Lab-LINK$_{TM}$ for Windows

Part 1
Lab-LINK for Windows User's Manual

Top Team Technology, Inc.

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Chapter 1 Installation

System Requirement

System Requirement

- ❒ CPU: Pentium Ⅲ 800 MHz, Pentium4 2.4GHz or above recommended
- ❒ RAM: 128MB, 256 MB or above recommended
- ❒ Hard Disk: 200MB or more available hard disk space
- ❒ CD-ROM
- ❒ SVGA Display card and Color Monitor
- ❒ Mouse and Keyboard
- ❒ Operating System: Windows 2000/XP

Installation

Please insert **Lab-LINK** for Windows CD-ROM into CD-ROM drive. The installation screen should appear:

Install Lab-LINK 4.0: Install the main system of **Lab-LINK** for Windows Scada Package

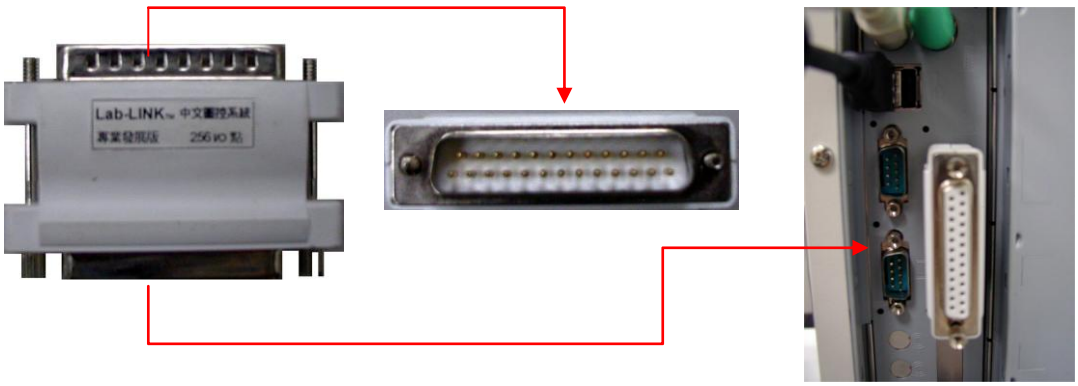
Install Lab-LINK 4.0 **Add-on Modules** : Install additional add-on modules:

- **Install DBSaver**: Install DBSaver Database Tool to provide commercial database data saving capability.
- **Install DBReport**: Install DBReport, a database report tool.
- **Install SmartRecipe**: Install SmartRecipe, a recipe access tool.
- **Install Notifier**: Install Notifier, a tool to send voice message through telephone.

Select “Install Lab-LINK for Windows 4.0” to install the main package. Follow the instructions to finish the installation. When the installation is completed, a Lab-LINK for Windows 4” folder will be created in the All Program List in Start Menu. The following shortcut will also be added into the folder:

- SmartPAM: The integrated Development Environment(IDE) of Lab-LINK.
- Security Editor: The user management tool of Lab-LINK.
- TagView: The Test and Debug Tool of Lab-LINK.
- Help: Lab-LINK documentation.
- Demo: A Lab-LINK demo project runtime shorcut.

Software protection



All **Lab-LINK** for Windows products come with a software protection dongle (keypro). The dongle must be properly connected to the parallel port or USB port of your computer for Lab-LINK to execute normally. Lab-LINK will be in evaluation mode when the dongle is not detected. Under evaluation mode, Lab-LINK has the following limits:

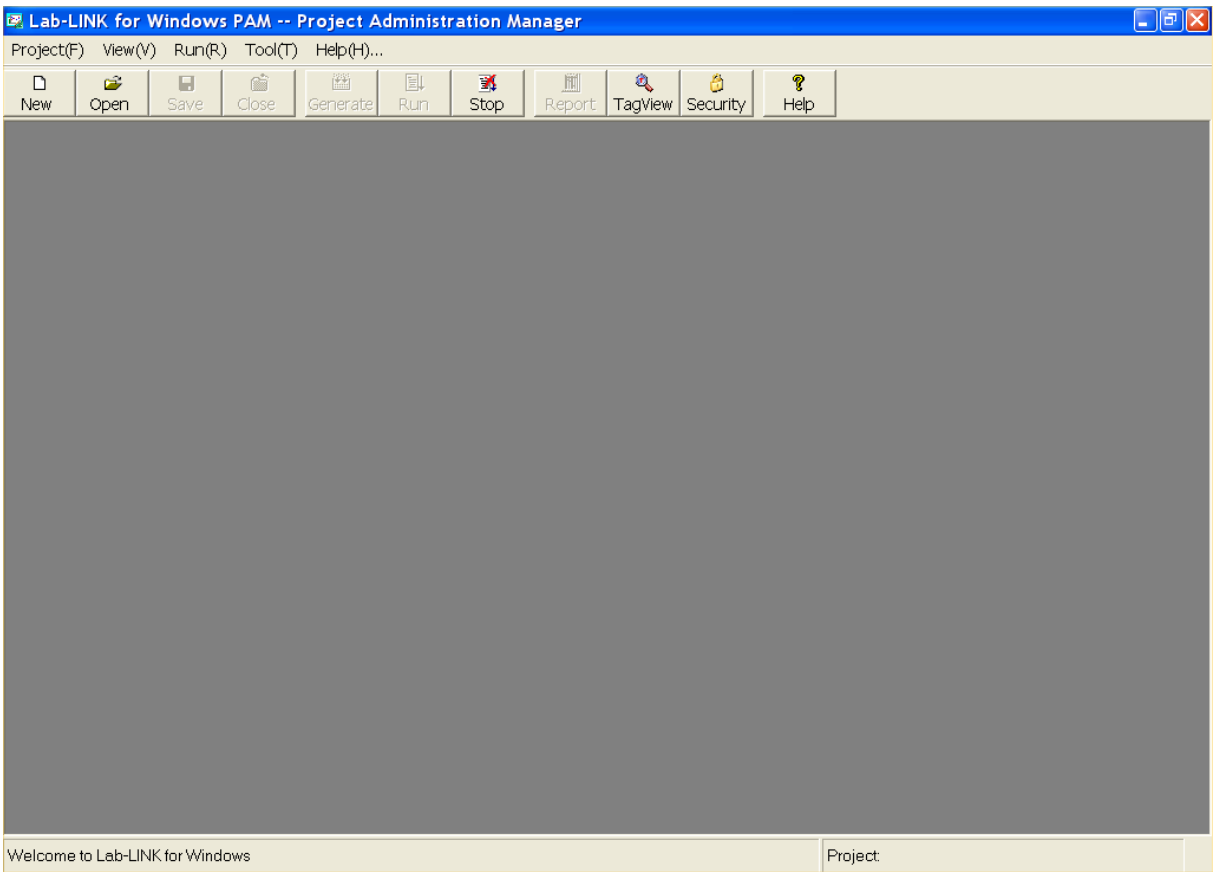
- ❒ Execution of Lab-LINK runtime will end in 60 minutes.
- ❒ The number of IO Tag cannot exceed 48.
- ❒ The panel file created by Panel Editor will be save a special format that is not compatible with those used by a licensed edition Lab-LINK.

Chapter 2 PAM

PAM is the Integrated Development Environment (IDE) of Lab-LINK. It is used to develop a Lab-LINK project and the configuration of each Lab-LINK modules used in this project.

Start PAM

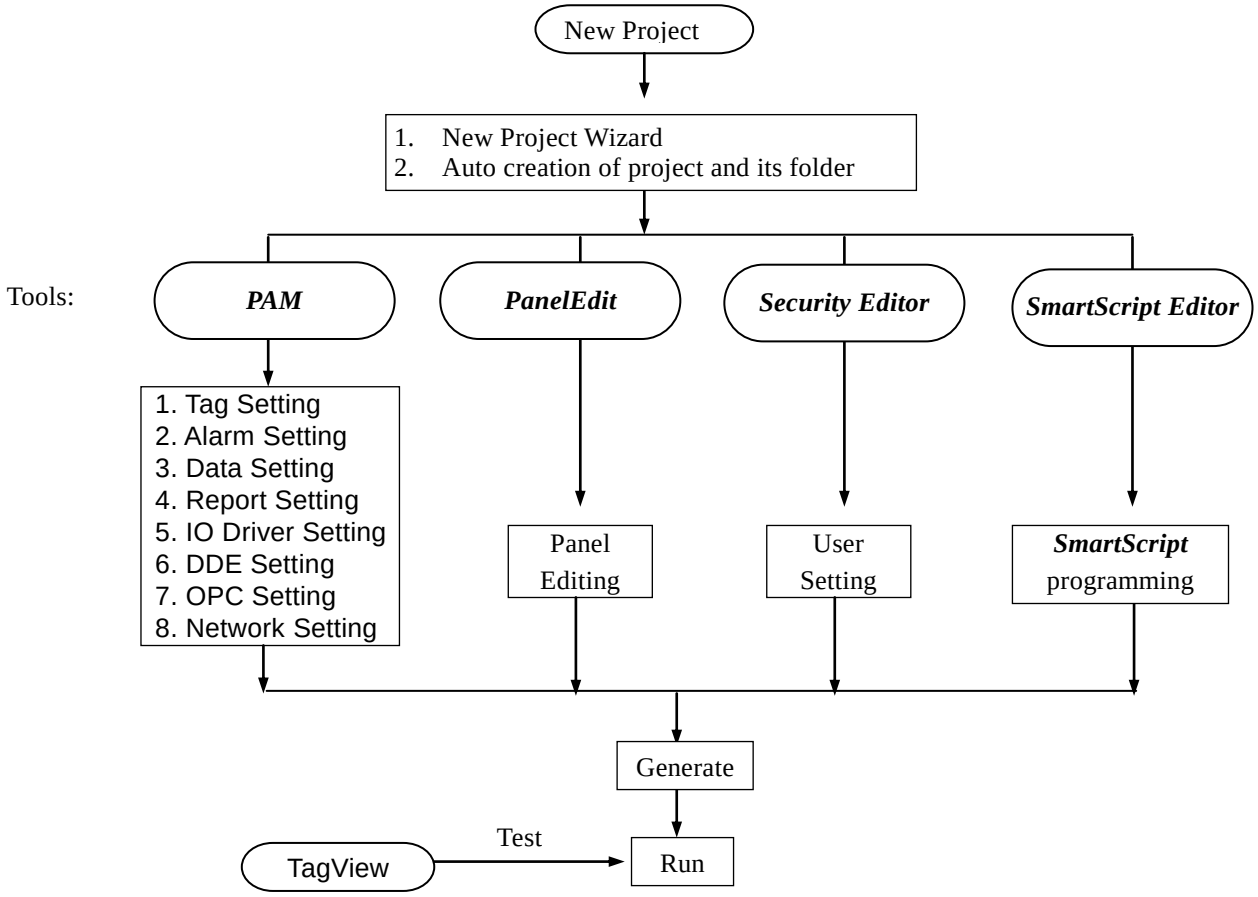
After the installation of **Lab-LINK**, select “Start\All Program\Lab-LINK 4 for Windows\PAM” to run PAM and begin the development of a project.



PAM

Project Configuration Procedure

Configuration of a **Lab-LINK** project can be summarized as shown in the flow chart:



Select **New** from **Project** menu in ***PAM*** to open a new project, **New Project Wizard** will guide you through the creation of the structure of a new project. Tools in **PAM** can then be used to configure detail setting of the project:

(1) ***PAM*** – Project Administration Manager

- Used to configure Workstation, Tag database, Alarm, Data, Report, DDE, Network, I/O Driver, OPC and Script.
- Please read related chapters in this manual for details.

(2) ***PanelEdit*** – Panel Editor

- Used to configure panels, the user interface screens. Please read "***SmartPanel*** User Manual" for details.

(3) Security Editor

- Used to define users. Please read Security chapter for details.

(4) ***SmartScript* Editor**

- Used to edit ***SmartScript***. Please read "***SmartScript*** Reference Manual" for details.

