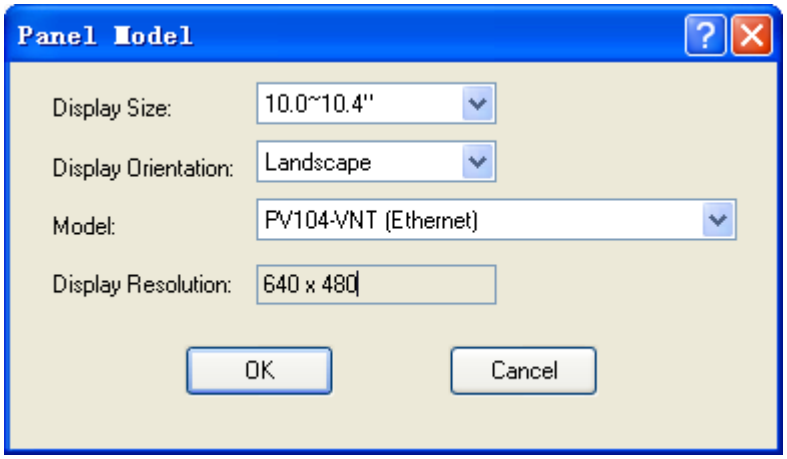
- **General**
  Described in Section 3.1.1.
- **Custom**
  Described in Section 3.1.2.
- **Keys**
  Described in Section 3.2.1.
- **Startup Macro / Main Macro / Event Macro / Time Macro**
  Described in Section 14.2.6.

3.1.1. General Settings

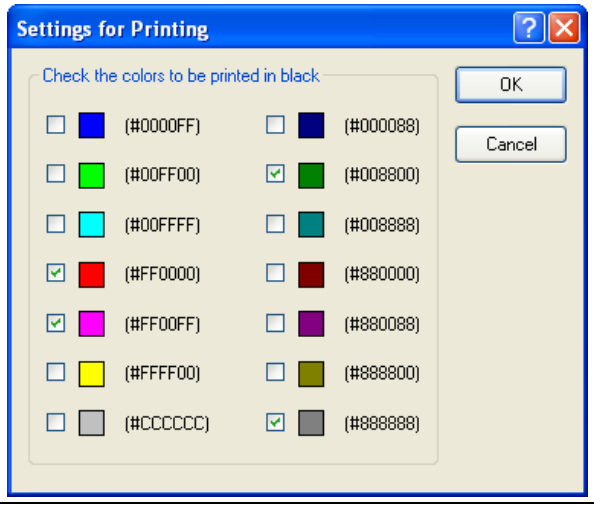
This section describes how to define the general settings for a panel application. The following is an example of the General page of the General Setup dialog box.



The following table describes each item in the General page.

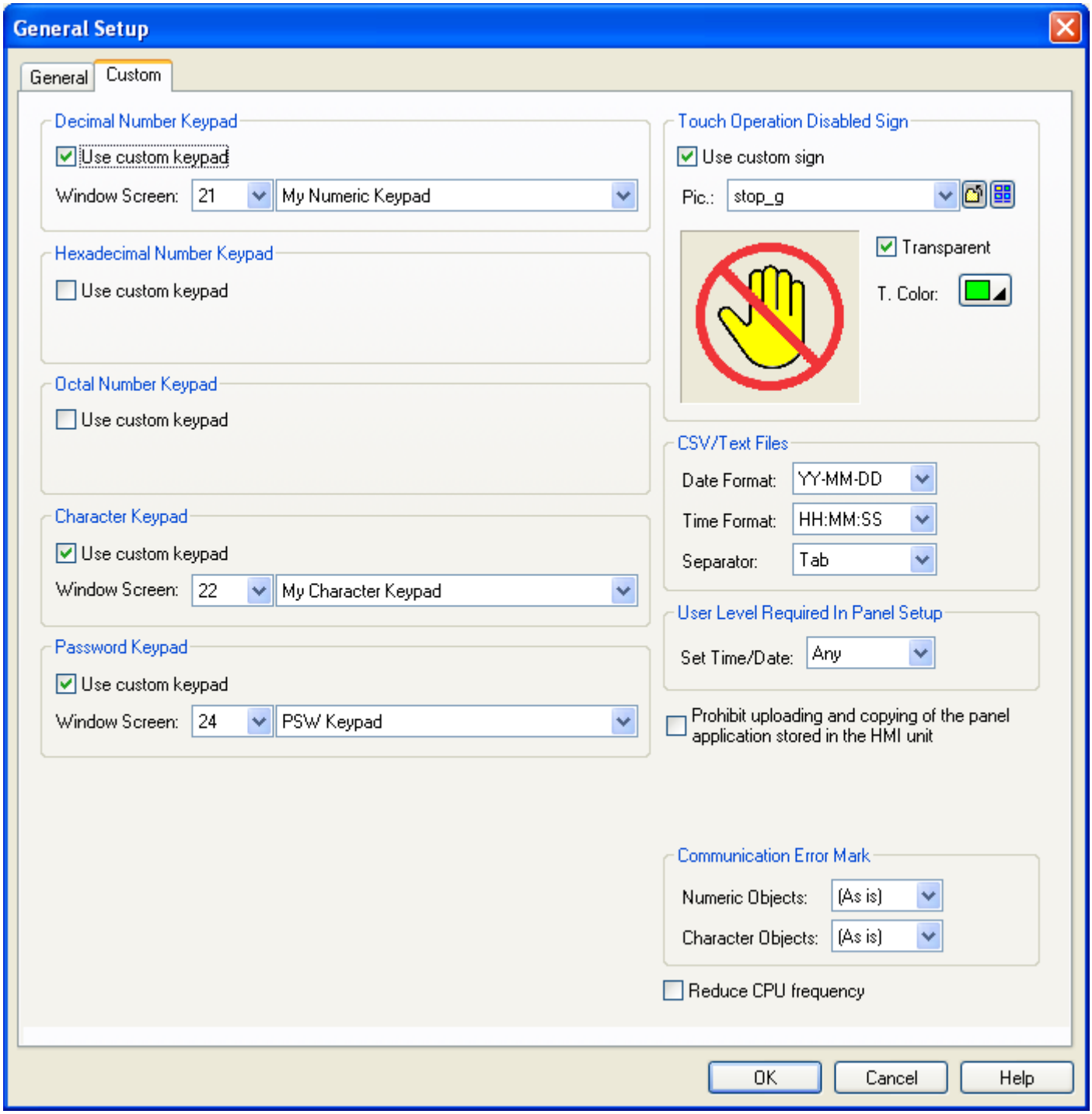
Item		Description
Application Name		The name of the panel application.
Model		The model of the target panel. Click [...] to bring up the Panel Model dialog box which helps you to select a model by specifying the size, resolution and orientation of the display. The following is a sample of Panel Model dialog box 
Battery Backed RAM		Specifies the size of the battery backed RAM installed in the target panel.
Flash ROM		Specifies the size of the flash ROM installed in the target panel.
Use External Keypad		Available if the target panel supports the custom designed external keypad. Select this option if the application uses a custom designed external keypad.
Start Up	Screen	Specifies the first screen of the application that the target panel will display after powering up.
	Delay Time	Specifies the time that the target panel will delay to run the application.
	Display Countdown	Check this option if you want the target panel to display countdown while it is waiting for the expiry of the Delay Time.
	Language	Specifies the language the application will display the text in after power up.
	Login Required	Check this option if you want the target panel to get a valid password from the operator before it displays the first screen.
	Default User Level	Available when Login Required is not selected. Specifies the initial user level for the application.
Idle Processing	Display Idle Screen	Check this option to display the Idle Screen when the target panel has idled for the specified amount of time.
	Idle Time	The length of time used to determine when the idle screen is displayed.
	Idle Screen	Specifies the screen that will be displayed as the idle screen.
	Change User Level	Check this option to change the current user level when the idle screen is displayed.
	Idle User Level	Available when the Change User Level is selected. Specifies the user once the idle screen is displayed.
	Screen Saver Time	Specifies the screen saver time. The target panel will turn off its backlight when it has not been operated by the operator for the specified amount of time.

Continued

<table>
<tr><th colspan="2">Item</th><th>Description</th></tr>
<tr><td colspan="2">Buzzer Sounding Time</td><td>Specifies the length of the beep sounded by the buzzer when a touch operation is activated.</td></tr>
<tr><td colspan="2">Overlapped buttons can be activated in sequence by one touch</td><td>Check this option if you want the application to have the overlapped buttons can be activated in sequence by one touch feature. This allows the operator to issue multiple data settings or commands with one touch. There are some constraints with using this feature. See Section 3.1.3 for details.</td></tr>
<tr><td colspan="2">Note</td><td>You can type a note for the panel application.</td></tr>
<tr><td rowspan="4">Macro</td><td>Startup Macro</td><td>Check this item if you want the application to have the Startup macro.
The Startup macro is only run once when the application starts. The target panel will not display the start-up screen until the macro terminates. You can use Startup macro to initialize global data and settings for your application.</td></tr>
<tr><td>Main Macro</td><td>Check this item if you want the application to have the Main macro.
The Main macro runs concurrently with the application. The target panel runs the Main macro cyclically, i.e. it will delay preset time to run Main macro starting from the first command each time after processing the last command of the macro, or when it encounters an END command in the middle of the macro.</td></tr>
<tr><td>Event Macro #1~#4</td><td>An Event macro is run whenever the associated trigger bit changes from 0 (Off) to 1 (On). An application can have up to four Event macros. If the application needs an Event macro for a certain event, check one of the items that are available and specify the associated trigger bit for the corresponding Event macro.</td></tr>
<tr><td>Time Macro #1~#4</td><td>A Time macro is run periodically with a preset time interval. An application can have up to four Time macros. Each Time macro has a different set of time intervals that can be chosen to specify how often it runs. The following table describes the available time intervals for each Time macro.
<table>
<tr><th>Time Macro</th><th>Available Time Intervals</th><th>Remark</th></tr>
<tr><td>#1</td><td>0.5 and 1 second</td><td></td></tr>
<tr><td>#2</td><td>1, 2, 3, ... and 59 seconds</td><td></td></tr>
<tr><td>#3</td><td>1, 2, 3, ... and 59 minutes</td><td>The macro is run at 0 second.</td></tr>
<tr><td>#4</td><td>1, 2, 3, ... and 24 hours</td><td>The macro is run on the clock.</td></tr>
</table>
If the application needs a Time macro, check the item of an appropriate Time macro and specify the time interval for that Time macro.</td></tr>
<tr><td rowspan="3">Print</td><td>Printer</td><td>Specifies the type of printer that the application will use.</td></tr>
<tr><td>Port</td><td>Specifies the port of the target panel that will connect to the printer.</td></tr>
<tr><td>Settings...</td><td>If the printer is a mono printer, you can click it to bring up the “Settings for Printing” dialog box which helps you to select the colors to be printed in black.
The following is a sample of Settings for Printing dialog box.
 
</td></tr>
</table>

3.1.2. Custom Settings

This section describes how to define the customization settings for a panel application. The following is an example of the Custom page of the General Setup dialog box.



The following table describes each item in the Custom page.