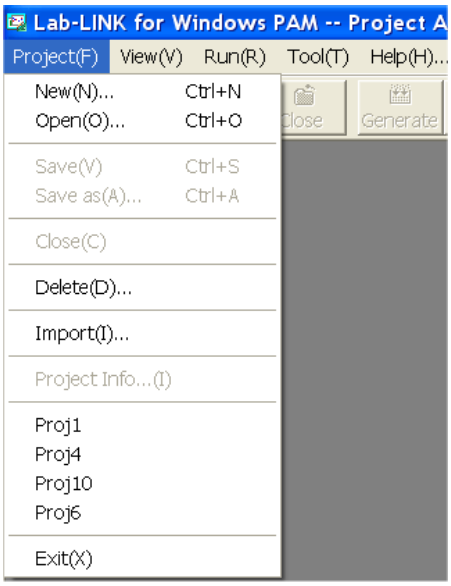
(5) Generate and run the project

- A project must be generated to create the runtime configuration files used by Lab-LINK runtime system to run the project.
- Modification on any module requires regeneration of the project for the change to take effect in Lab-LINK runtime system. Panel file or graphic file modification doesn't need regeneration of project.
- Run project to test it.
- TagView can be used to monitor the value of each Tag. Please read chapter 14 for the use of TagView.

Menu

PAM has these Menus: **Project**, **View**, **Run**, **Tool** and **Help** to provide corresponding functions.

Project Menu



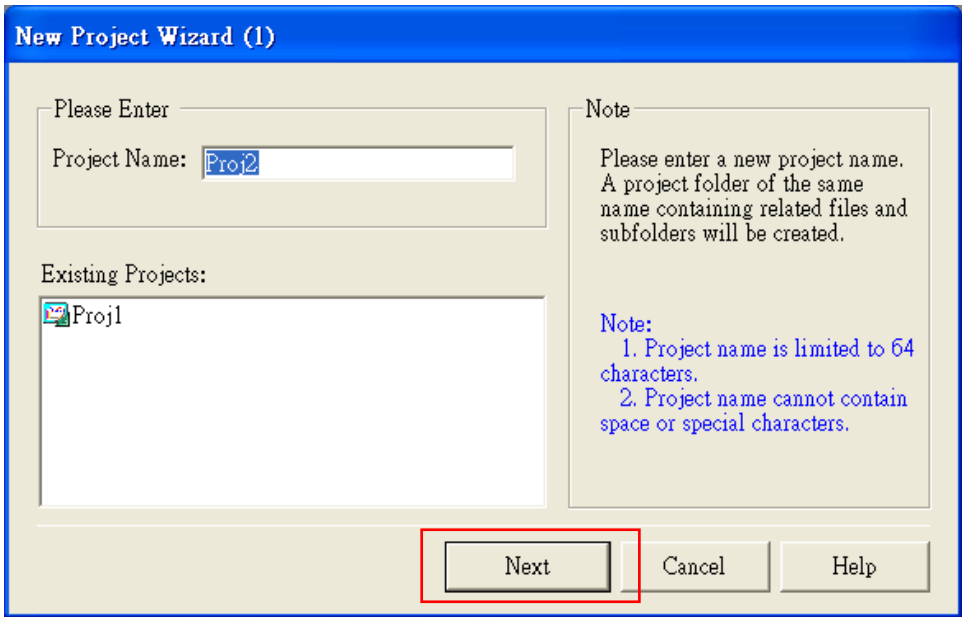
- New – Create a new project.
- Open – Open an existed project.

- Save – Save a modified project.
- Save as – Save the modified project to a new project with different name.
- Close – Close the current opened project.
- Delete- Delete one or more projects.
- Import – Import an existed project and save it as a different name. Usually to upgrade a project with previous version of PAM
- Project Info – To show and edit project related information.
- Latest project – The names of the last four projects that have been open lately is shown. An easy way to select and open these projects.
- Exit – End the execution of PAM.

New

Select New to create a new project. **New Project Wizard** will appear to guide you through the procedures.

New Project Wizard (1)



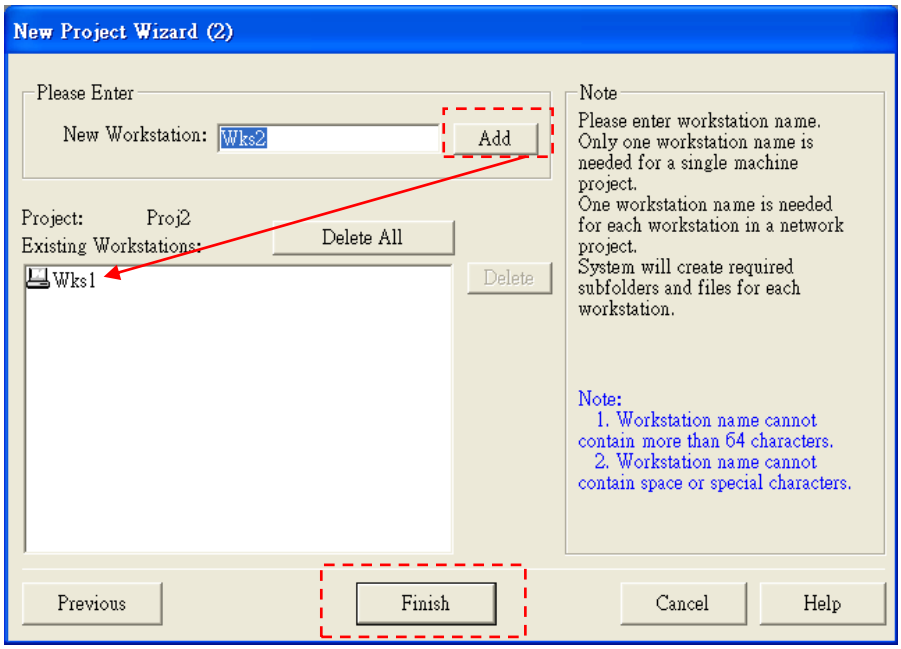
New Project Wizard (1) ─ Enter project name

Page 1 of **New Project Wizard** of will request for a new project name. The name will also be use to created the project folder under \lablink\project. All files related to the project should be store under the project folder.

Press **Next** button to enter page 2 of **New Project Wizard**.

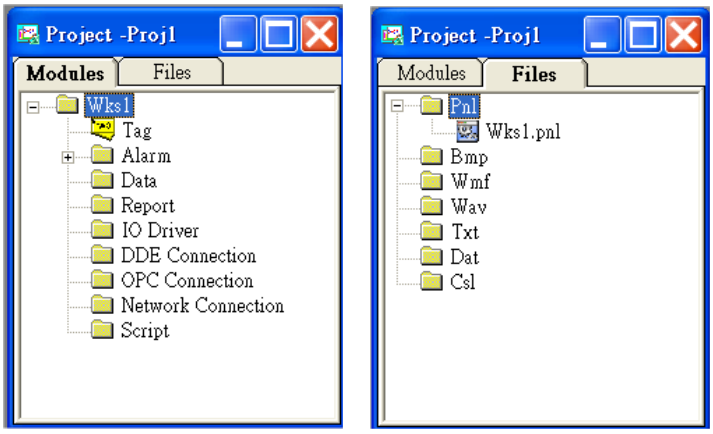
New Project Wizard (2)

Page 2 of **New Project Wizard** of will request for new workstation names. A project can contain one or more workstations. Each workstation can have separate configuration for their panels, alarm, data, report…functions.



New Project Wizard (1) ─ Enter workstation name

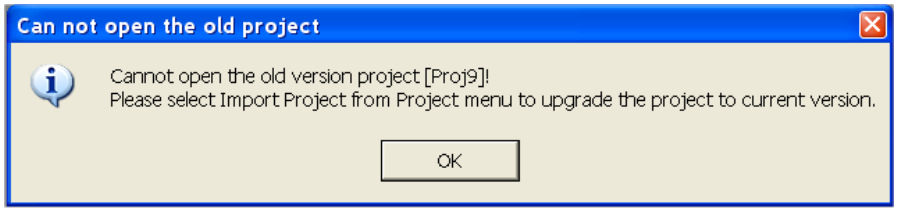
Press **Add** button after entering workstation name in **New Workstation** field and the name is shown in the box below. Add all the workstation as needed and press **Finish** button to close the wizard. A root panel file with the same name as the workstation will be created in pnl subfolder under the project folder for each workstation.



Open

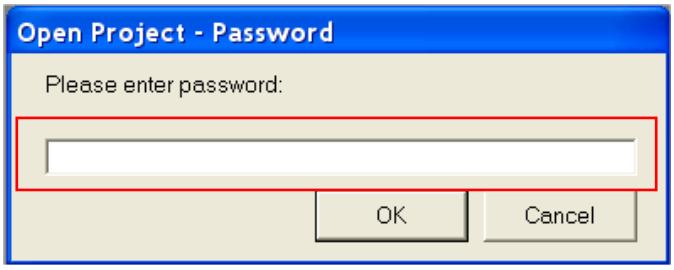
Select **Open** from **Project** menu to open an existed project. A dialog listing all existing project will be shown. Click on the project you wish to open and press **OK** button to open it.

If the selected project is created by previous version of **PAM**, a message box will be shown to indicate that the project cannot be opened directly. Use **Import** to upgrade the project in order to open it.



Password

A project can be protected by a password. If so, a message will appear when you try to open the project. Enter correct password and press OK to open it. Please see **Project Info** section for password details.



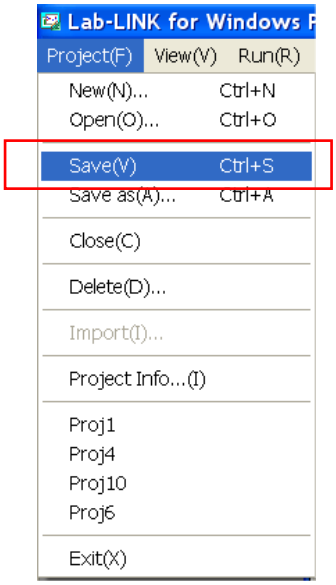
Error message shown if the password entered is incorrect

Read-only Problem

If any of the project file or folder is set with read-only attribute, PAM will not be able to open it. Be sure to clear the read-only attribute.

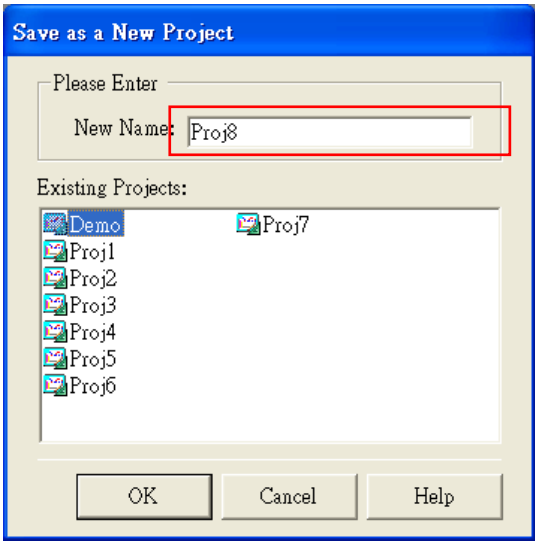
Save

Select **Save** from **Project** menu to save the change you made to the currently opened project.



Save as

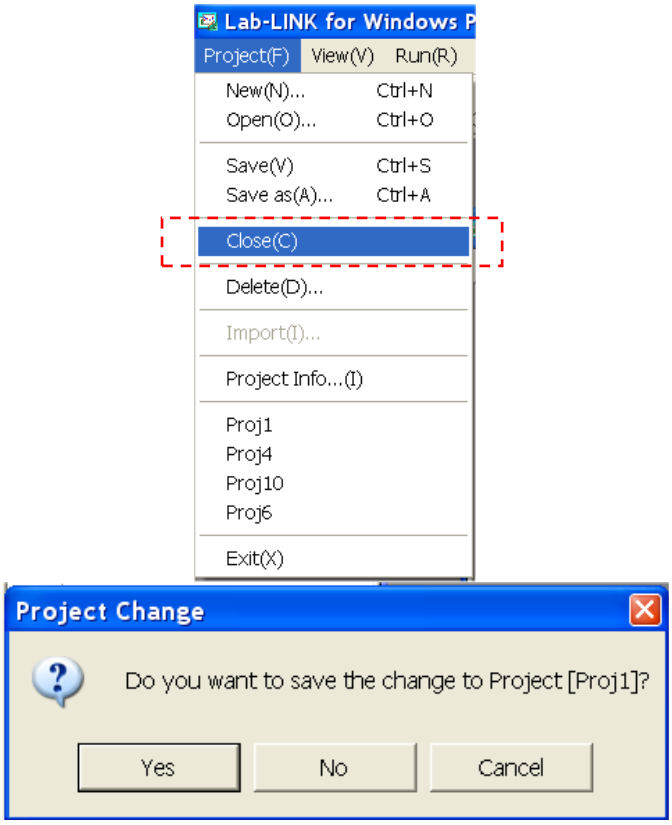
Select **Save as** to save the currently opened project to a new project with a different name.



Note : When saved as a new project, object definition in panel files related to file path designation may need modification due to the change of project folder. Reference path described in Appendix can help on this issue.

Close

Choose **Close** from **Project** menu to close the opened project. Remember to save the project before closing. Closing a project without saving it may cause the lost of all modification made to it. A message will appear to remind user about this.

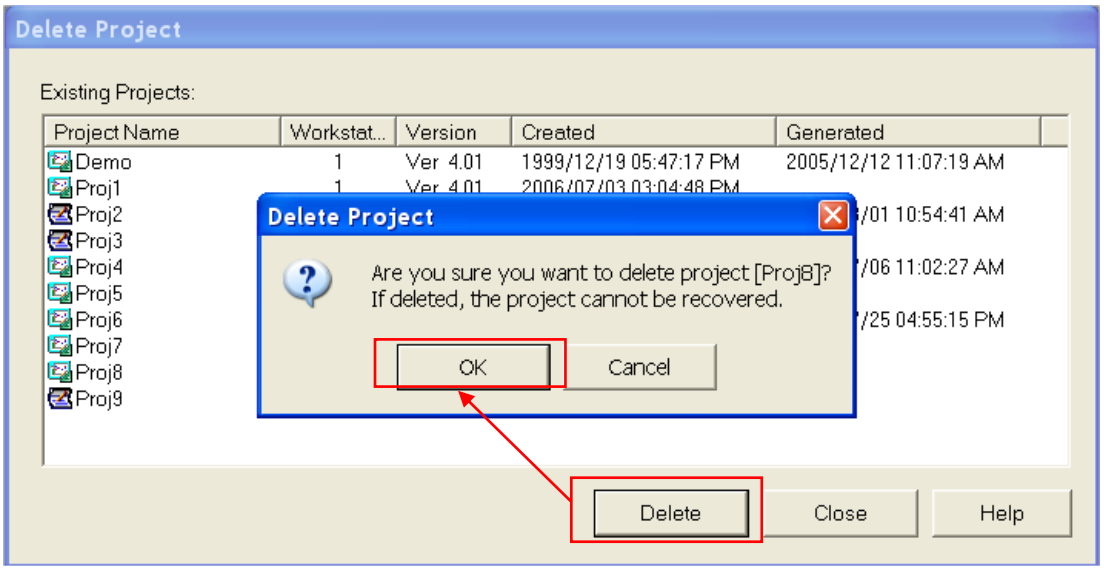


Save project confirmation

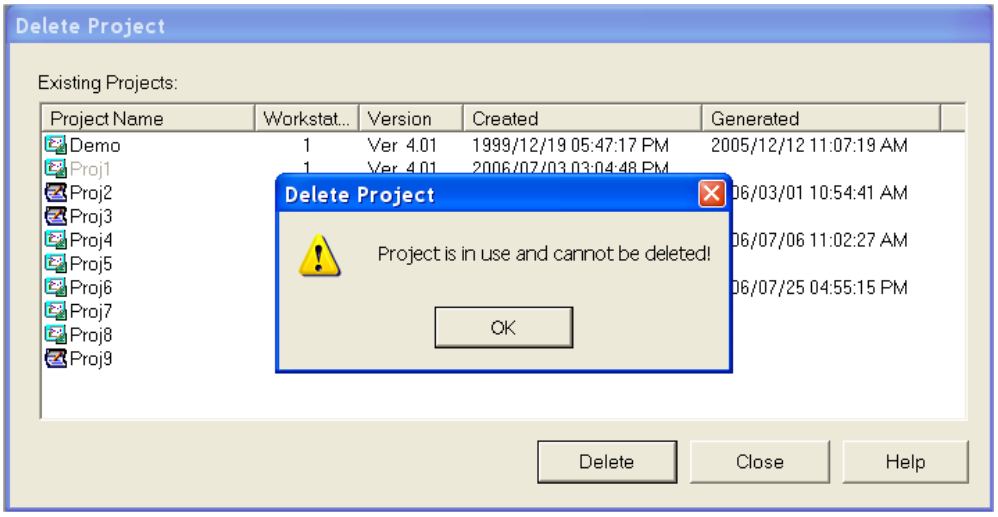
Delete

Select **Delete** from **Project** menu and a dialog listing all existing project will appear. Select a project from the list and press **Delete** button to delete it.

Note: Delete a project will also remove any file or subfolder under its project folder



A project in used or opened cannot be deleted and will be shown in gray color.



Import

Select **Import** from **Project** menu to upgrade a project to current Lab-LINK version.

Project Info

Select **Project Info** from **Project** menu to show the Project Info Dialog. There are three pages in the dialog: **Basic**, **Password** and **I/O Tag**.

Basic

Click on **Basic** Tab to show the basic information of the project:

Location: Location of the project folder in the file system

Created: The date and time when the project was created.

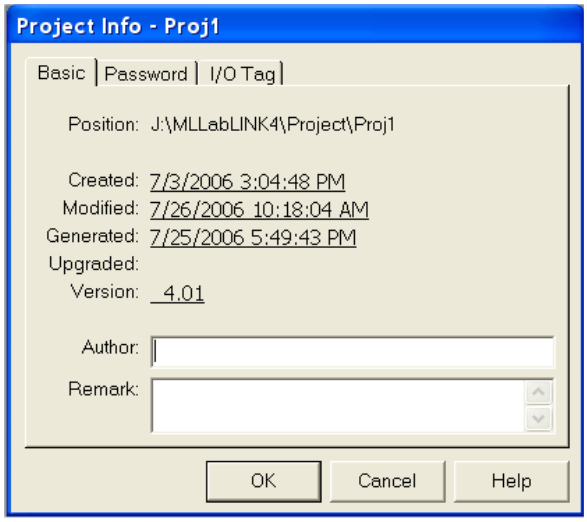
Modified: The date and time when the project was last modified.

Generated: The date and time when the project is last generated.

Upgraded: The date and time when the project is upgraded.

Autoho: Name of the user who create the project.

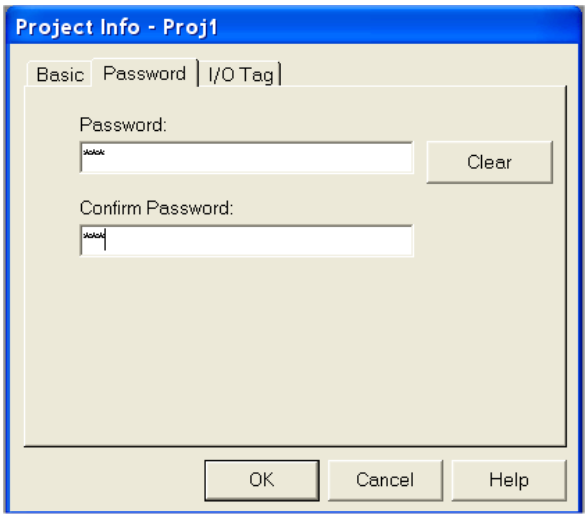
Remark: Description of the project.



Password

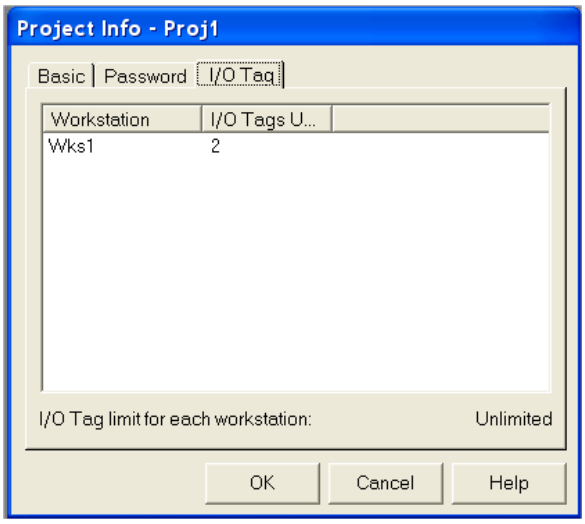
Password page is used to set the password used to protect the project from unauthorized modification. If a password is set, it will be needed when the project is opened. Any text string can be used as a password and there is no limit on the number of characters in a password. The password must be entered twice to confirm its correctness.

Press **Clear** button to clear the password setting.



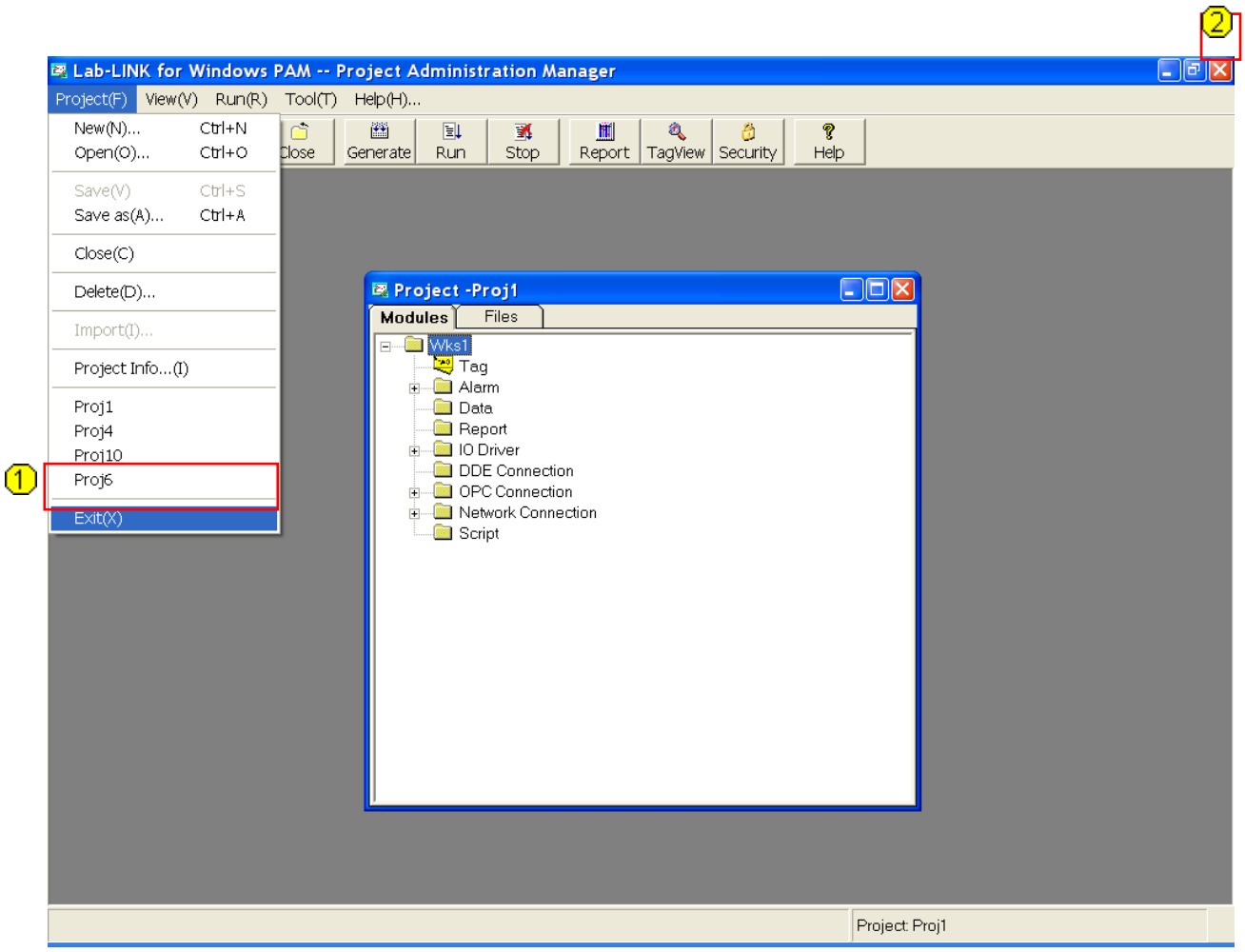
I/O Tag

This page display the number used by each of the workstation.