Item		Description
Decimal Number Keypad	Use custom keypad	Check this item if you want the application to use the custom keypad instead of the built-in keypad for the entry of decimal numbers.
	Window Screen	Specify the window screen that is designated as the decimal number keypad.
Hexadecimal Number Keypad	Use custom keypad	Check this item if you want the application to use the custom keypad instead of the built-in keypad for the entry of hexadecimal numbers.
	Window Screen	Specify the window screen that is designated as the hexadecimal number keypad.
Octal Number Keypad	Use custom keypad	Check this item if you want the application to use the custom keypad instead of the built-in keypad for the entry of octal numbers.
	Window Screen	Specify the window screen that is designated as the octal number keypad.
Character Keypad	Use custom keypad	Check this item if you want the application to use the custom keypad instead of the built-in keypad for the entry of characters.
	Window Screen	Specify the window screen that is designated as the character keypad.
Password Keypad	Use custom keypad	Check this item if you want the application to use the custom keypad instead of the built-in keypad for the entry of passwords.
	Window Screen	Specify the window screen that is designated as the password keypad.
Default Folder for File I/O		This field is available only for Windows-based panels. There are 4 kinds of default folder that you can select for your application. They are Same as Application File, Pre-assigned, New Per Day, New Per Month. Please see Section 3.1.4 for details
Touch Operation Disabled Sign	Use custom sign	Check this item if you want the application to display the custom sign instead of the built-in sign when the touch operation of an object is disabled.
	Picture	Specify the picture that is to replace the built-in sign.
	Transparent	Select this item if you want parts of the custom sign to be transparent.
	T. Color	Specify the transparent color.
CSV/Text Files	Date Format	The date format that the target panel will use to output date information to text files.
	Time Format	The time format that the target panel will use to output time information to text files.
	Separator	Select desired delimiter that can be TAB, semicolon, or comma of CSV files.
User Level Required in Panel Setup	Set Time/Date	The minimum user level that is required to set the time and date of the target panel through the target panel's Panel Setup menu.
Prohibit uploading and copying of the panel application stored in the HMI unit		Check this option if you want to prohibit uploading and copying of the panel application stored in the HMI unit.
Communication Error Mark		Specify what to display for the Numeric Objects (including Numeric Entry and Numeric Display) and Character Objects (including Character Entry and Character Display) when their monitored data are unavailable due to communication errors. You can select the following options as the error mark.

Mark	Description
(As is)	No communication error mark for the object. Leaves the display unchanged.
(Blank)	Clears the display of the object.
?	Displays a string of character '?'.
#	Display a string of character '#'.

3.1.3. Activating Multiple Overlapped Buttons by One Touch

To enable the feature of activating multiple overlapped buttons by one touch, open the Panel General Setup dialog box and check the option of “Activate multiple overlapped buttons by one touch” on the General page. With this feature, the overlapped underlying buttons will be activated sequentially from top to bottom when the top-most button is pressed. The following are the constraints of applying this feature.

1. The types of buttons that support this feature include: Bit Button, Toggle Switch, Screen Button, Function Button, Word Button, Multi-state Switch, and Keypad Button.

2. The first button, i.e. the top-most button, can only be a bit button, a toggle switch, a word button, a multi-state switch, or a keypad button. The button cannot have the optional property of Minimum Hold Time or Operator Confirmation. If the button is a bit button, a toggle switch, or a keypad button, it cannot have any macro. If the button is a word button, it cannot be configured for Enter Value or Enter Password. If the button is a multi-state switch, it cannot be configured as a List or Drop-down List.

3. The underlying buttons that have the optional property of Minimum Hold Time or Operator Confirmation will not be activated.

4. An underlying bit button that is configured for Momentary ON or Momentary OFF will not be activated. However, if that bit button is the second button and the first button is a keypad button, it can be activated. An underlying bit button that has any macro will not be activated.

5. An underlying toggle switch that has any macro will not be activated.

6. An underlying multi-state switch that is configured as a List or Drop-down List will not be activated.

7. A function button can only be the last button, i.e. the bottom-most button. All the buttons that are under a function button will not be activated.

8. A screen button can only be the last button. All the buttons that are under a screen button will not be activated.

9. A word button that is configured for Enter Value or Enter Password can only be the last button. All the buttons that are under such a button will not be activated.

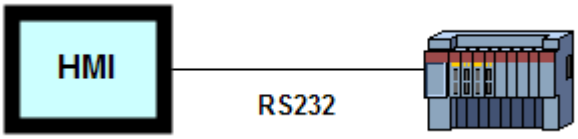
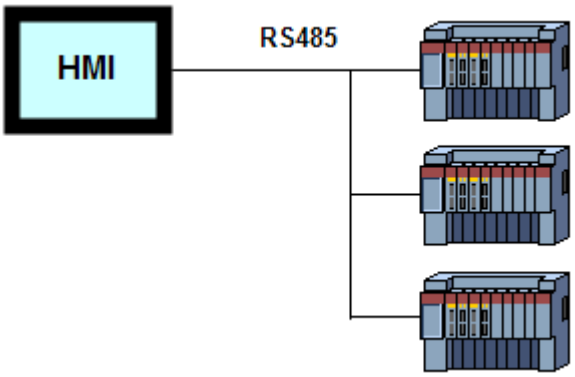
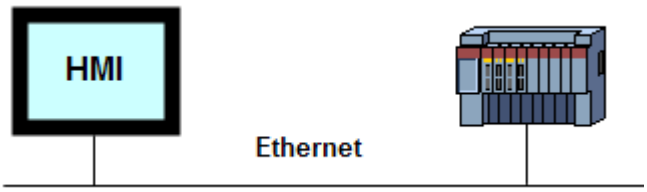
10. The maximum number of buttons that can be indirectly activated by one touch is 10.

3.2. Communication Links

This section describes how to set up communication links to allow the panel application to access the data of external devices.

3.2.1. Types of Communication Links

The following table describes the three types of communication links that the panel application can have.

Link Type	Description
Direct link	Directly connects the panel with the specified device(s). The following are examples of direct links. **[Example 1]** The panel uses an RS232 direct link to talk with the specified device directly.  **[Example 2]** The panel uses an RS485 direct link to talk with the specified devices directly.  **[Example 3]** The panel uses an Ethernet direct link to talk with the specified device directly. 

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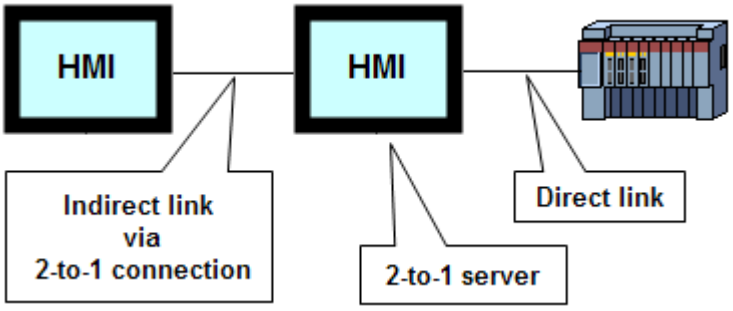
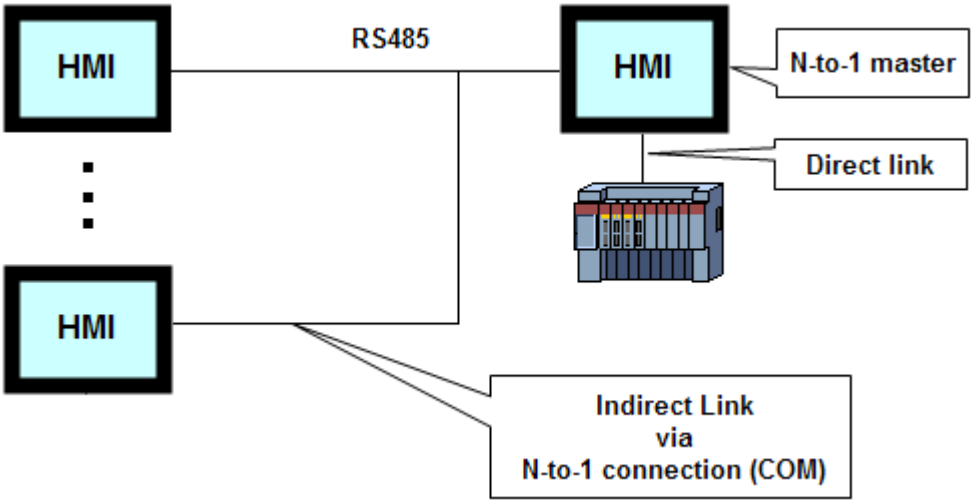
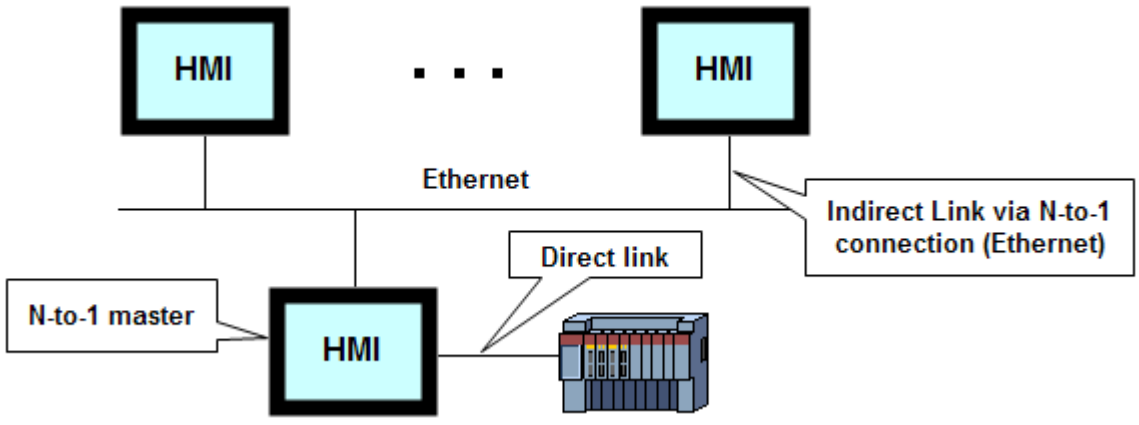
Link Type	Description
Indirect link	Allow the panel to talk with a device that is not directly connected to it. An indirect link connects the panel with a specified indirect link server. The indirect link server is the target panel of a panel application in the same project and is directly connected to the specified device. **[Example 1]** Indirect Link via 2-to-1 Connection  **[Example 2]** Indirect Link via N-to-1 Connection (COM)  **[Example 3]** Indirect Link via N-to-1 Connection (Ethernet) 

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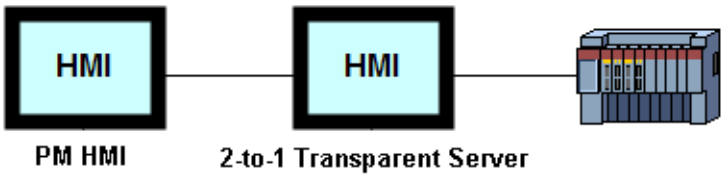
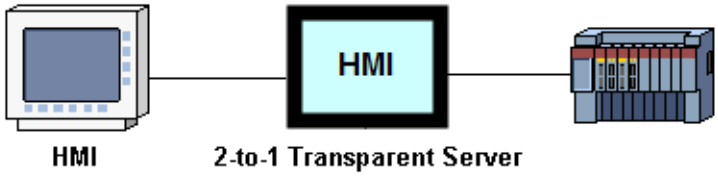
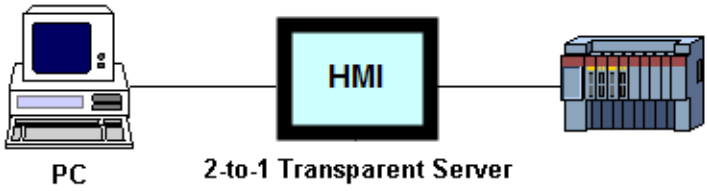
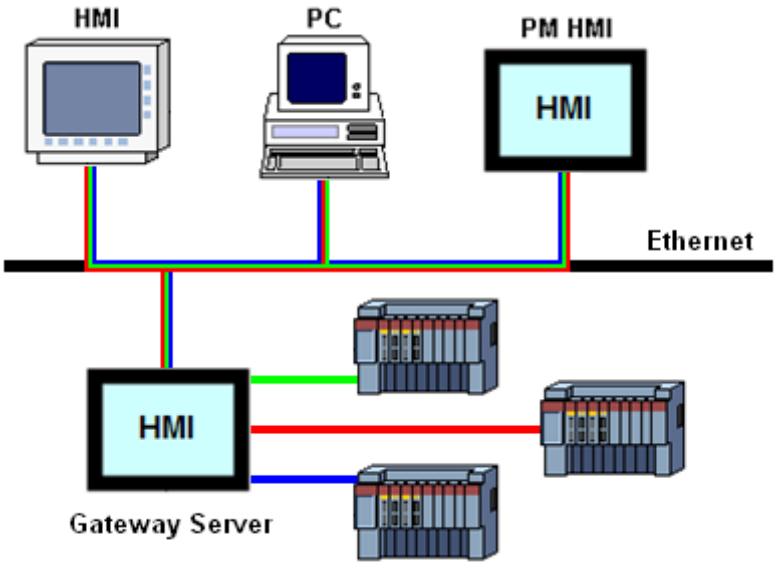
<table>
<tr><th>Link Type</th><th>Description</th></tr>
<tr><td>Communication service</td><td>Add an appropriate communication service link to the application to allow other panels to communicate with the device directly connected to the target panel. The following table describes the available communication services.
<table>
<tr><th>Communication Service</th><th>Description</th></tr>
<tr><td>2-to-1 Server (COM)</td><td>You need to specify the data link, i.e. the associated direct link, for this communication service. This service allows two panels to talk with one device, and only one communication port is required on that device.</td></tr>
<tr><td>2-to-1 Transparent Server (COM)</td><td>This communication service makes the target panel a gateway for another computing device, such as, a PC, another target panel, or a panel of another brand, to access the associated controller. See the following diagrams for the possible applications.
 