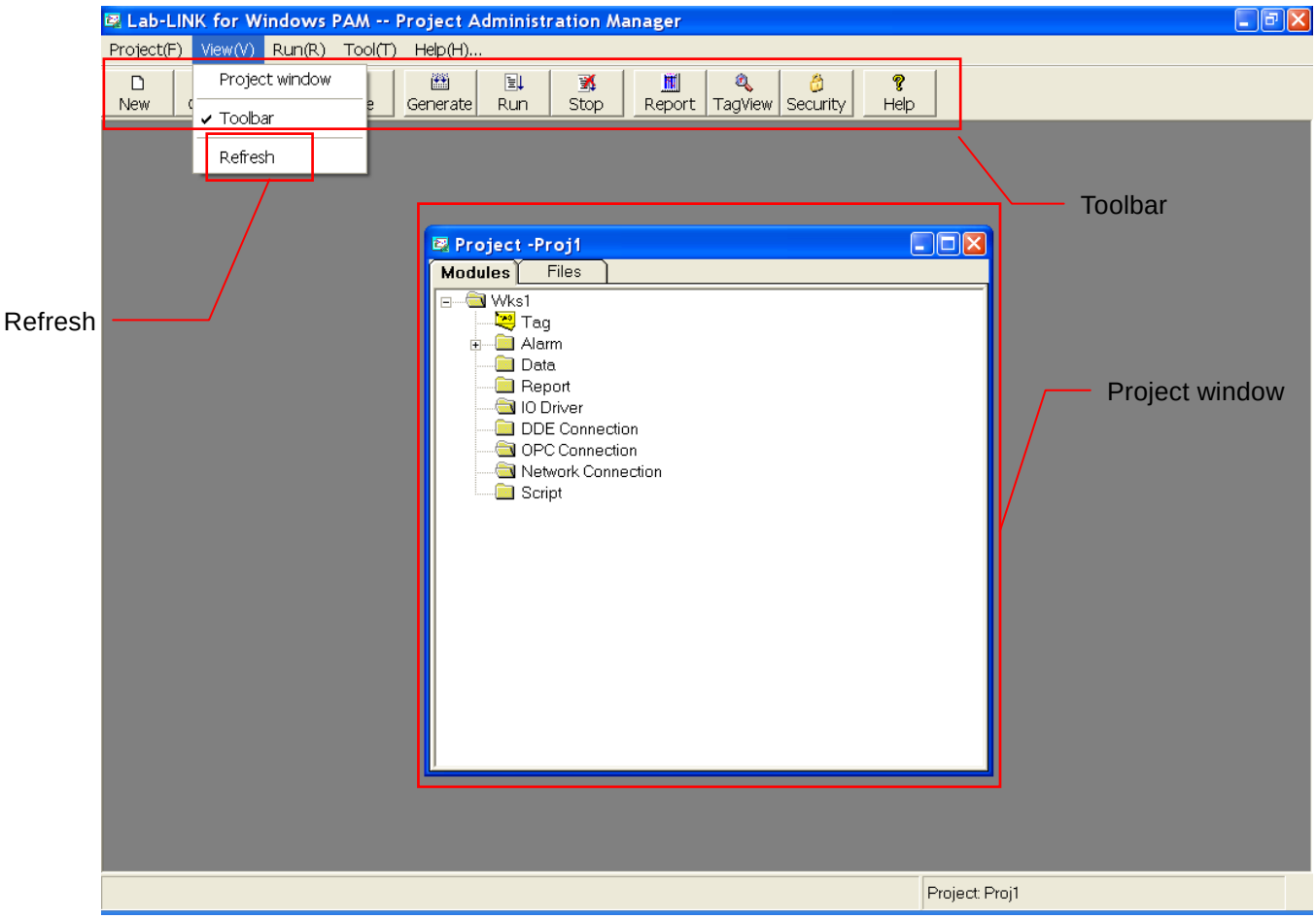


Exit

Select **Exit** from **Project** menu to end the execution of ***PAM***.



View

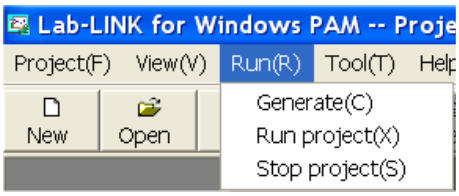


Project Window – Select **Project Window** from **View** menu to show or hide the project window.

Toolbar – Select **Toolbar** from **View** menu to show or hide the tool bar.

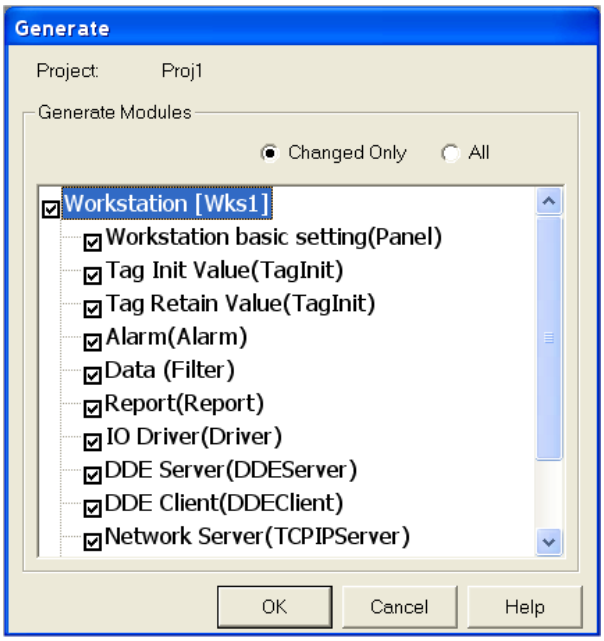
Refresh –Select **Toolbar** from **View** menu to refresh display.

Run

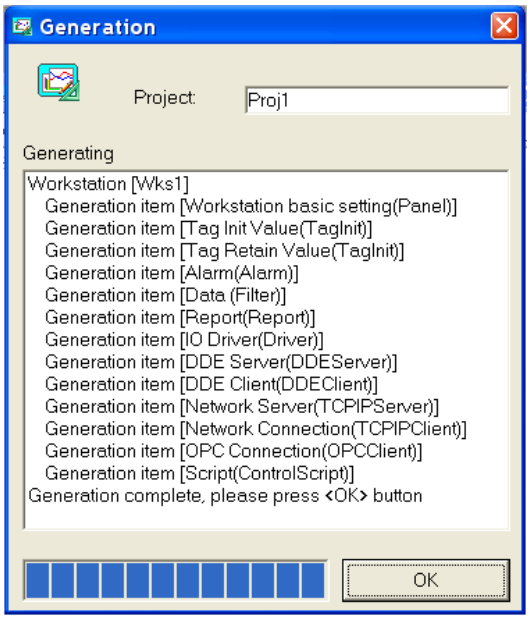


Generate

After the configuration of a project, you should conduct **Generate** on the project to create the configuration files needed by Lab-LINK runtime system. Select **Generate** from **Run** menu to generate the project.



Only module changed since last generation will be regenerate to speed up the process. However, you can select the module you want to regenerate disregard whether it is changed or not by click on the checkbox of that module. All checked module will be regenerated. After the selection, press **OK** to start the generation. Select **All** and press **OK** will cause all modules are checked and regenerated.

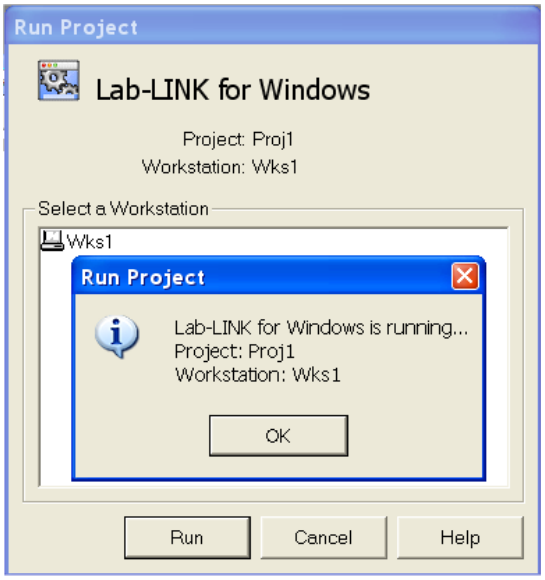


A message will appear after the generation to show the result. Press **OK** to close the message.

Besides the runtime configuration files, generation will also create the shortcut for each workstation under the project folder. The shortcut will be named as WorkstationName_Panel (ex. Wks1_Panel) and can used to execute the Lab-LINK runtime system for that workstation.

Run Project

After the configuration and generation of a project, it is ready for execution. Select **Run Project** from **Run** menu will execute Lab-LINK runtime system and load the current Project setting. A dialog will appear for you to select which workstation should be run. Select a workstation and press **OK** button to start the runtime system of the selected workstation.

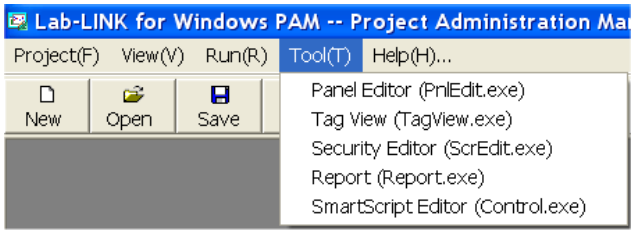


Stop project

Stop the execution of a running project.

Tool

Tool menu provide the execution of Lab-LINK development Tools of ***PAM*** which includes:



Panel Editor ─ Start panel editor for user to edit a panel file.

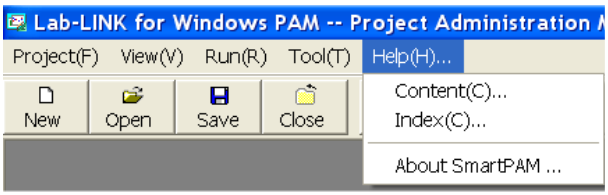
TagView ─ Start TagView, the tool to help you test and debug a project.

Security Editor ─ Start Security Editor, the tool to manage users by setting their username, password and privilege.

Report ─ Run Report and load report setting of current project.

SmartScript ─ Start ***SmartScript*** Editor, the tool to edit and debug script.

Help

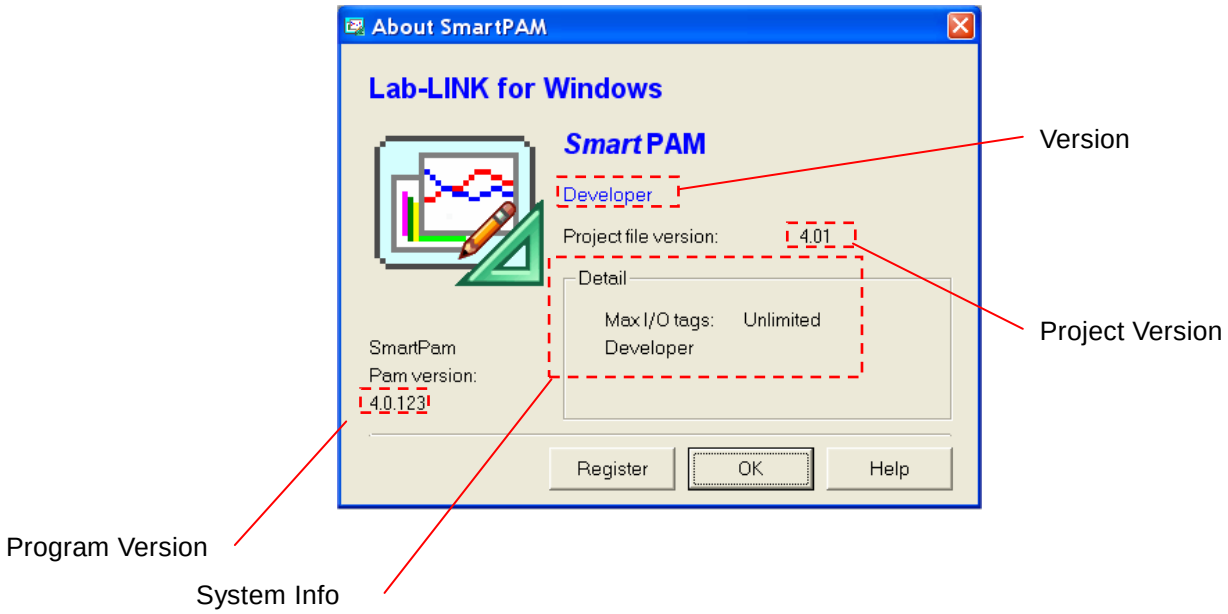


About ***PAM***

Display version and license information of Lab-LINK.

License Version：Shows which license version of Lab-LINK is running. If a keypro is not detected, it will show Evaluation.
Project Version: Project files version number of the opened project.
Program Version: Program file version number of PAM.

System Info: Information recorded in the Keypro including license version and I/O Tag capacity. If no keypro is detected, Max. I/O Tags will be 0.



Toolbar

Toolbar contains the most often used menu items:

New –Create a new project.

Open–Open an existed project.

Save–Save the opened project.

Close–Close the opened project.

TagAdmin– Open Tag Administration Dialog for tag management.

Generate–Generate the opened project.

Run Project–Run the selected workstation of the opened project.

Stop Project–Stop the running project.

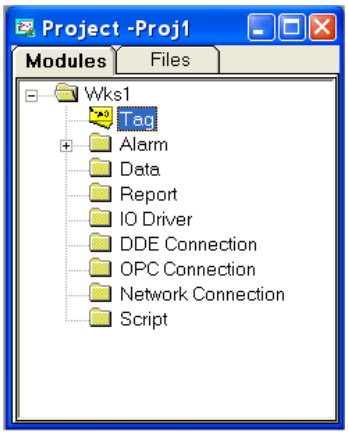
Report–Run the report setting of the selected workstation of the opened project.

TagView–Run TagView.

Security–Run Security Editor.

Help–Open Lab-LINK Help online document

Module Page in Project Window



Module page of project window display module structure of each workstation in a tree view. Workstations are top level node with Tag database and modules as their child node. Press ⊞ button before each node to expand it and press ⊟ button will collapse it.

Workstation

Basic setting of the workstation includes Identification, Security and Execution. See Workstation chapter for details.

TAG Database

Used for management of the Tag database. Tags can be created and their properties including Init or retain value can be set. See Tag chapter for details.

Alarm

Used for Alarm basic setting and Alarm Tag settings. Alarm is further divided into 8 categories:

Digital ─ Used for digital alarm. User can specify an alarm occur when an alarm Tag change from 0 to 1 or 1 to 0.

High/Low Alarm ─ Used for analog alarm. A high limit and a low limit can be set. If the alarm Tag value is greater than the high limit, a high alarm occurs. If the alarm Tag value is smaller than the low limit and the low alarm occurs.

HH/H/L/LL Alarm ─ Used for analog Alarm. Similar to High/Low alarm but provide a second set of high-high and low-low limit setting. A high-high alarm occurs when the alarm tag value is greater than the high-high limit while a low-low alarm occurs if the value is smaller than the low-low limit.

Rate of Change Alarm ─ Used for analog alarms. If the rate of change of the alarm tag is greater than a set limit, an alarm occurs.

Deviation Alarm ─ Used for analog alarm. A base value and a deviation are set. If the alarm tag value is greater or smaller than the base by the value of the deviation then the alarm occurs.

Timeout ─ Used for digital alarm. When the state of a digital alarm tag changed, it is compared to the value of a referenced Tag. If the alarm Tag does not change as the referenced Tag within a preset time limit, an alarm occurs.

Trip ─ Used for digital alarm. When the state of a digital alarm tag changed, it is compared to the value of a referenced Tag. If the referenced Tag does not change in the preset manner, an

alarm occurs.

Event ─ used for digital Tags. Any change on the state of the Tag is recorded as an event.

Please see Alarm chapter for alarm details.

Data

This module is used to define how Tag data are stored. It can store Tag data into files with specified time interval. Two data file formats are supported by this module:

- Lab-LINK Data files (XDF): This is a Lab-LINK proprietary binary format used by SmartPanel object and Lab-LINK Report. Select this file type if data will be presented by Lab-LINK.
- Text files (TXT): Data will be stored as text files. Select this file type if data will be used by other application such as spreadsheet or database.

Please see Data chapter for details.

Report

Report module use data files stored by Data module to create reports. Lab-LINK reports provide three time span:

- Daily Report
- Monthly Report
- Yearly Report

There are also two different report format:

- Text Report
- Trend Report

Please see Report chapter for details.

DDE Connection

DDE Connection can be used to share data with other applications. Please see DDE Connection chapter for details.

Network Connection

Network Connection is used to share Tag data among Lab-LINK workstations. Please see Network chapter for details.

IO Driver

I/O Drivers are used to connect PLC, controller or any other I/O devices supported by Lab-LIMK. Define communication parameters IO and I/O address mapping between Tags and I/O points and the I/O Driver will communicate with the devices to access real time data at runtime. Please see I/O Driver chapter for details.

OPC Connection

OPC Connection is used to integrate OPC Server provided by hardware venders or third party with Lab-LINK. Through OPC connection, Lab-LINK will be able to communication with the I/O devices it doesn't support. Please see OPC Connection chapter for details.

Script

SmartScript is the built-in script language of Lab-LINK. Script can be run with Lab-LINK project to provide user specific functions such as control logic or complex mathematic calculation. Please read Script chapter and "***SmartScript*** Reference Manual" for details.

Project Files and Folders

A folder named "Project" is created under Lab-LINK folder after installation. The path should be "C:\LabLINK\Project\" in a typical installation. Every time you create a project in **PAM**, a project folder with the same name will be created under this system project folder. For example, a project named "Proj1" should create a project folder with path "C:\LabLINK\Project\Proj1".

Files and folders will also be created for a project. For a project named "Proj1" with one workstation named "Wks1", the project files and folders under its project folders include:

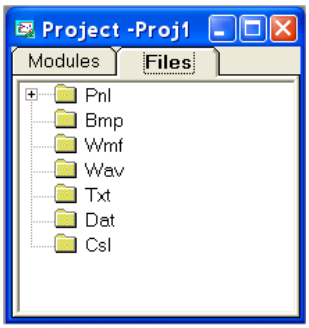
Folder/File	Description	Reference Path
Project		

cfg / Wks1	Runtime configuration files of workstation Wks1. These files are created when the project is generated by PAM.	
pnl	Panel files.	~1
bmp	BMP files used by panel objects.	~2
wmf	WMF files used by panel objects.	~3
wav	Wav files used by panel objects.	~4
txt	Text files used by panel objects.	~5
dat	Default Data files storage	~6
csl	SmartScript files	
LabLINK.pjt	Project basic information	
LabLINK.pjt.bak	Backup of Lab-LINK.pjt before it is modified by PAM.	
Wks1.pam	Workstation configuration of Wks1.	
Wks1.pam.bak	Backup of Wks1.pam before it is modified by PAM.	
Wks1 Panel	Runtime shortcut for workstation Wks1.	

註：**Reference Path** is the shorthand notation for the frequently used path in Lab-LINK project. It is strongly recommended that they are used whenever it's possible during panel object configuration. Please read Appendix for Reference Path details.

File Page in Project Window

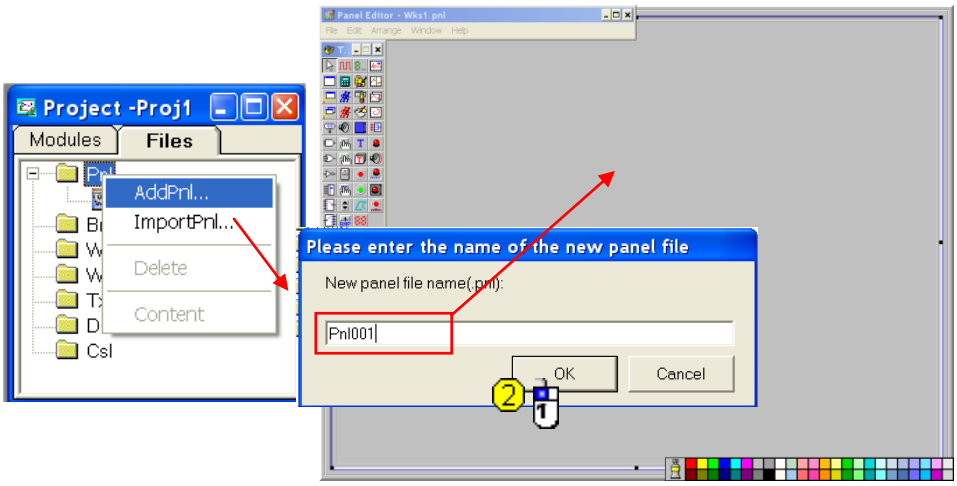
Click on **File** tab in **Project Window** to show this page. A tree view shows the sub folders and files under the project folder. Project subfolders discussed in previous section are represented as nodes in the tree view. Click on ⊞ to expand a node and click on ⊟ to collapse it.



File Operation

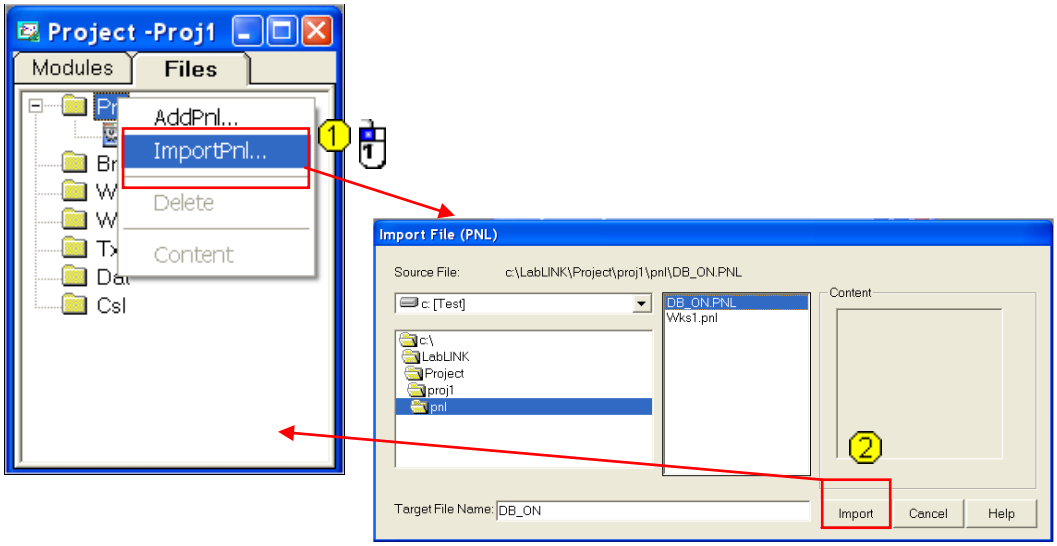
Add

Right click on a subfolder node to show its popup menu. Select "**Add … File**" to add a new file of that type. A dialog will appear to request for a file name. Enter file name and press **OK** button. The new file will be created and the associated application that can edit that file will be run. For example, right click on **Pnl Panel File** node, select **Add Panel File** and enter a panel file name will run Panel Editor to edit the newly created file.



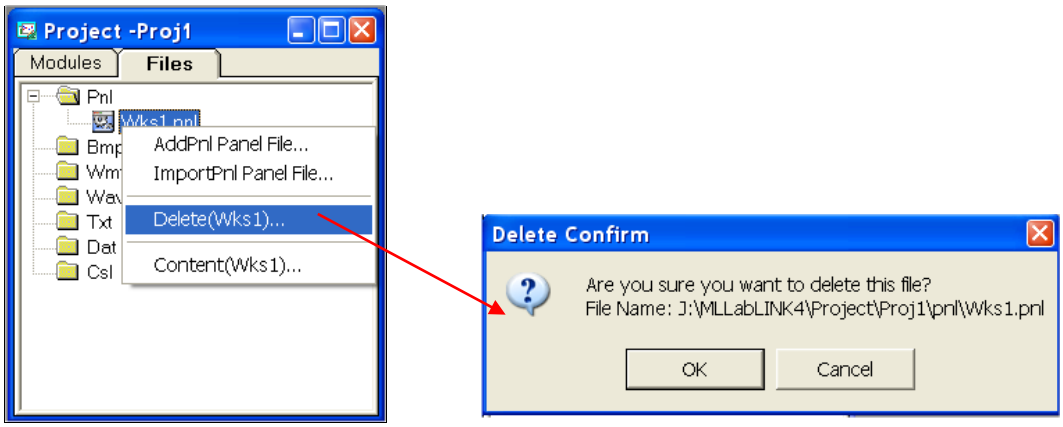
Import

Right click on a subfolder node to show its popup menu. Select "**Import … File**" to copy an existing file to the folder in current project. A dialog will appear to let you select an existing file. Press **Import** button after a file is selected. The file will be copy to the project.