Any kind of controller whose communication protocol is of the request-reply type can be supported by this communication service. Ask your local representative to check if your controller is supported. Note that the communication parameters (baud rate, number of data bits, number of stop bits, and type of parity check) of the computing device and the communication parameters of the 2-to-1 Transparent Server must be identical.</td></tr>
<tr><td>N-to-1 Master (COM)</td><td>You need to specify the data link, i.e. the associated direct link, for this communication service. This service allows up to 16 panels to talk with one device, and only one communication port is required on that device.</td></tr>
<tr><td>N-to-1 Master (Ethernet)</td><td>You need to specify the data link, i.e. the associated direct link, for this communication service. This service allows up to 16 panels to talk with one device, and only one communication port is required on that device.</td></tr>
</table></td></tr>
</table>

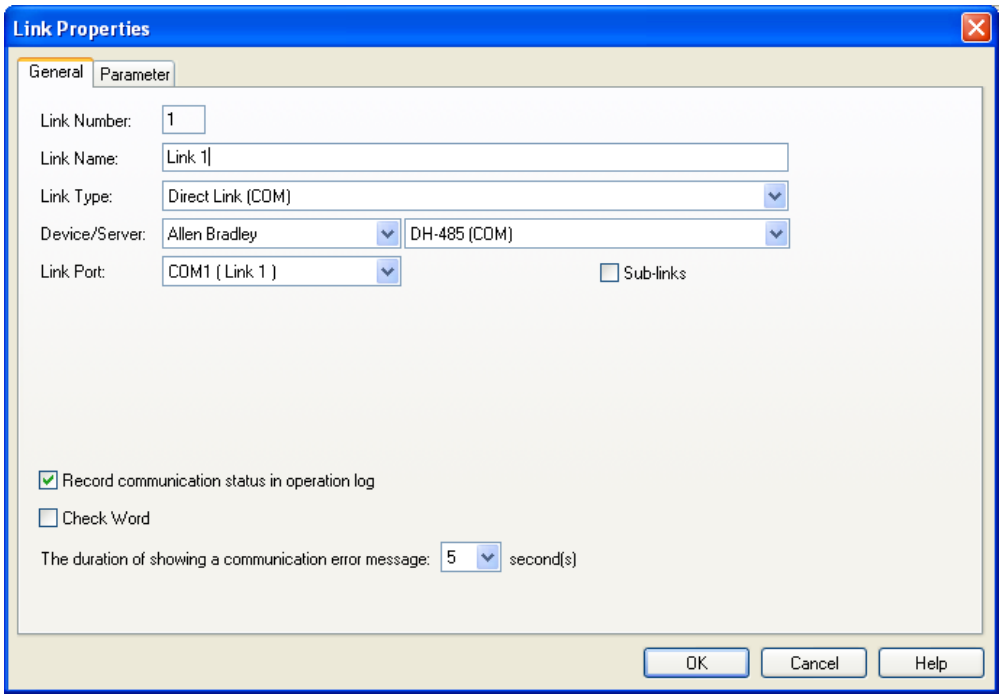
Continued

<table>
<tr><th>Link Type</th><th>Description</th></tr>
<tr><td>Gateway service</td><td>Allows an application program running on any computing device, such as a PC, to access the data of the controllers that are connected to the HMI with Gateway Server. The following table describes the available gateway services.
<table>
<tr><th>Gateway Service</th><th>Description</th></tr>
<tr><td>TCP/IP Gateway Server (Ethernet)</td><td>This gateway service makes the target panel a gateway for another computing device, such as, a PC, another target panel, or a panel of other brand, to access the associated controller through Ethernet. See the following diagram to know the possible applications.
 

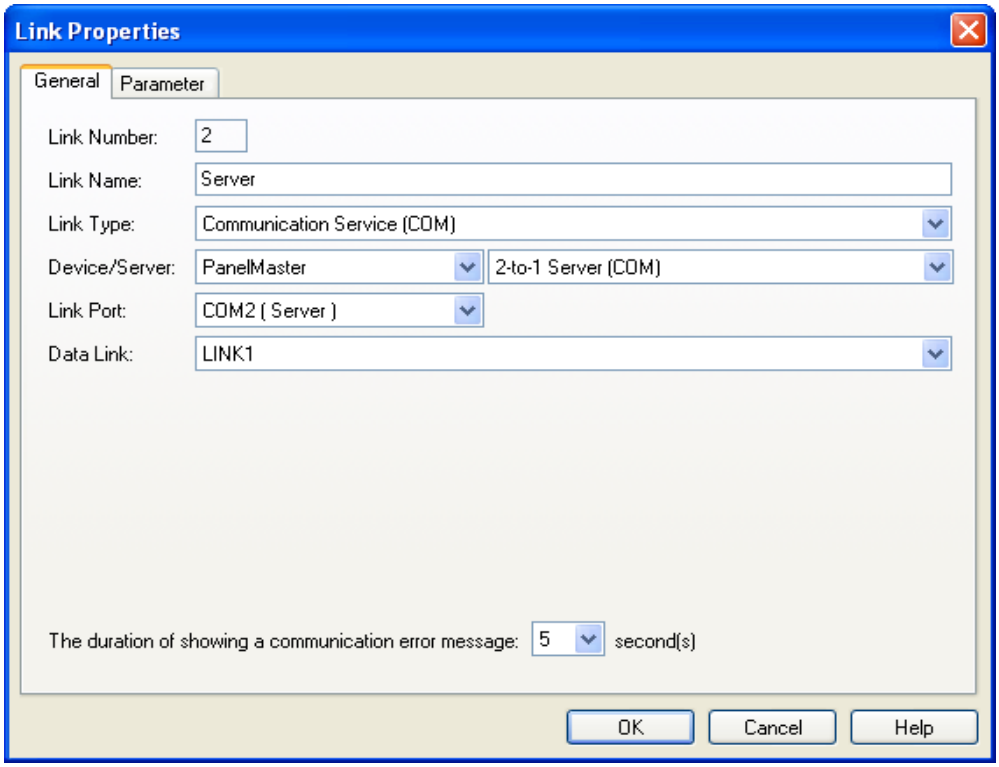
The blue, green, and red lines in the above figure indicate the different data blocks flowing on the Ethernet with the target panel acting as a gateway server.
The gateway server makes the HMI behave as a Modbus device. Your application program can use the Modbus protocol to access the transfer memory of the gateway server. To use the gateway server, please see Section 3.4.8 for details.</td></tr>
</table>
</td></tr>
</table>

3.2.2. General Settings

This section describes how to define the general settings for the communication links using the General page of the Link Properties dialog box. The following is an example of the General page that defines a direct link.



The following is an example of the General page that defines a communication service link.



The following table describes each property in the General page of the Link Properties dialog box.

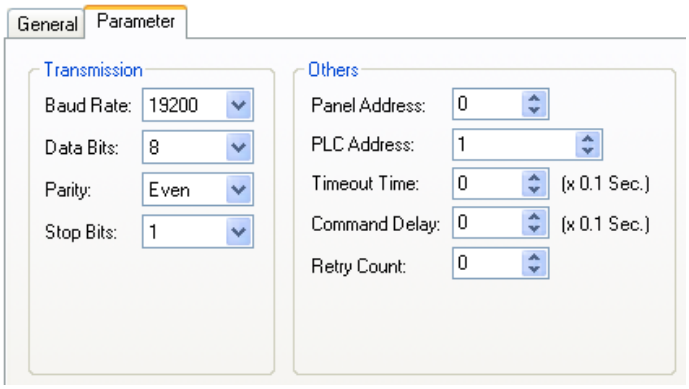
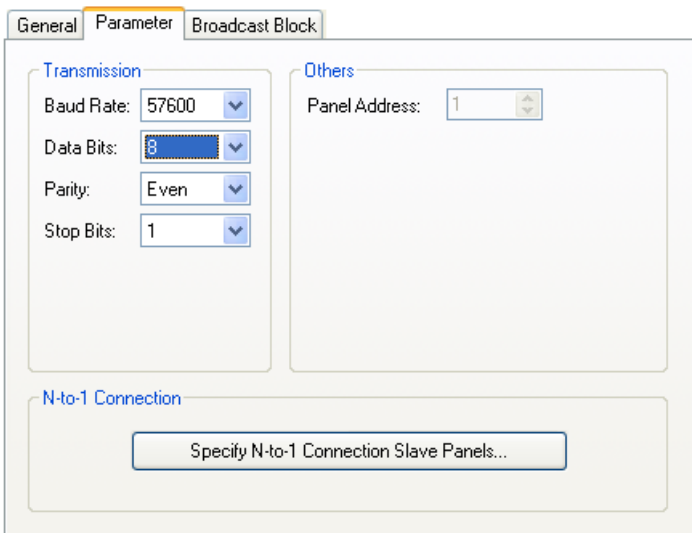
<table>
<tr><th>Property</th><th>Description</th></tr>
<tr><td>Link Number</td><td>The sequence number of the communication link. It is assigned when the link is created and reassigned when any other link of the same application is removed.</td></tr>
<tr><td>Link Name</td><td>Specifies the name of the communication link.</td></tr>
<tr><td>Link Type</td><td>Select one of the following link types for the link:
<table>
<tr><th>Link Type</th><th>Description</th></tr>
<tr><td>Direct Link (COM)</td><td>The link connects to the specified device directly through the specified serial (COM) port.</td></tr>
<tr><td>Direct Link (Ethernet)</td><td>The link connects to the specified device directly through the specified Ethernet port.</td></tr>
<tr><td>Communication Service (COM)</td><td>The link connects to one or more other target panels through the specified serial (COM) port and provides the communication service specified in the Device/Server field to the connected target panels. See the description of the Device/Server field to know the available communication services.</td></tr>
<tr><td>Communication Service (Ethernet)</td><td>The link connects to one or more other target panels through the specified Ethernet port and provides the communication service specified in the Device/Server field to the connected target panels. See the description of the Device/Server field to know the available communication services.</td></tr>
<tr><td>Gateway Service(Ethernet)</td><td>The link connects to a target panel that provides gateway service as a gateway server through the specified Ethernet port.
The target panel allows an application program running on any computing device, such as a PC, to access the data of the controllers through that target panel.</td></tr>
<tr><td>Indirect Link via 2-to-1 Connection (COM)</td><td>The link connects to a target panel that provides the communication service as a 2-to1 server through the specified serial (COM) port. The target panel can communicate with the associated device indirectly through that target panel.</td></tr>
<tr><td>Indirect Link via N-to-1 Connection (COM)</td><td>The link connects to a target panel that provides the communication service as an N-to1 master through the specified serial (COM) port. The target panel can communicate with the associated device indirectly through that target panel.</td></tr>
<tr><td>Indirect Link via N-to-1 Connection (Ethernet)</td><td>The link connects to a target panel that provides the communication service as an N-to1 master through the specified Ethernet port. The target panel can communicate with the associated device indirectly through that target panel.</td></tr>
</table></td></tr>
</table>