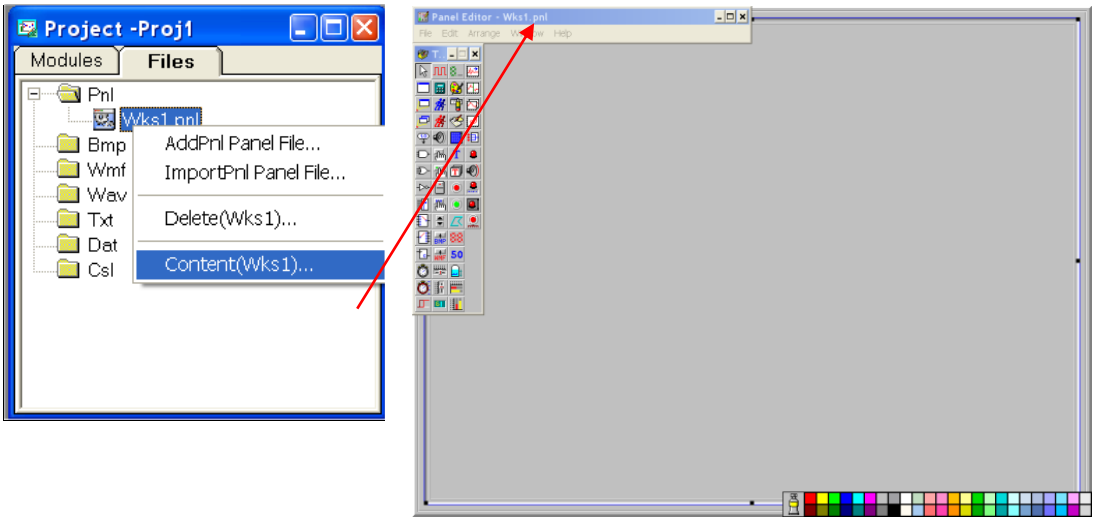
Delete

Right click on a file name to show its popup menu and select "**Delete**" to delete the file. A confirm message box will appear. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation.



Content

Right click on a file name to show its popup menu and select "**Content**" to open the file. The application associated with that type of file will be run and the file selected will be loaded for editing or display. Double click on a file name has the same effect.



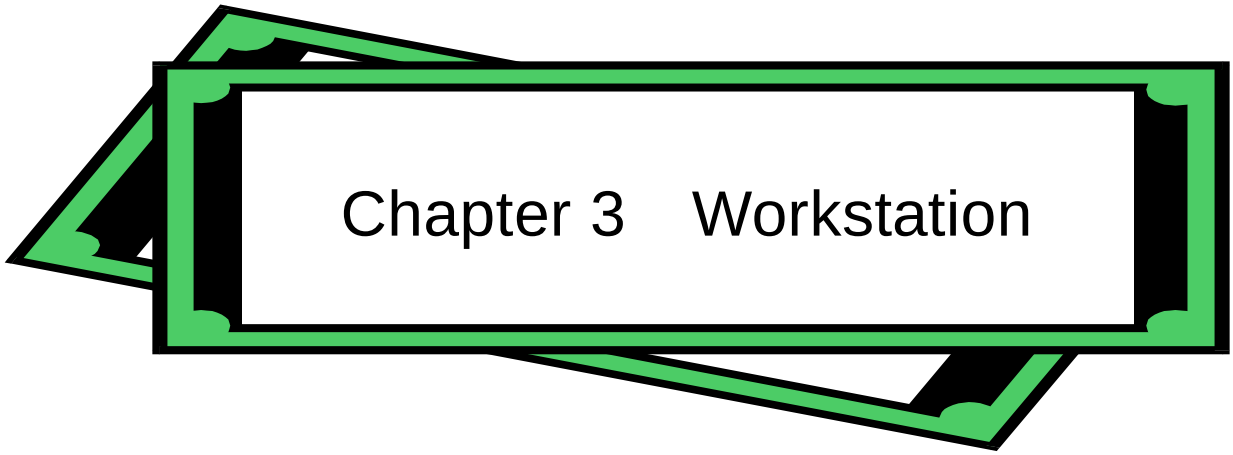
Management of Other Files

Management of other types of files is very similar to the operation of panel files. The files include BMP graphic files, WMF graphics files, WAV sound files, TXT text files, DAT data files, CSL script files. File page of Project windows provide **Add**, **Import**, **Delete** and **Content** operation for these files. Please follow the instructions discussed above for panel file to handle these files. When **Content** is selected for a certain file, the application associated with that type of file will be run to open the file for viewing or editing.

Lab-LINK provide sample library for BMP graphic files, WMF graphic files and WVA sound files. User can import these file from the resource folder of Lab-LINK into their project. Location of the resource folder is at “C:\lablink\resource” for a typical installation. Three folders, BMP, WMF and WAV, store the three types of sample files. BMP and WMF folders contain subfolders for several categories of graphic files.

Script File

Please note that adding a **Script File** in **File** page is not the same as adding a **Script** module in **Module** Page. The file added in **File** page won’t run automatically when the project is run. Only a **Script File** referenced by a **Script** module in **Module** page will be loaded when the project is run. Please read Script chapter for details. Please refer to Script chapter for details.



Chapter 3 Workstation

In a Lab-LINK project, the tasks of a computer running **Lab-LINK** are defined in a workstation. This chapter will discuss the basic setting of a workstation. Detail description of the setting of each module in a workstation will be discussed in the chapters follows.

Workstation

Workstation contains all the setting used by a computer running **Lab-LINK**. Complete workstation setting may include the followings:

- Workstation Basic Setting
- Tag Database
- Alarm
- Data
- Report
- I/O Driver
- DDEConenction
- OPC Connection
- Network Connection
- Script

Number of workstations needed for a project depends on the tasks performed by each computer. In general, single machine project that involves only one computer needs one workstation only, and a network project involving multiple computers may need to setup several workstation. However, because only one workstation is needed for several computers performing exactly the same tasks, the number of workstations needed may be less than the computers involved,

Settings of different workstation's module are independent except the Tags defined in Network Connections whose real time data will be shared among Server and Client workstations. Files in a project can be used by all workstations and are store in the corresponding subfolder under the project folder.

Basic Setting of Workstation

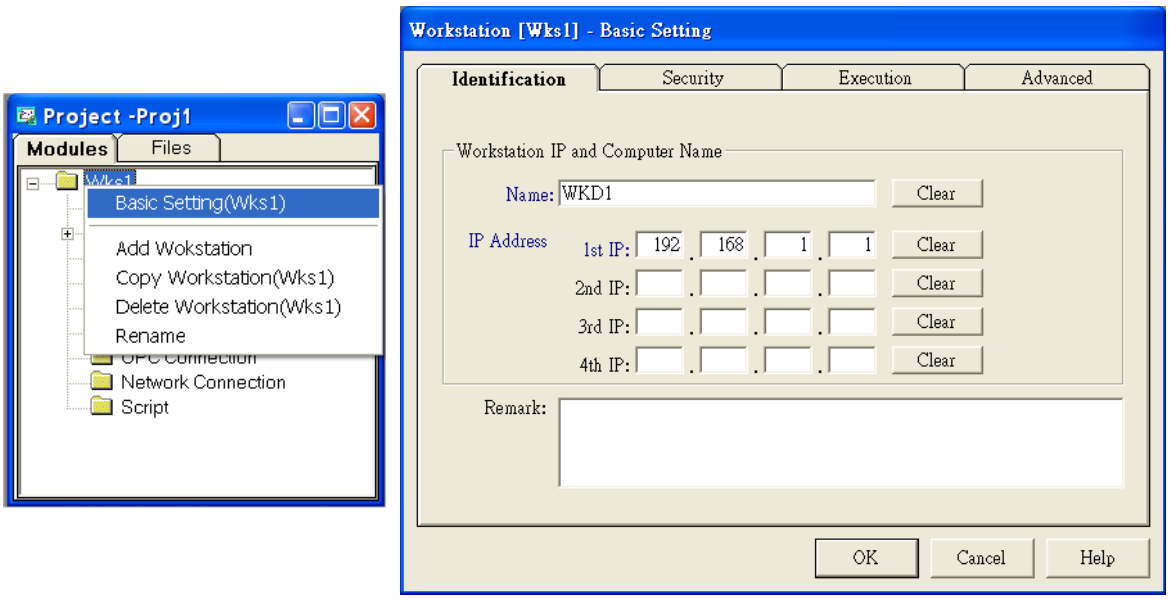
Basic Setting includes some basic information related to a workstation: its network identification, security file location and project start settings.

Right click on a workstation to show its popup menu and select **Basic Setting**, a dialog appears. There are three pages in the dialog:

Identification

Click on **ID** Tab to show **Identification** page. This page defines the computer name, IP address and an optional remark field of the workstation. This information will be used in Network Connection configuration. You can ignore this setting for a single machine project.

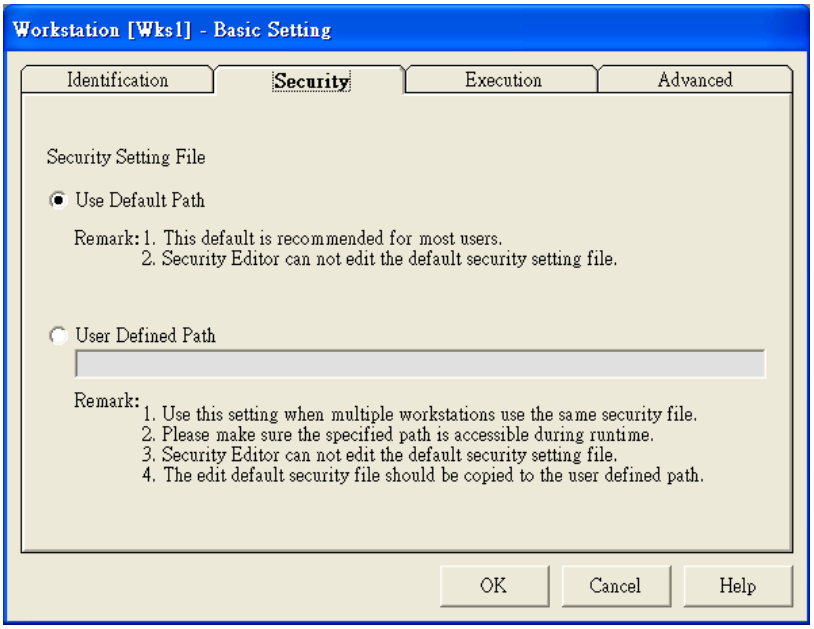
Either a computer name or a fixed IP address is mandated when a workstation is defined as a **Network Server**. Up to 4 IP addresses which may be used by different **Network Clients** can be set for a workstation. Please read **Network** chapter for **Network Connection** details.



Security

Click on **Security** page to define the location of **Security Setting** file. **Security Setting** file contains Lab-LINK user database which define the user name, password and privilege. The information is used for authentication when users are operating Lab-LINK runtime system.

Default Security Setting path is at Lab-LINK system folder (C:\LabLINK\System4 for a typical installation) and its file name is “ScrMan.xdb”. By selecting **User Defined Path** and enter a different path in this dialog, **Lab-LINK** runtime system fill try to find the **Security Setting** file in the user specified location at runtime. **Lab-LINK** project maintenance staff is responsible of placing the **Security File** at the specified location to guarantee. Please refer to Security chapter for security details.