Continued

<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td colspan="2">Device/Server</td><td>When the Link Type is Direct Link, specify the link's connected device.
When the Link Type is Communication Service (COM), select one of the following servers.
<table>
<tr><th>Server</th><th>Description</th></tr>
<tr><td>2-to-1 Server</td><td>In the Data Link field, specify a direct link of the application as the data link for the server. The 2-to-1 server is a bridge between another panel and the device connected to the specified data link. Another panel/application of the project can now use an indirect link to access the device connected to the server through the specified data link.</td></tr>
<tr><td>2-to-1 Transparent Server</td><td>In the Data Link field, specify a direct link of the application as the data link for the server. The service link connects to a computing device, and allows the device to indirectly communicate with another device through the data link. The computing device can be a target panel, a panel of another brand, or a PC. If the computing device is a target panel, it must use a direct link to accept the service.</td></tr>
<tr><td>N-to-1 Master</td><td>In the Data Link field, specify a direct link of the application as the data link for the server. The link can connect up to 8 target panels, and allow these panels to indirectly communicate with the device connected to the specified data link. The panels served by the link must use an indirect link to accept the service.</td></tr>
</table>
When the Link Type is Communication Service (Ethernet), select one of the following servers.
<table>
<tr><th>Server</th><th>Description</th></tr>
<tr><td>N-to-1 Master</td><td>In the Data Link field, specify a direct link of the application as the data link for the server. The link can connect up to 8 target panels, and allow these panels to indirectly communicate with the device connected to the specified data link. The panels served by the link must use an indirect link to accept the service.</td></tr>
</table>
When the Link Type is Indirect Link and the Indirect Link Server Location is specified, the indirectly connected device is shown here.</td></tr>
<tr><td colspan="2">Link Port</td><td>Select a port for this link.</td></tr>
<tr><td colspan="2">Sub-links</td><td>When an RS485 communication line has many devices connected to it, the logical connection of a device on the link with the target panel is called a sub-link.
This field is available when the Link Type is Direct Link (COM). Select this option if this link will connect to many devices, and you want to identify, monitor, or control the communication with each connected device.</td></tr>
<tr><td colspan="2">Data Link</td><td>Select a direct link of the application as the data link for the communication service when the Link Type is Communication Service.</td></tr>
<tr><td rowspan="2">Indirect Link Server Location</td><td>Panel Application</td><td>Select the panel application that provides the communication service for this indirect link.</td></tr>
<tr><td>Link</td><td>Select the communication service link that provides the communication service for this indirect link.</td></tr>
<tr><td colspan="2">Record communication status in operation log</td><td>Check this option if you want the communication status of the link or the link's sub-links to be recorded in the operation log. The recordable types of status include: Enabled, Disabled, Failed, and Recovered. The operation log display can show the logged communication status.</td></tr>
<tr><td colspan="2">Check Word</td><td>The panel will read the specified word periodically to check the status of the link's connection.</td></tr>
<tr><td colspan="2">The duration of showing a communication error message</td><td>The communication error message box will hide and show according to the specified duration. If the duration is 0, the error message box will not show.</td></tr>
</table>

3.2.3. Parameter Settings (Serial Port)

This section describes how to set up the communication parameters for the serial communication links using the Parameter page of the Link Properties dialog box.

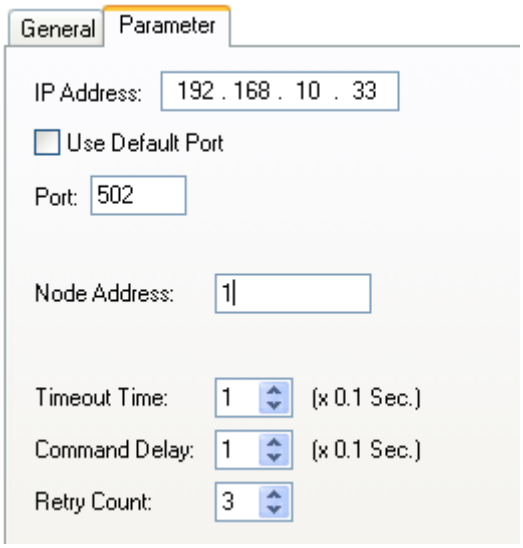
The following is an example of the Parameter page for a serial direct link.	The following is an example of the Parameter page for an N-to-1 master.
	

The following table describes each property in the Parameter page of the Link Properties dialog box for a serial link.

Property	Description
Baud Rate	The baud rate used.
Data Bits	The number of data bits used.
Parity	The scheme of parity used.
Stop Bits	The number of stop bits used.
Panel Address	The address of the target panel.
PLC Address	The address of the connected device.
Timeout Time	The maximum time allowed for the communication driver to wait for a reply from the connected device. When the elapsed time exceeds the Timeout Time, the communication driver assumes the communication failed.
Command Delay	If the Command Delay is 0, the communication driver immediately sends the next request to the connected device when it receives a reply from the last request. If the Command Delay is nonzero, the communication driver delays for the specified amount of time before sending the next request to the connected device.
Retry Count	The number of times the communication driver will retry for each request to get a successful reply from the connected device. If the number is zero, the communication driver will use the default retry count.
Specify N-to-1 Connection Slave Panels	This button is available when the link is an N-to-1 master. Click this button to bring up the N-to-1 Connection Slave Panels dialog box. You can define the slave panels of the N-to-1 connection in the dialog box.
Specify Other Data Sharing Panels	This button is available when the link is a direct link and the connected device is Data Sharer (RS485). Click this button to bring up the Other Data Sharing Panels dialog box. You can define the other data sharing panels in the dialog box.

3.2.4. Parameter Settings (Ethernet Port)

This section describes how to set up the communication parameters for Ethernet links using the Parameter page of the Link Properties dialog box. The following is an example of the Parameter page for an Ethernet direct link.



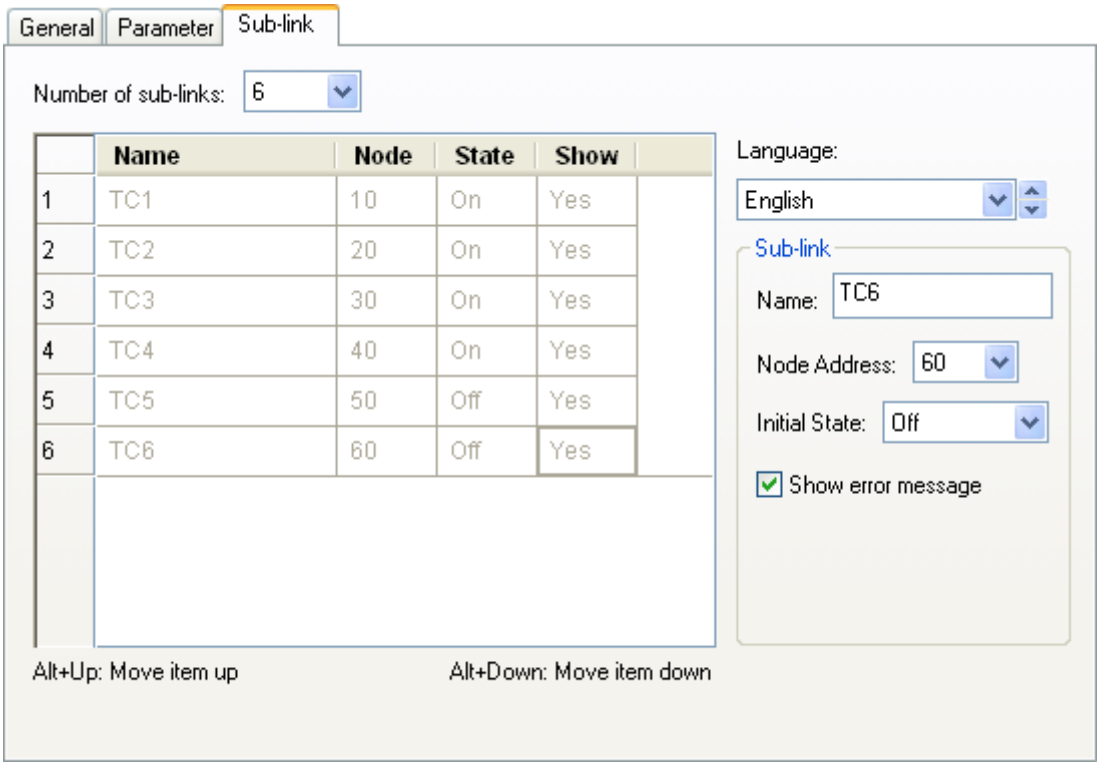
The following table describes each property in the Parameter page of the Link Properties dialog box for an Ethernet link.

Property	Description
IP Address	The IP address of the connected device.
Use Default Port	Check this option if the default IP port is used
Port	Specifies the IP port used
Node Address	Specifies the node address of the connected device.
Timeout Time	The maximum time allowed for the communication driver to wait for a reply from the connected device. When the elapsed time exceeds the Timeout Time, the communication driver assumes the communication failed.
Command Delay	If the Command Delay is 0, the communication driver immediately sends the next request to the connected device when it receives a reply from the last request. If the Command Delay is nonzero, the communication driver delays for the specified amount of time before sending the next request to the connected device.
Retry Count	The number of times the communication driver will retry for each request to get a successful reply from the connected device. If the number is zero, the communication driver will use the default retry count.

3.2.5. Sub-link Settings

An RS485 link can have many slave devices connected to it. The HMI uses the same communication protocol to talk with all the slave devices. The connection between the HMI and each of the slave devices is a sub-link. With the Sub-link table, the operator can enable or disable a sub-link at any time.

This section describes how to define the sub-links within a direct link using the Sub-link page of the Link Properties dialog box. The following is an example of the Sub-link page.

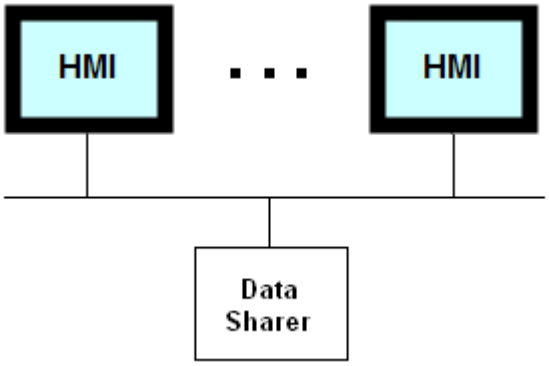


The following table describes each property in the Sub-link page of the Link Properties dialog box for a direct link.

Property	Description
Number of sub-links	Specifies how many devices the link will connect as sub-links.
Language	Specifies the current language for the Name field.
Name	The name of the selected sub-link for the language specified in the Language field.
Node Address	The address of the selected sub-link. The address must be a unique number within all the sub-links.
Initial State	The initial communication state for the selected sub-link. If the state is On, the panel will communicate with the sub-link after running the application. If the state is Off, the panel will not communicate with the sub-link until the communication state is turn On in a sub-link table.
Show error message	If this option is checked, the communication error message will be shown when the selected sub-link encounters communication errors. If this option is unchecked, no error message will be shown for any communication errors.

3.2.6. Sharing Data among Panels Using Data Sharer

The data sharer is a virtual device. It allows data sharing among up to 16 target panels on an Ethernet or an RS485 network. Each of the target panels can have up to 256 words of data to share.



To set up the communication for data sharing, create a direct link and select Data Sharer (UDP) or Data Sharer (RS485) as the connected device. The panel address that you can set in the Parameter page of the Link Properties dialog box must be unique for each sharing panel as it is used to identify the shared data.

The communication driver for the link connecting to Data Sharer is responsible for broadcasting the panel's shared data on the network. For example, if the panel address of a panel is 10 and the number of the link connecting to Data Sharer is 2, the following Macro command will cause the communication driver to broadcast the corresponding data on the network.

2\P10.0 = MOV($u300, 30)

The communication driver receives the broadcasted shared data on the network automatically. It has a block of memory to store the shared data. To access a word, use the following address, where m is the panel address and n is the word number of that panel’s shared data.

Pm.n m=1~16; n=0-255

To access a bit, use the following address, where b is a hexadecimal number representing the bit number in the specified word.

Pm.n.b m=1~16; n=0-255; b=0~f

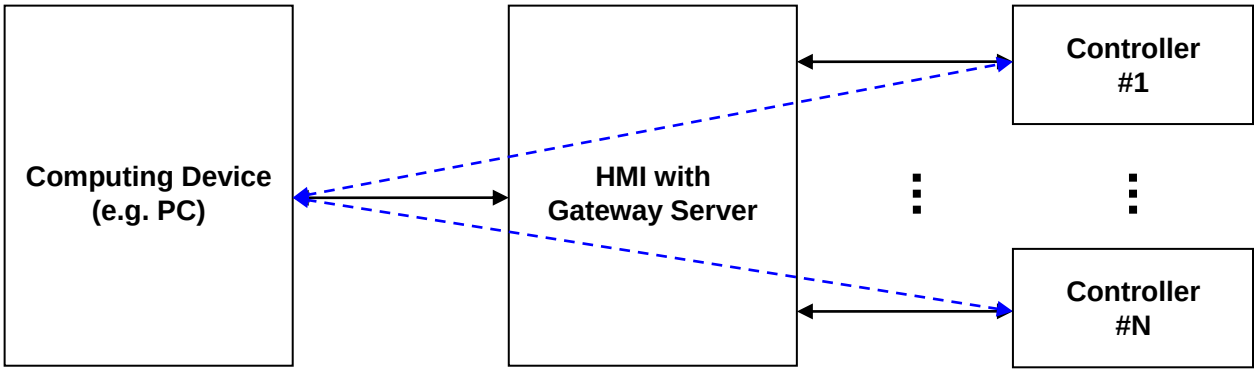
The UDP is used for the data sharing on Ethernet.

3.2.7. Using Gateway Server of the Target Panel

A gateway server in a HMI allows an application program running on any computing device, such as a PC, to access the data of the controllers that are connected to that HMI. The HMI behaves as a Modbus device. Your application program can use the Modbus protocol to access the transfer memory provided by the gateway server.

There are two gateway servers available to be selected for your application. The Serial Gateway Server is for the serial port connection, and the TCP/IP Gateway Server is for the Ethernet port connection.

Gateway Server	Protocol Used	Link Type
TCP/IP Gateway Server	Modbus TCP/IP	Ethernet
Serial Gateway Server	Modbus RTU	RS-232/422/485

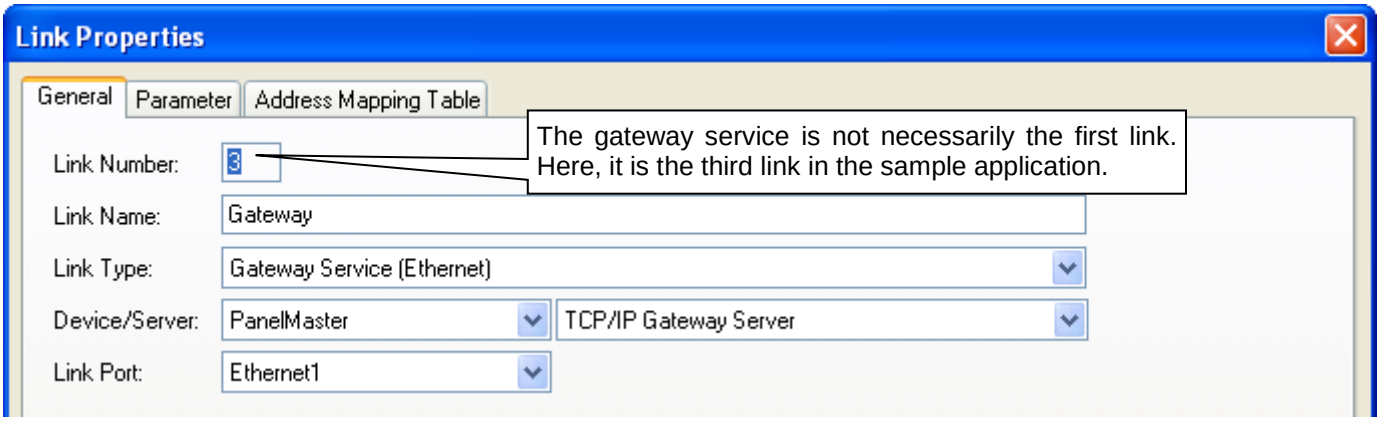


The blue dashed lines shown in the above figure indicate that the PC can access the data of Controller #1 and Controller #N through the HMI with the help of the gateway server.

3.2.7.1. Setting up Gateway Service

Suppose that the application has two links: One direct link that connects the target panel and PanelMaster->Null PLC device through COM1; the other direct link that connects the target panel and Siemens AG->Simatic S7-300(MPI Port) device through COM2. To use the gateway service, you may do the followings:

1. Create a new link and select Gateway Service (Ethernet) as the Link Type and PanelMaster->TCP/IP Gateway Server as the Device/Server in Link Properties dialog box.

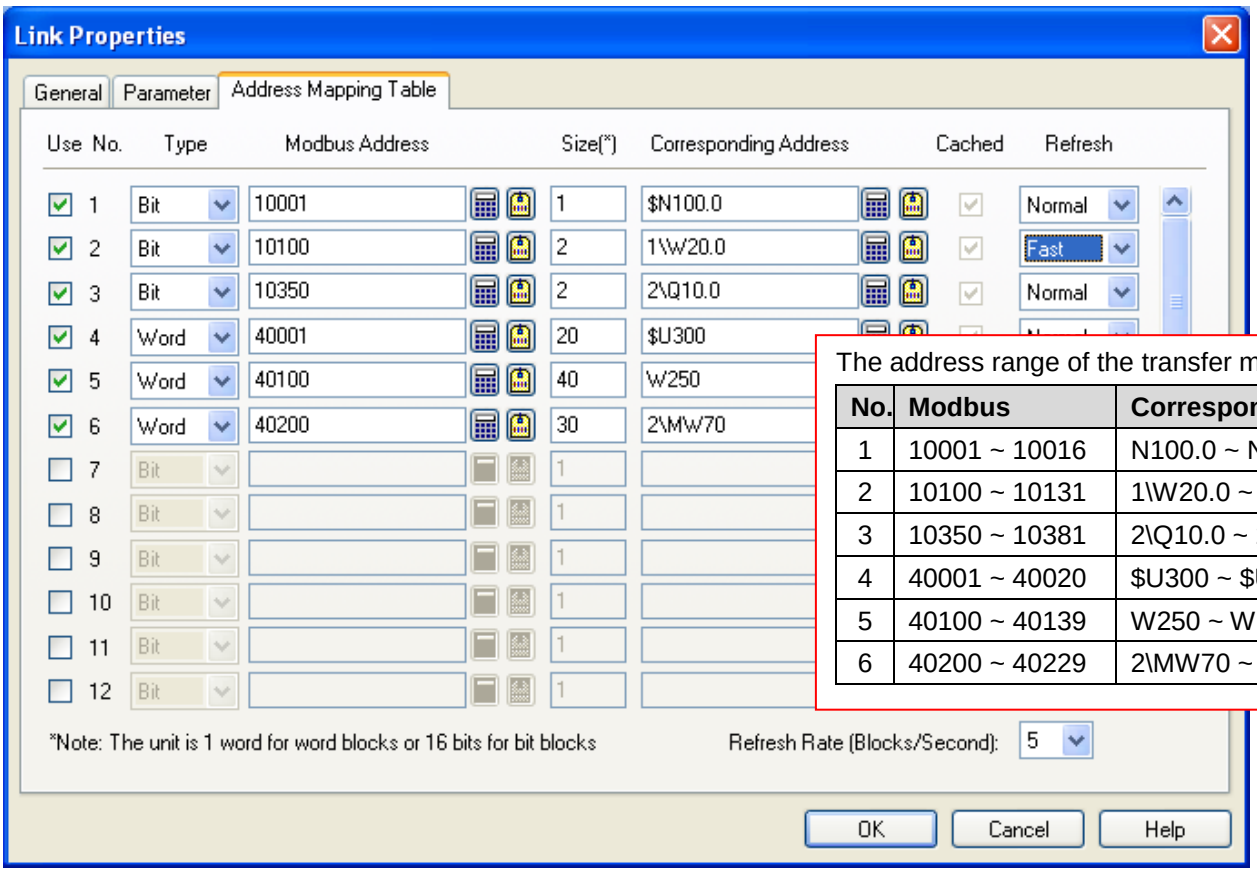


2. You need to define the address mapping table for the gateway server because:

■ When your application writes a block of data to the transfer memory of the gateway server, the gateway server knows the real destination of that block of data, and writes the data to the real destination for your application.

■ When your application program reads a location of the transfer memory of the gateway server, the gateway server knows the real data source of the read operation, and retrieves the data from the real data source for your application.

To define the address mapping table, click the Address Mapping Table tab in the Link Properties dialog. The following is an example of the Address Mapping Table page.



The address range of the transfer memory:

No.	Modbus	Corresponding
1	10001 ~ 10016	N100.0 ~ N100.f
2	10100 ~ 10131	1\W20.0 ~ 1\W21.f
3	10350 ~ 10381	2\Q10.0 ~ 2\Q13.7
4	40001 ~ 40020	$U300 ~ $U319
5	40100 ~ 40139	W250 ~ W289
6	40200 ~ 40229	2\MW70 ~ 2\MW99

The following table describes each property in the Address Mapping Table page of the Link Properties dialog box for a Gateway Service (Ethernet) link.

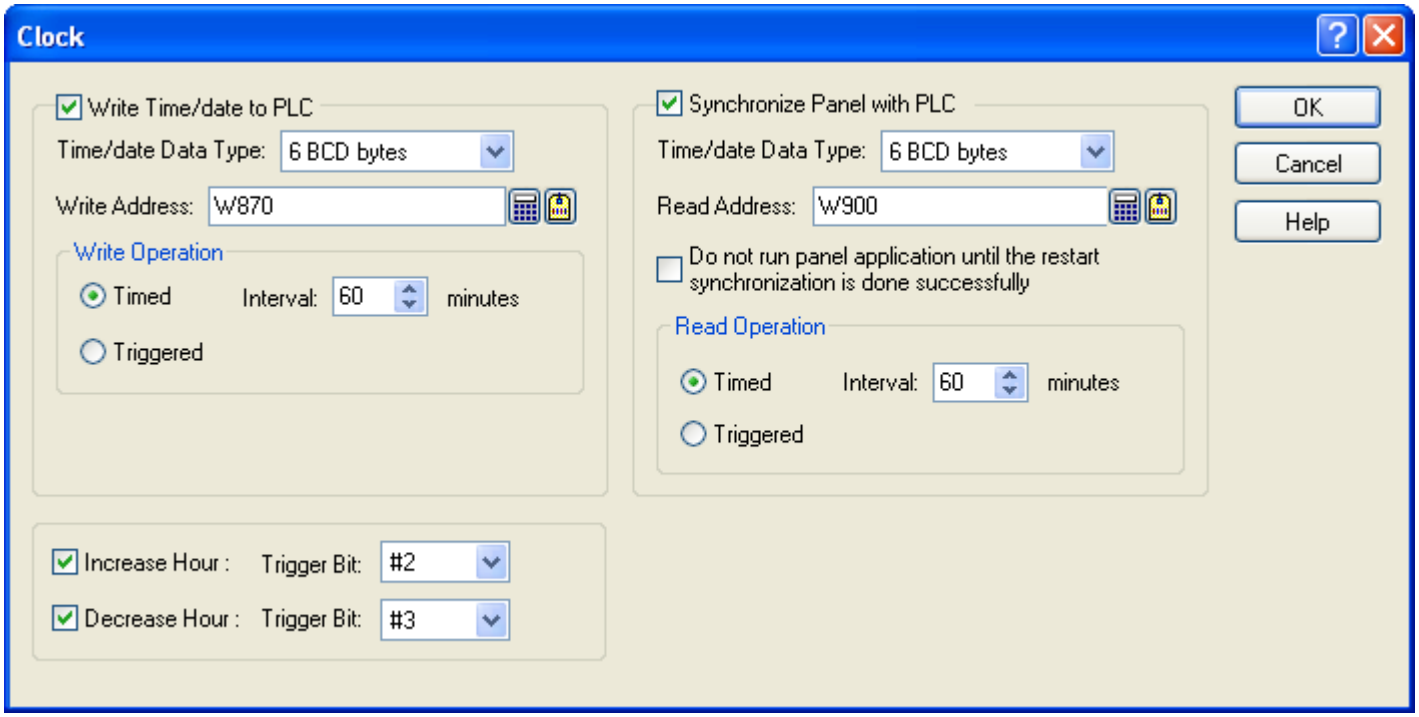
<table>
<tr><th>Property</th><th>Description</th></tr>
<tr><td>Use</td><td>Check this option if you want to use mapping block #n.</td></tr>
<tr><td>No</td><td>The mapping block's number.</td></tr>
<tr><td>Type</td><td>Select location type for the mapping block. Bit indicates a bit block, and Word indicates a word block.</td></tr>
<tr><td>Modbus Address</td><td>The starting address in the computing device that is using the Modbus protocol. The address ranges and the location types of the transfer memory are shown in the table.
<table>
<tr><th>Address Range</th><th>Location Type</th><th>Max. Size of Block Read/Write</th><th>Note</th></tr>
<tr><td>1~9999</td><td>Bit</td><td>256 bits</td><td>Read Only</td></tr>
<tr><td>10001~19999</td><td>Bit</td><td>256 bits</td><td></td></tr>
<tr><td>30001~39999</td><td>Word</td><td>128 words</td><td>Read Only</td></tr>
<tr><td>40001~49999</td><td>Word</td><td>128 words</td><td></td></tr>
</table>
</td></tr>
<tr><td>Size</td><td>The block size. If the location type is Word, the unit is 1 word. If the location type is Bit, the unit is 16 bits. For example: The size of the mapping bit block, 3, is 2 words and 32 bits.</td></tr>
<tr><td>Corresponding Address</td><td>The starting address of the corresponding controller or the target panel with gateway server.</td></tr>
<tr><td>Cached</td><td>Check this option to save data into the memory devoted to high-speed retrieval of requested data.</td></tr>
<tr><td>Refresh</td><td>Available only when the Cached option is checked. Select Fast to refresh data in the memory every second. Select Normal to refresh data in the memory every 3 seconds.</td></tr>
</table>