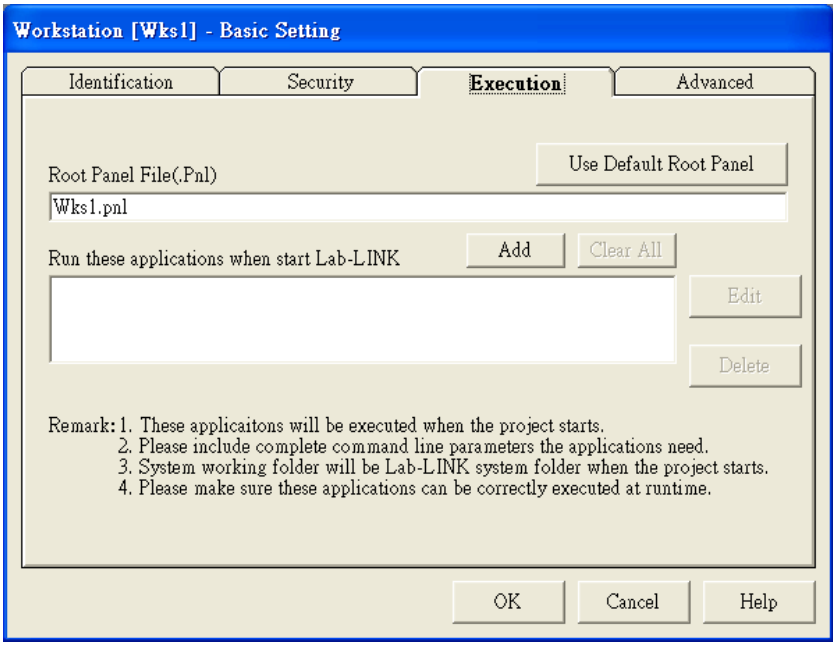
Execution

Click on Execution tag to select **Execution** page. This page defined the **Root Panel** and the applications that need to start with the project.

A **Root Panel** is the first panel file loaded by **Lab-LINK** runtime system when it starts a project. Default **Root Panel** has the same file name as the workstation. Enter a different panel file name in the **Root Panel File** field to replace the default setting.

It is also possible to specify some applications to be run as the Lab-LINK runtime starts.

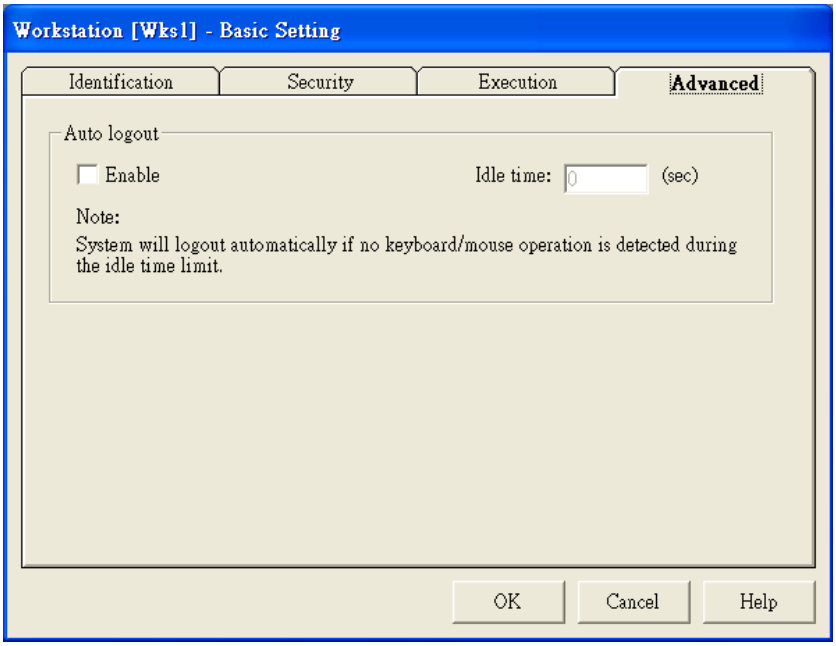
This is most often used to start add-on module of Lab-LINK. By entering the command to execute the add-on module or any other application program you wish to run, they will be run when the Lab-LINK runtime project is executed. Please remember to include all necessary parameters in the command line.



Advanced

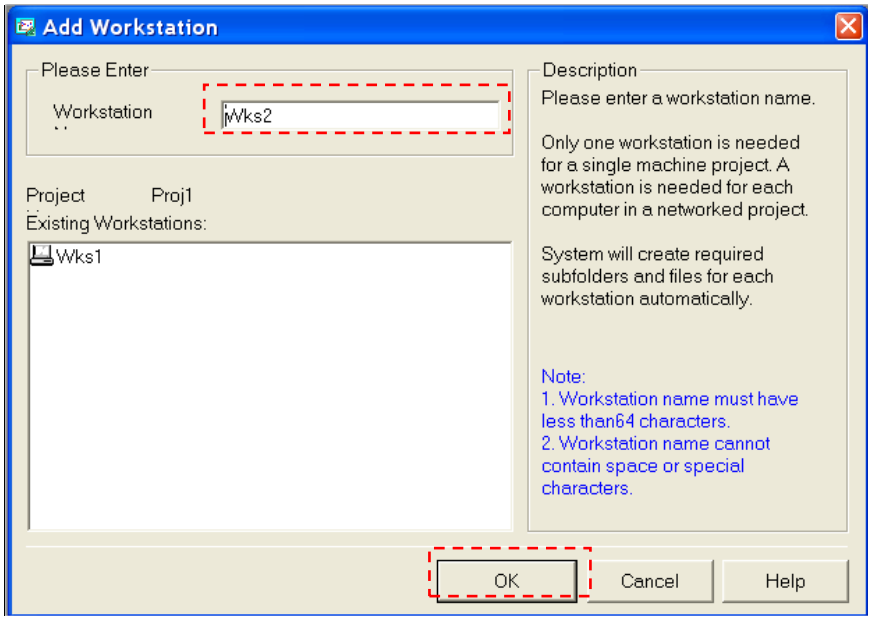
Click on Advanced to show the advanced setting page. Clcik on **Enable** check box and enter a number in the **Idle Time** field to set the auto logout function. During run time, this setting will automatically log out users after the specified time expires without any keyboard or mouse operation on the system.

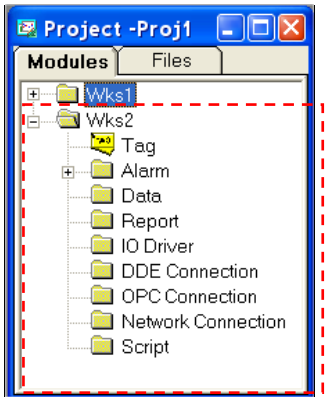
This setting I s to prevent unauthorized operation when a user leave the site but forget to logout from the system.



Add Workstation

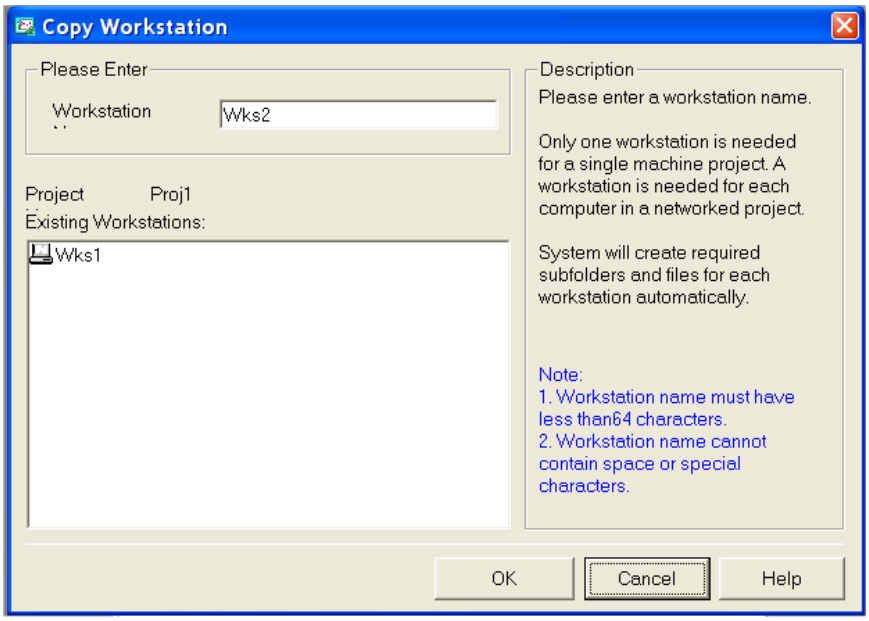
Right click on a workstation and select **Add Workstation** from the popup menu, a dialog appear to request for a new workstation name. Enter a name and press **OK** button, a new workstation is created and appear as new node in the project tree.





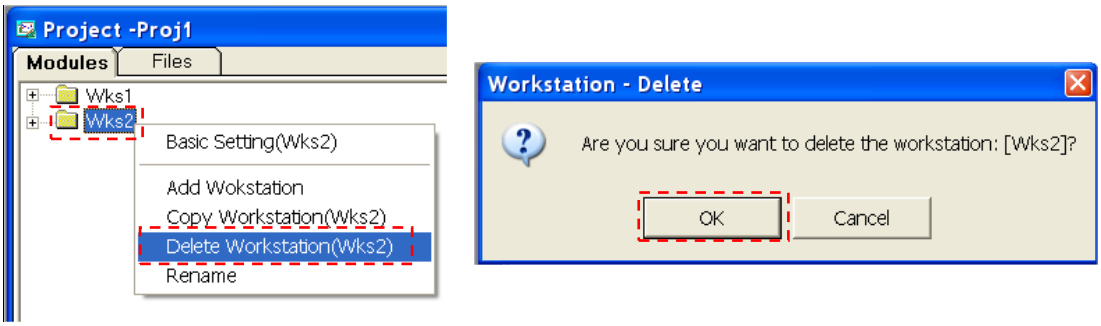
Copy Workstation

Right click on a workstation and select **Copy Workstation** from the popup menu, a dialog appear to request for a new workstation name. Enter a name and press **OK** button, a new workstation with exact the same setting as the original workstation is created and appear as a new node in the project tree.



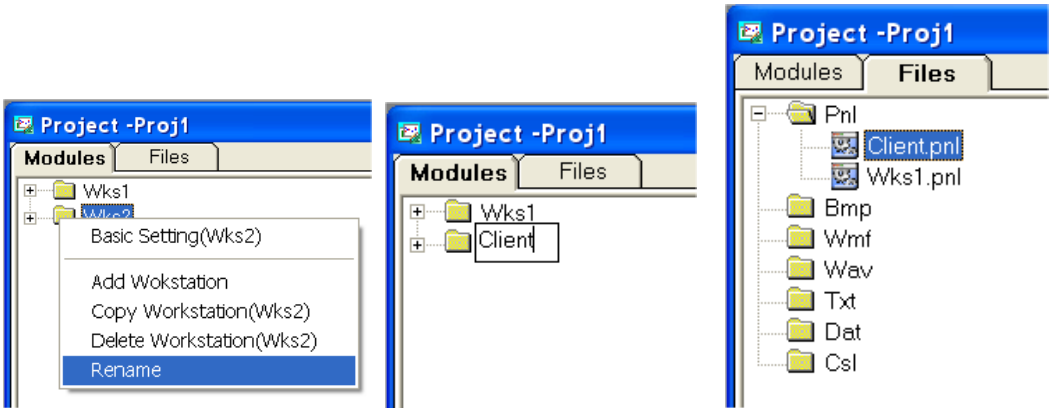
Delete Workstation

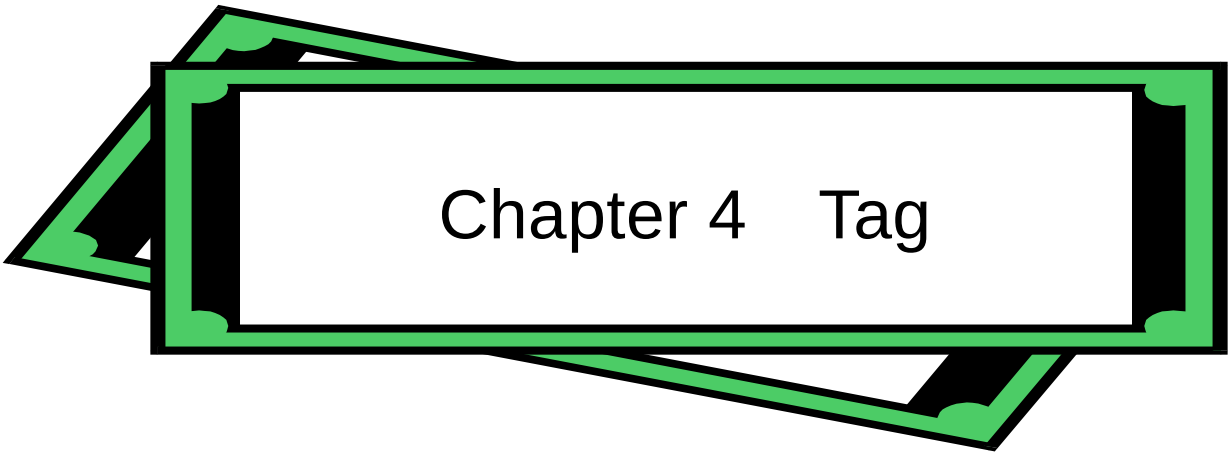
Right click on a workstation and select **Delete Workstation** from the popup menu, a message box appear to request for confirmation of this operation. Press **OK** button to delete the workstation or press **Cancel** button to cancel the operation.