Limitations:

1. At most, 32 mapping blocks can be defined.
2. At most, 12 mapping blocks can be cached.
3. At most, 4 of the cached mapping blocks can have fast refresh rate.
4. When reading a block of words or bits, the words or bits must be within a single mapping block, or the read operation will fail.

3.3. Setting up Clock Operations

This section describes how to define Clock Operations for the panel application using the Clock dialog box. The following is an example of the Clock dialog box.



The following table describes each property in the Clock dialog box.

Property		Description
Write	Write Time/date to PLC	Select this option so the panel will write time and date information to the specified variable.
	Time/date Data Type	Select one of the following data types for the output time and data information.

Data Type	Description
6 BCD bytes	The following shows the data structure.

Byte No.	Content
0	Minute; 0-59
1	Hour; 0-23
2	Day; 1-31
3	Month; 1-12
4	Year; 00-99
5	Day-of-week; 0(Sunday)-6(Saturday)

Note: All the values are in BCD format.

Continued

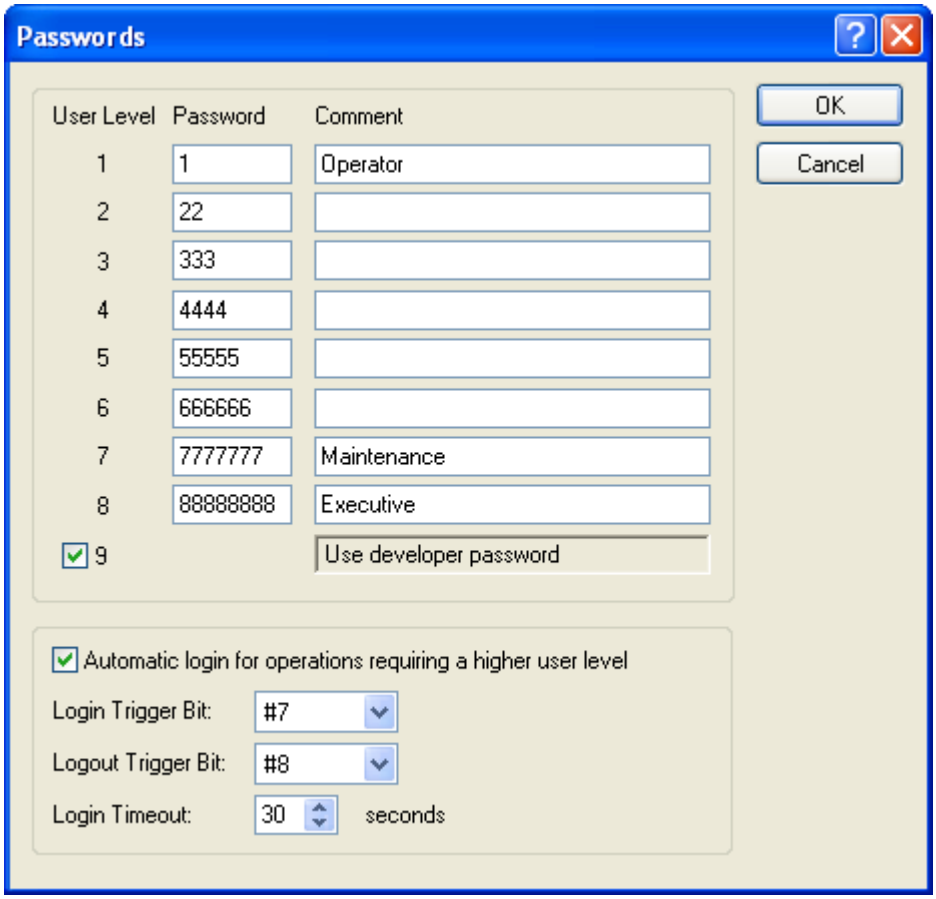
<table>
<tr><th colspan="3">Property</th><th>Description</th></tr>
<tr><td>Write</td><td>Time/date Data Type</td><td></td><td>
<table>
<tr><th>Data Type</th><th>Description</th></tr>
<tr><td>8 BCD bytes</td><td>The following shows the data structure.
<table>
<tr><th>Byte No.</th><th>Content</th></tr>
<tr><td>0</td><td>Minute; 0-59</td></tr>
<tr><td>1</td><td>Hour; 0-23</td></tr>
<tr><td>2</td><td>Day; 1-31</td></tr>
<tr><td>3</td><td>Month; 1-12</td></tr>
<tr><td>4</td><td>Year; 00-99</td></tr>
<tr><td>5</td><td>Day-of-week; 0(Sunday)-6(Saturday)</td></tr>
<tr><td>6</td><td>Second; 0-59</td></tr>
<tr><td>7</td><td>0</td></tr>
</table>
Note: All the values are in BCD format.</td></tr>
<tr><td>7 BCD words</td><td>The following shows the data structure.
<table>
<tr><th>Word No.</th><th>Content</th></tr>
<tr><td>0</td><td>Second; 0-59</td></tr>
<tr><td>1</td><td>Minute; 0-59</td></tr>
<tr><td>2</td><td>Hour; 0-23</td></tr>
<tr><td>3</td><td>Day; 1-31</td></tr>
<tr><td>4</td><td>Month; 1-12</td></tr>
<tr><td>5</td><td>Year; 00-99</td></tr>
<tr><td>6</td><td>Day-of-week; 0(Sunday)-6(Saturday)</td></tr>
</table>
Note: All the values are in BCD format.</td></tr>
<tr><td>7 binary words</td><td>The following shows the data structure.
<table>
<tr><th>Word No.</th><th>Content</th></tr>
<tr><td>0</td><td>Second; 0-59</td></tr>
<tr><td>1</td><td>Minute; 0-59</td></tr>
<tr><td>2</td><td>Hour; 0-23</td></tr>
<tr><td>3</td><td>Day; 1-31</td></tr>
<tr><td>4</td><td>Month; 1-12</td></tr>
<tr><td>5</td><td>Year; 00-99</td></tr>
<tr><td>6</td><td>Day-of-week; 0(Sunday)-6(Saturday)</td></tr>
</table></td></tr>
</table>
</td></tr>
<tr><td></td><td>Write Address</td><td></td><td>Specifies the variable that will receive the output time and date information.</td></tr>
<tr><td></td><td>Write Operation</td><td>Timed</td><td>When this item is selected, the panel writes time and date information to the specified variable periodically at a rate specified in the Interval field. Specify an interval between 1 and 255 minutes.</td></tr>
<tr><td></td><td></td><td>Triggered</td><td>When this item is selected, the panel writes time and date information to the specified variable whenever the specified trigger bit changes from Off to On.</td></tr>
</table>

Continued

Property			Description
Read	Synchronize Panel with PLC		Select this option so the panel will read time and date information from the specified variable and adjust its clock accordingly.
	Time/date Data Type		Specifies the data type for the input time and data information. For details, see the description of the Time/date Data Type field of the Write group.
	Read Address		Specifies the variable that the panel will read the time and date information.
	Do not run panel application until the restart synchronization is done successfully		Select this option so the panel application does not run until the restart synchronization is done successfully.
	Read Operation	Timed	When this item is selected, the panel reads time and date information from the specified variable periodically at a rate specified in the Interval field. Specify an interval between 1 and 255 minutes.
		Triggered	When this item is selected, the panel reads time and date information from the specified variable whenever the specified trigger bit changes from Off to On.
Increase Hour			Select this option to increase the panel's clock by one, by changing the specified trigger bit from Off to On.
Decrease Hour			Select this option to decrease the panel's clock by one, by changing the specified trigger bit from Off to On.

3.4. Setting up Passwords

This section describes how to set up passwords for the panel application using the Passwords dialog box. The following is an example of the Passwords dialog box.



The following table describes each property in the Passwords dialog box.

Property	Description
Password	The Password column contains 8 fields. Specify the password for a user level in the corresponding field. A password is a positive integer up to 8 digits. A password must be unique within the application.
Comment	The Comment column contains 8 editable fields. You can type the comment for a password or user level in the corresponding field.
9	Check this item if you want the developer password to be the password with the highest privilege.
Automatic login for operations requiring a higher user level	The password keypad will be displayed to enter a password for a higher user level when the operator touches an object that requires a higher user level than the current one in order to perform the programmed operation.
Login Trigger Bit	When the specified trigger bit changes from Off to On, the password keypad will be displayed to enter a password. The operator can enter a valid password or cancel the password keypad.
Logout Trigger Bit	When the specified trigger bit changes from Off to On, the current user level is reset to 0.
Login Timeout	The password keypad will close automatically when it gets no input from the operator for the specified time.

3.5. Screens

3.5.1. Types of Screens

There are three types of screens: Normal Screen, Window Screen and Menu Screen.

To create any type of screen, you can do the following:

1) Create a screen. Default is a normal screen. To learn how to create a screen, please see Section 3.9.2 for details.
2) Open Screen Properties dialog box. To learn how to open the dialog box, please see Section 3.9.3 for details.
3) In the dialog box, select the type you would like the screen to be.

The following table describes how each type of screen opens, closes, and displays.

Types	Description
Normal Screen	A screen that will be displayed when it is selected to be a startup screen, or when a screen button with open screen/previous screen operation is pressed. Usually the normal screen cannot be closed until the other normal screen is opened. The normal screen is also called a main screen that is only displayed one at a time in the panel. The screen size is fixed and depends on the panel model.
Window Screen	A screen that appears in the following situations: • Screen button with open screen operation is pressed • Selected to be a startup screen • OPEN_WS macro command is used. • Alarm is active or clear when the display screen option in the discrete/analog alarm block is selected • Page selector object is used • Custom keypad is needed Usually the window screen stays on the normal screen until the close button is pressed on the title bar or the screen button or CLOSE_WS macro command to close. It then disappears. The panel can display many window screens at a time. At runtime, the window screen will initially be displayed at the predefined position. If the window screen has the title bar, click-and-hold the title bar to move it around in the panel.
Menu Screen	A screen that is displayed when it is selected to be a startup screen, or when a screen button with the open screen operation is pressed. The menu screen remains on the normal screen or window screen, until an area outside the menu screen is pressed, or the screen button is used to close the menu screen. The menu screen then closes. The panel can display one menu screen at a time. The menu screen can slide horizontally into view from either the left or right side of the screen. It can also appear by the left or right side of the button and slide upward or downward into view. Please see Section 5.3.4 to learn how to use the screen button to set up the position of the menu screen. Usually the menu screen stays on the normal screen or window screen until you press anywhere outside the menu screen or use screen button to close. It then disappears.

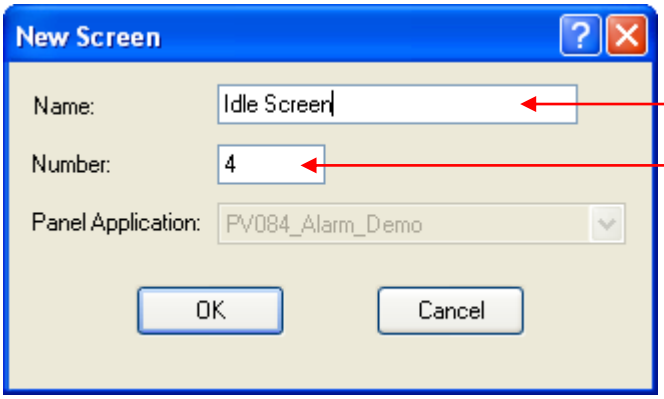
3.5.2. Creating and Opening Screens

■ Creating Screens

To create a screen, you can do the following:

1) Do one of the following:
   - On the Screen menu, click New Screen…
   - In the Project Manager window, right-click the panel application > Screens item and then click New Screen… on the pop-up menu.

2) In the New Screen dialog box, type the name and number desired, and hit the ENTER key or click the OK button to validate your choice. The following is an example of the New Screen dialog box.



Specify the screen name. Screen names are case insensitive. For example, the names Startup Screen, startup screen are considered to be the same.

Specify the screen number. The screen number must be between 1 and 7999.

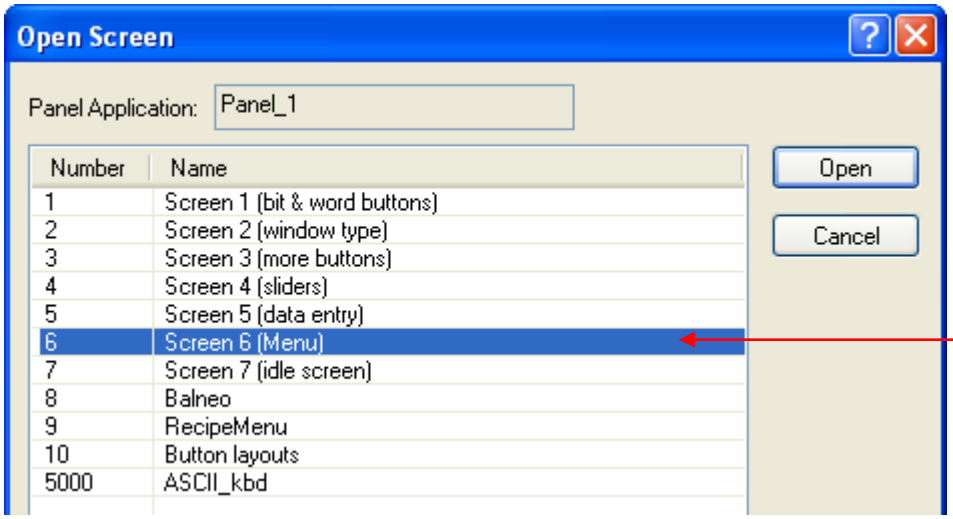
Note: In each panel application, both the screen name and the screen number have to be unique.

■ Opening Screens

To open a screen, you can do the following:

1) In the Project Manager window, double click the screen you want to open
2) On the Screen menu, click Open Screen… In the Open Screen dialog box, select one or multiple screens and click Open button to open all the selected screens.

   The following is an example of Open Screen dialog box.



To select a screen, click the row of the screen in the list.

To select multiple screens, click one row and use Ctrl + Click to add additional rows to the selection.

To select continuous screens, click one row and hold the Shift key and click the last row.

■ **Activating Screens after Opening**

To uncover any screen that is partially or completely obscured by other screens, you can do the following:

1) In the Project Manager window, double click the screen which is not at the top.
2) On the Window menu, click the screen you need to activate. Or click Windows… to bring out the Windows dialog box. In the Windows dialog box, select the screen and then click Activate button.
3) Click anywhere on the screen. If the screens are maximized, click on the title tab of the screen.

3.5.3. Setting up a Screen

You can set up the screen with the Screen Properties dialog box.

To set up a screen, right click Panel Application > Screens > screen to set up in the Project Manager window, and then click Properties on the pop-up menu.

To set up a current screen (an opened screen which is at the top), do one of the following:

1) In the Project Manager window, double click the current screen.
2) Right click the blank area on the current screen, and then click Screen Properties… on the pop-up menu.
3) On the Screen menu, click Screen Properties…

The Screen Properties dialog box contains the following pages. Some of the pages appear only when they are needed.

■ **General**
Described in Section 3.9.3.1.

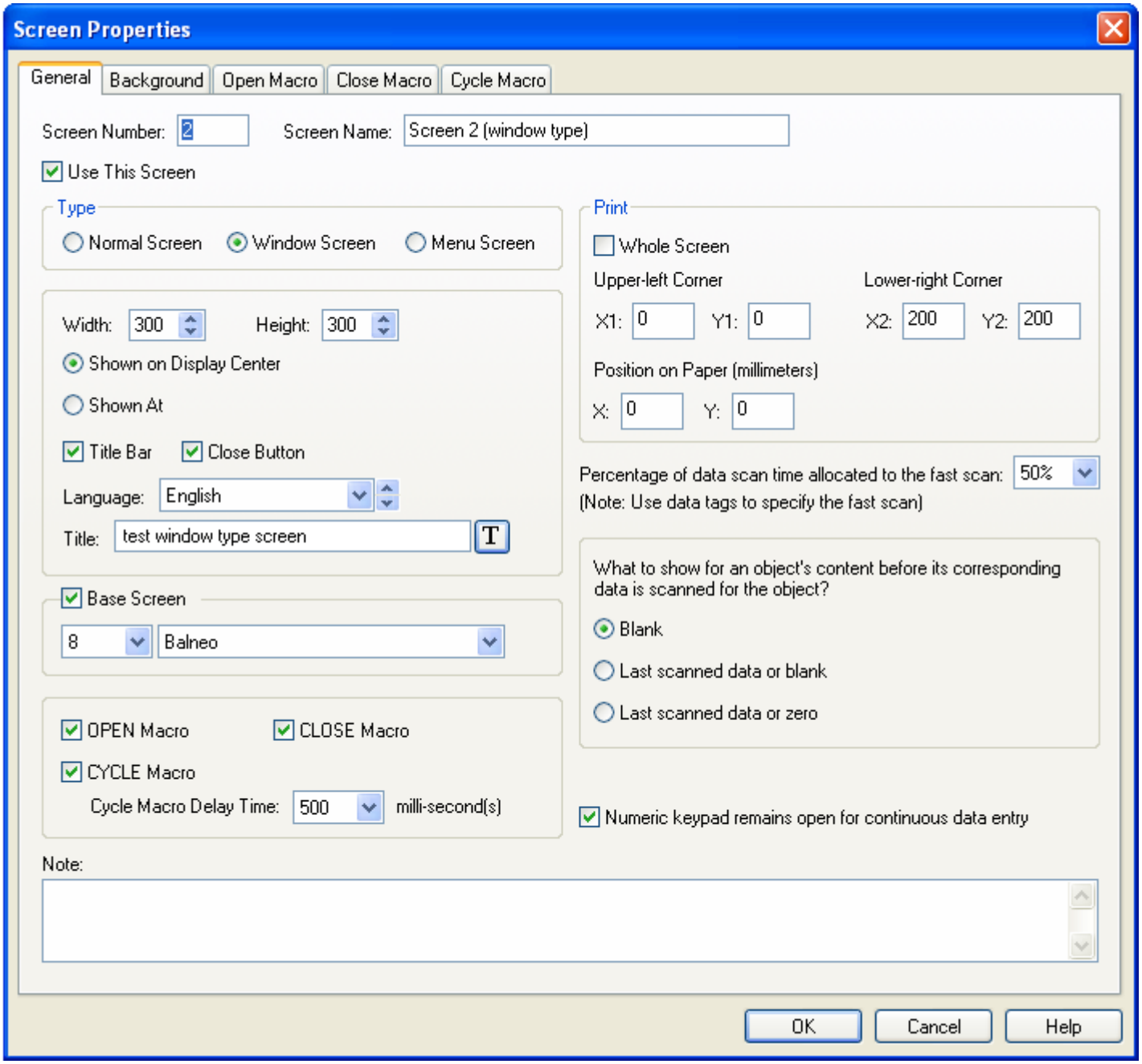
■ **Background**
Described in Section 3.9.3.2.

■ **Keys**
Described in Section 3.2.2.

■ **Open Macro / Close Macro / Cycle Macro**
Described in Section 14.2.6.

3.5.3.1. General Page

This section describes how to define the general settings for a screen. The following is an example of the General page of the Screen Properties dialog box.



The following table describes each item in the General page.

Property	Description
Screen Number	The number of the screen. It must be between 1 and 7999.
Screen Name	The name of the screen.
Use This Screen	Check this option to use the screen.
Type	Specifies the type of the screen. There are three types: Normal Screen, Window Screen and Menu Screen. Please see Section 3.9.1 for details.

Continued

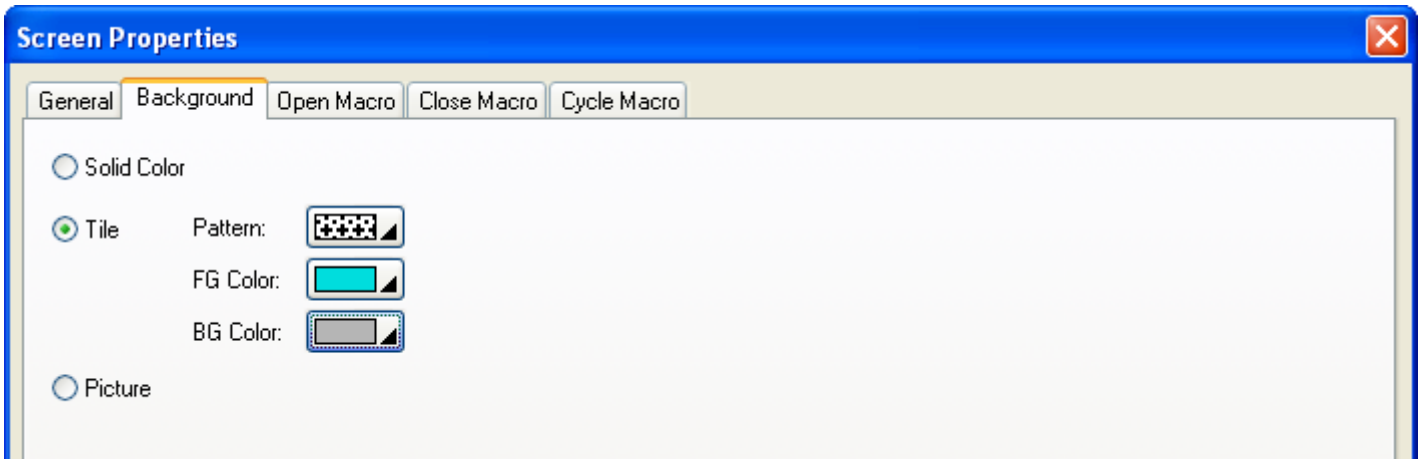
Property		Description
Width		Specifies the width (in pixels) of the screen. This field is available to edit when the Type is Window Screen and Menu Screen.
Height		Specifies the height (in pixels) of the screen. This field is available to edit when the Type is Window Screen and Menu Screen.
Shown on Display Center		Check this option to show the window screen on the display center. This field is available when the Type is Window Screen.
Shown At		Check this option to show the window screen at the specified position. This field is available when the Type is Window Screen.
	X	Specifies the X coordinate of the window screen's upper-left corner in pixels on the normal screen.
	Y	Specifies the Y coordinate of the window screen's upper-left corner in pixels on the normal screen.
Title Bar		Select this option to show a title bar with the specified title with the window screen when the Type is Window Screen.
Close Button		Select this option for the window screen to have a close Button when the Type is Window Screen and the Title Bar field is checked.
Language		Select a language to view and edit the settings of the title for that language. This field is available when the Type is Window Screen and Title Bar field is checked.
Title		Specifies the title or select the title from text database for the Title Bar. Click T to select the text from text database. Click to edit text. This field is available when the Type is Window Screen and Title Bar field is checked.
Base Screen	<Check Box>	Check this option to have a base screen for the current screen
	<Combo Box>	Specifies the screen to be a base screen. This field is available when the Base Screen is checked.
OPEN Macro		Check this item for the screen to have the OPEN macro. An Open Macro is run once when the associated screen is being opened. The target panel will not display the screen until the Open Macro terminates. Use OPEN macro to initialize global data and settings for the screen.
CLOSE Macro		Check this item for the screen to have the CLOSE macro. A Close Macro is run once when the associated screen is being closed. The target panel will not erase the screen until the Close Macro terminates.
CYCLE Macro	<Check Box>	Check this item for the screen to have the CYCLE macro. A Cycle Macro is run continuously while the associated screen is open. The target panel runs Cycle Macros cyclically, i.e. a Cycle Macro will run beginning with the first command each time after it completes the processing of the last command of the macro, or when it encounters an END command in the middle of the macro. The cycle macro terminates immediately when the screen is closed.
	Cycle Macro Delay Time	Specifies the delay time in 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 millisecond for the cycle macro.
Print	Whole Screen	Check this item to print the whole screen by Command Flag or Function Button or Macro Command
	Upper-left	Specifies the X and Y coordinates in pixels for the upper-left corner of the screen's printing area. The field is available when Whole Screen item is unchecked.
	Lower-Right	Specifies the X and Y coordinates in pixels for the lower-right corner of the screen's printing area. The field is available when Whole Screen item is unchecked.
	Position on Paper	Specifies the X and Y coordinates in millimeters for the position where the specified area of the screen will print on paper.

Continued

Property		Description
Percentage of data scan time allocated to the fast scan		Select the percentage of data scan time allocated to the fast scan among 50%, 66%, 75%, 80%, 86% and 90%. Note: With a bigger percentage, the data scan time is faster to the tag with fast scan rate. However, data scan time is slower to the tag with normal scan rate.
What to show for an object's content before its corresponding data is scanned for the object?	Blank	Select this item to show blank for an object's content before its corresponding data is scanned for the object.
	Last scanned data or blank	Select this item to show last scanned data or blank for an object's content before its corresponding data is scanned for the object.
	Last scanned data or zero	Select this item to show last scanned data or zero for an object's content before its corresponding data is scanned for the object.
Operable under window screen		Check this option to make the screen operable under window screen. This field is available only when the Type is Normal Screen.
Numeric keypad remains open for continuous data entry		Check this option for numeric keypad to remain open for continuous data entry.
Note		Type a note for the screen.

3.5.3.2. Background Page

This section describes how to define the background of a screen. The following is an example of the Background page of the Screen Properties dialog box.



The following table describes each item in the Background page.

Property		Description
Solid Color		Check this option for the screen background to be filled with a solid color.
	<Solid Color>	Click the corresponding color button to specify the color used to fill the background. This item is available when Solid Color option is selected.
Tile		Check this option for the screen background to be filled with a pattern.
	Pattern	Specify the pattern used to fill the background. Click the corresponding Pattern icon and select a pattern from the Pattern palette. This item is available when Tile option is selected.
	FG Color	The color used to paint the black part of the pattern. When the solid white pattern is selected, this color is not used. This item is available when Tile option is selected.
	BG Color	The color used to paint the white part of the pattern. This item is available when Tile option is selected.
Picture		Check this option to have a picture background for the screen.
	<Name>	The name of the picture. Use the drop-down list to select a picture from the picture database. Click to select a picture file. Then, the picture of the selected file is imported and saved in the picture database. Click to bring up the Select/Import from Library dialog box. Select a picture from a picture library file. Then, the selected picture is imported and saved in the picture database.
	Stretch	Check this item so the picture can change its size automatically to fit the screen.

3.5.4. Importing/Exporting a Screen

This section describes how to export a screen and import a screen regardless of the panel model and screen size.

■ Importing a screen

1) Right-click Panel Application > Screens item in the Project Manager window to bring out the pop-up menu and then use Import Screen…
2) Click the *.snf file you want to create a new screen from. To open a screen that was saved in a different folder, locate and open the folder first.
3) Click Open.

■ Exporting a screen

If you have screen you want to reuse, you can export the screen as a .snf file. You can do the following:

1) In the Project Manager window, click the screen to export
2) Right-click on the screen to display the screen item's "pop-up menu"; and then click Export Screen...
3) To save a screen in a different folder, locate and open the folder first, then click Save.

3.5.5. Cutting/Copying/Pasting/Deleting a Screen

■ Copying or Cutting and Pasting a Screen

To copy/cut a screen which is opened and activated, right click the blank area on the screen, and then click Copy Screen/Cut Screen on the pop-up menu, or use the Copy Screen/Cut Screen command On the Screen menu.

After Copying or Cutting, you can paste the screen by right clicking the blank area on any of the screen, and then use Paste Screen on the pop-up menu or the Paste Screen command On the Screen menu.

■ Deleting a Screen

To delete a screen which is opened and activated, right click the blank area on the screen, and then click Delete Screen on the pop-up menu or use the Delete Screen command on the Screen menu.

To delete a screen from Project Manager window, locate the screen to delete and right-click on the screen node to use the Delete command on the pop-up menu. Confirm the deleting operation.

3.5.6. Saving Screens as Pictures

This section describes how to save screens as pictures.

■ Saving a screen as a picture

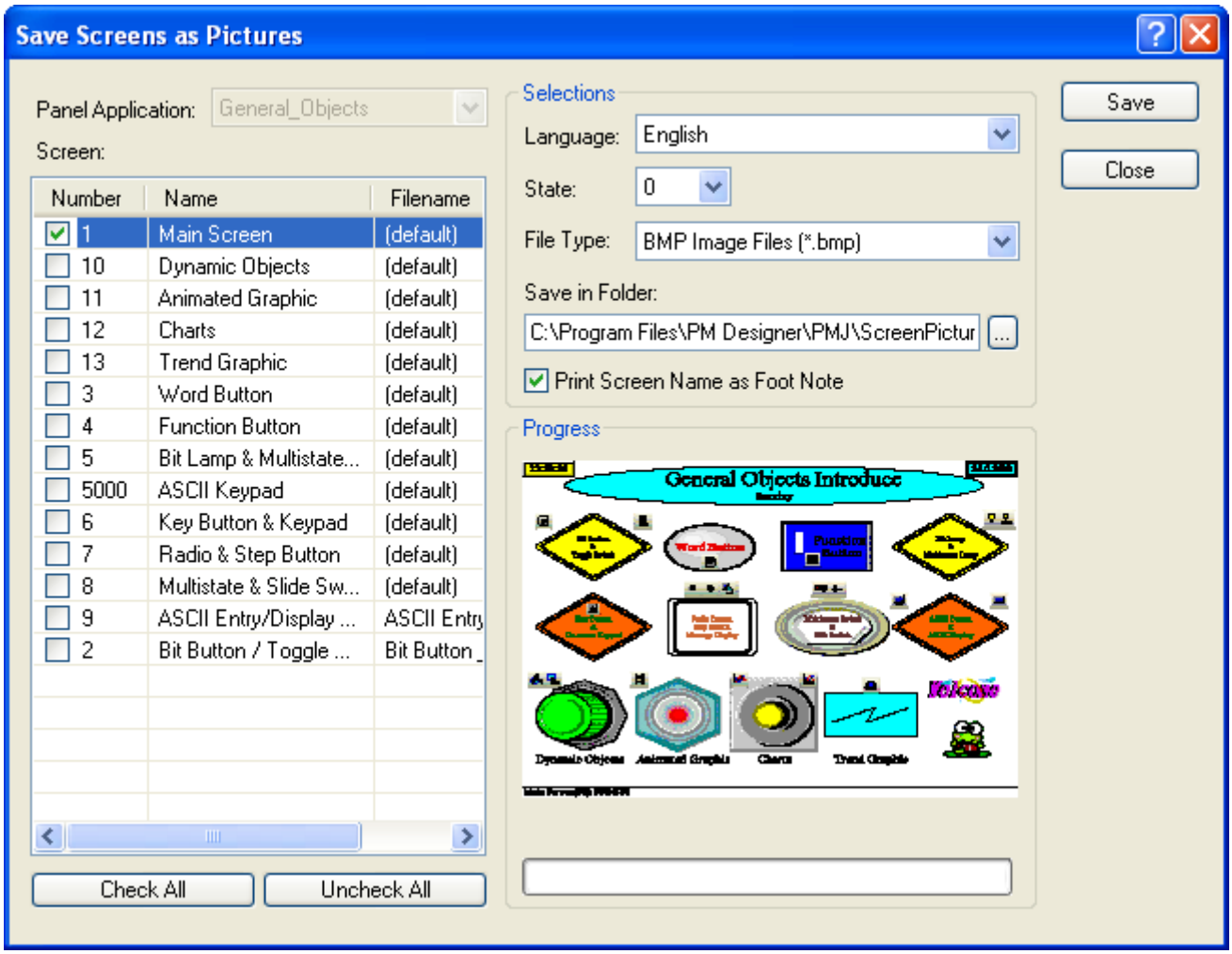
To save a current screen as the bmp or jpg file, you can do the following.

1) Open and activate the screen as a current screen
2) Right click anywhere on the current screen, and then click Save Current Screen as Picture… on the pop-up menu.
   - or -
   On the Screen menu, click Save Current Screen as Picture…

■ Saving multiple screens as pictures

You can also use the Save Screens as Pictures dialog box to save a screen or multiple screens as bmp or jpg files. To open the dialog box, click Save Screens as Pictures… on the Screen menu.

The following is an example of the Save Screens as Pictures dialog box.



The following table describes each item in the dialog box.

<table>
<tr><th colspan="2">Property</th><th>Description</th></tr>
<tr><td colspan="2">Panel Application</td><td>The application Name.</td></tr>
<tr><td colspan="2">Screen</td><td>The screen list shows all the screens in the panel application. Click the column header to sort the items.
The following table describes each column in the screen list.
<table>
<tr><th>Column</th><th>Description</th></tr>
<tr><td>Number</td><td>The screen number. Check the box before the screen number to save the screen as a picture file.</td></tr>
<tr><td>Name</td><td>The screen name.</td></tr>
<tr><td>Filename</td><td>The Filename. The default filename is Screen Name+Language Name+S+State Number.
Note: If any of the characters such as /\:*?"<>| in the screen name, they will be converted to underscore (_).</td></tr>
</table></td></tr>
<tr><td colspan="2">Check All</td><td>Click the button to check all the screens.</td></tr>
<tr><td colspan="2">Uncheck All</td><td>Click the button to uncheck all the screens.</td></tr>
<tr><td rowspan="5">Selections</td><td>Language</td><td>The language used to display the text of objects.</td></tr>
<tr><td>State</td><td>The state that displays the state of objects.</td></tr>
<tr><td>File Type</td><td>Select the file type. There are two types: bmp and jpg.</td></tr>
<tr><td>Save in Folder</td><td>Specifies the folder to locate the files. If the file exists in the folder, it will be replaced by the new one.</td></tr>
<tr><td>Print Screen Name as Foot Note</td><td>Check this option to display general screen information, such as foot note. The format of the foot note is Screen Name (#Screen Number); Screen WidthXScreen Height.</td></tr>
<tr><td rowspan="2">Progress</td><td><Screen View></td><td>Show the selected screen or the screen which is being saved. To select a screen, click its row in the screen list.</td></tr>
<tr><td><Progress Bar></td><td>Show the saving progress after the Save button is clicked.</td></tr>
<tr><td colspan="2">Save</td><td>Click the button to save all the selections with the specified conditions.</td></tr>
<tr><td colspan="2">Close</td><td>Click the button to exit the dialog box.</td></tr>
</table>