Rename

Right click on a workstation and select **Rename** from the popup menu, you can edit the workstation name directly on the node. Press <Enter> key on your keyboard after a new name is entered. The workstation is then renamed. When a workstation is renamed, its root panel file will also be renamed to the same name.





Chapter 4 Tag

Tag

Tag is the “carrier” of real time data in Lab-LINK. It is transfer among Lab-LINK modules and Lab-LINK runtime kernel will guarantee the consistent and update of Tag data. For example, a temperature reading is assigned to a Tag named TEMP001 by a PLC Driver. If the Tag is also referenced by a DigiMeter object in SmartPanel, whenever a new temperature reading is scanned by the PLC Driver, the number display by the DigiMeter object will be updated.

Tag Manager

Tag Manager plays the key role in Lab-LINK runtime system kernel. It is responsible for the transferring of real time Tag data among modules. Its major task includes:

- Maintain the consistency of Tag data among modules.
- Control the Tag data flow among modules such that only the modules use that Tag receive its update to achieve high efficiency.

Lab-LINK Tag can be divided into two categories: **System Tag** and **User Tag**. **System Tags** are created by Lab-LINK runtime system to store key system information and their names always start with “$”. **User Tag** is defined by users for their specific purpose and their names are given by user.

Tag Naming Rule

Lab-LINK has these naming rules for Tag:

- All alphanumeric character and some symbol characters such as “-“ and “_” can be used. Chinese characters can also be used.

- Some symbol characters are not allowed in Tag name: ! . [ ] ` / \ : * ? " < > | # $ % & '( ) + , ; = @ ^ { } ~
- Tag name cannot start with a numeric character, but they are allowed in other place. Ex. 1Tag cannot be used but Tag1 is allowed.
- The limit on the number of characters in a Tag name is 8. A Chinese character will be counted as two characters.
- Tag name is case sensitive. Ex. Tag1 and TAG1 are two different Tags.

Tag Data Structure

There is no need to declare data type for Tag. However, every Tag contains these data field:

- Name – Name of the Tag
- State – State of the Tag. Possible states include:

  Unknown: The initial state of a Tag when Lab-LINK is started

  Uncertain: Reserved.

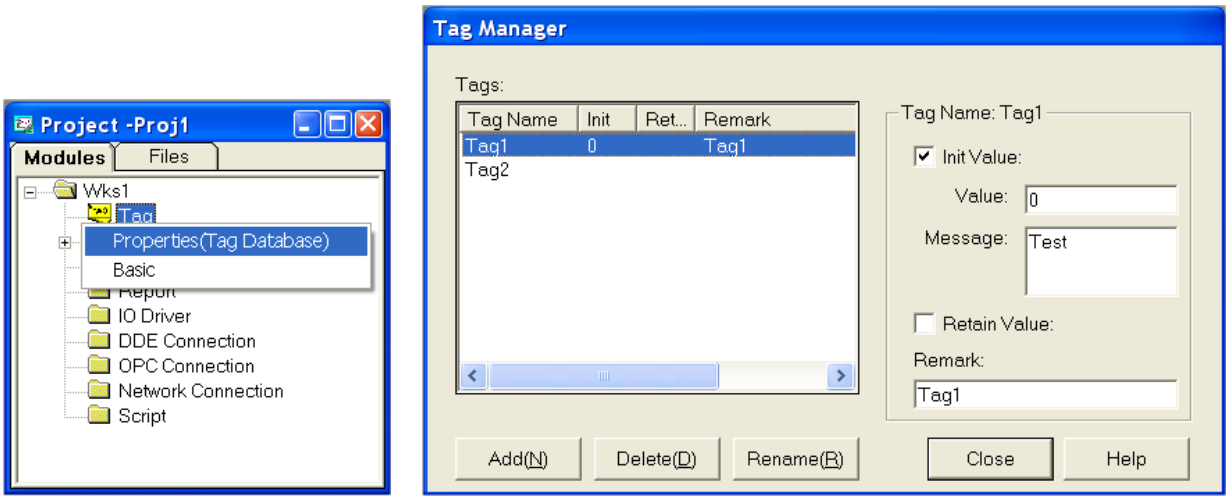
  Online: For an I/O Tag means the corresponding data on the I/O device can be normally accessed. For a non-I/O Tag, it is online when any of the Lab-LINK module accesses it.

  Offline: The corresponding data on the I/O device can not be normally accessed.

  Output Fault: The last output attempt to write to the corresponding data on the I/O device failed.
- Date – The date when last value or message change is detected on the Tag. The date format is Year/Month/Date.
- Time –The time when last value or message change is detected on the Tag. Time format is Hour:Minute:Second.
- Value – The newest value of the Tag. It is stored as a floating number with precision of about 15 or 16 digits. Its range is – Negative:-1.797693134862316 E+308~-4.94065E-324; Positive: 4.94065E-324~1.797693134862316E+308.
- Message – The newest text message store in the Tag. It is stored as standard text string and its length limit is 80 characters. (A Chinese character is counted as two characters.)

Tag Manager Dialog

Usually, the first step to configure a workstation is to define its Tag database. Double click on the Tag node of the workstation will open the **Tag Manger** dialog. Tags can be added, edited, renamed and deleted using this dialog.



Tag Manager

Left side of the dialog is the **Tags** list showing the names, init value, retain setting and remark of all user defined Tag. Select a Tag by left click on its name and its detailed setting is shown on the right.

- **Init Value** – Select this item to set the initial value and/or message of the Tag when Lab-LINK runtime is started.

  Value: The assigned to the Tag when Lab-LINK runtime system starts.

  Message: The text message assigned to the Tag when Lab-LINK runtime system starts.

  If no Init Value is set for the tag, its value will be 0 and its message will be blank when runtime system starts.

- **Retain Value** – Selecting this item means Tag value should be retained. When Lab-LINK runtime system ends, value of the Tag will be saved. Next time Lab-LINK is started, the saved value will be assigned to the Tag as its initial value.

- **Remark** – A short text string can be entered into this field and used as the description of the Tag.

Note：**Init Value** and **Retain Value** cannot be selected at the same time.

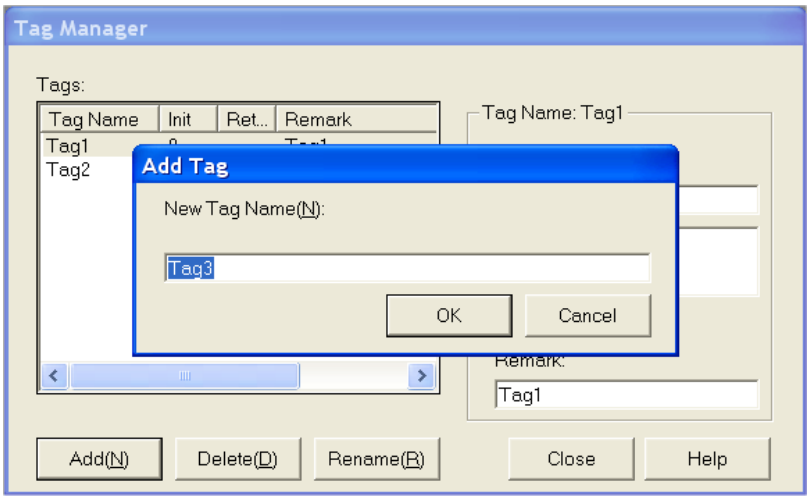
System Tag

Besides user Tags, there are some Tags created automatically by the system. These Tags are called **System Tag**. All **System Tag** names start with "$". Name and application of the System Tags are described as follows:

- $DISK: Its value shows the remaining space in the hard disk in M Bytes。
- $EXIT: When its value is set to "1", Lab-LINK runtime system will end. It is usually assigned to a **Button** object in ***SmartPanel*** and used to end the runtime system when a user presses the button.
- $TIME: Its value increase by "1" every second.
- $USER: Its value is the privilege of current logged-in user, and its message is his or her user name.
- $ALARM*: Its value is the number of active alarms and its message is the latest alarm message.
- $ALM_PRI*: Its value is the highest Priority value of unacknowledged active alarms.
- $NEW_ALM*: Whenever a new alarm occurs, its value is set to "1".
- $LOGOUT: When its value is set to "1", current user will be logged out.
- $RUN: During the execution of Lab-LINK runtime, its value will be set to "1". Its value will be set to "0" when the Lab-LINK runtime system ends.

*These **System Tags** are related to **Alarm** module.

Add Tag

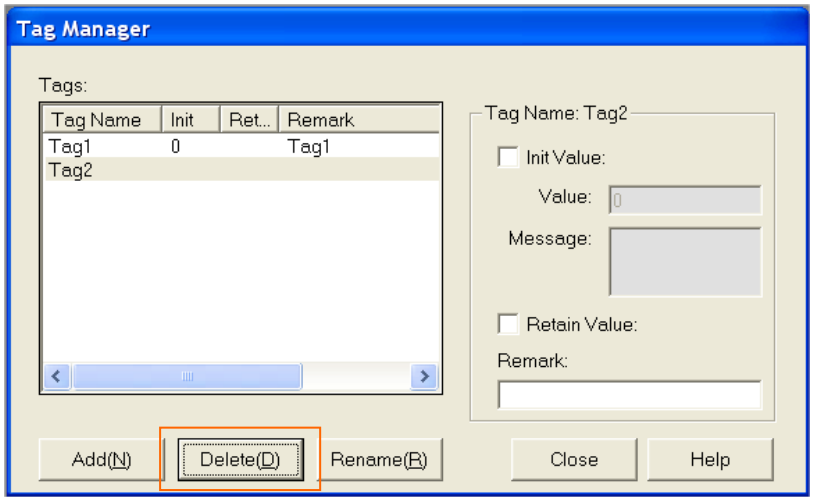


Add Tag dialog

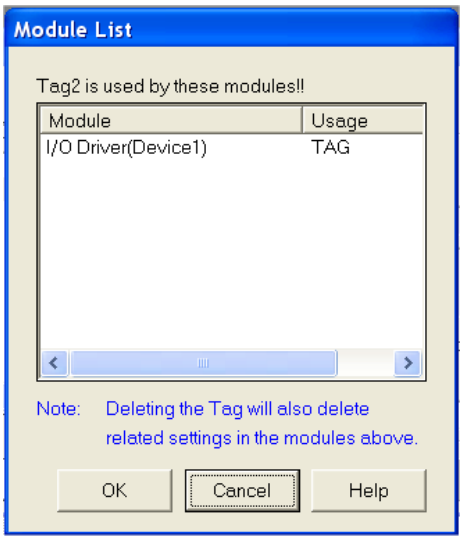
Press **Add** button in the **Tag Manager** dialog to add a new Tag. A small dialog will appear to request for a new Tag name. Enter a name following Tag naming rule and press **OK** button. A new Tag is created for the workstation. You can then set continue to do the further setting on the Tag.

Delete Tag

Select a Tag from the **Tags** list and press **Delete** button. If the Tag is already used by other modules, a message box showing which modules are using it appears to request for confirmation on the deletion. Press **OK** button to delete the Tag and settings related to the Tag in all the modules will also be deleted. Otherwise, press **Cancel** button to cancel the operation. If the Tag is not used by any module, it will be deleted immediately without the confirmation.



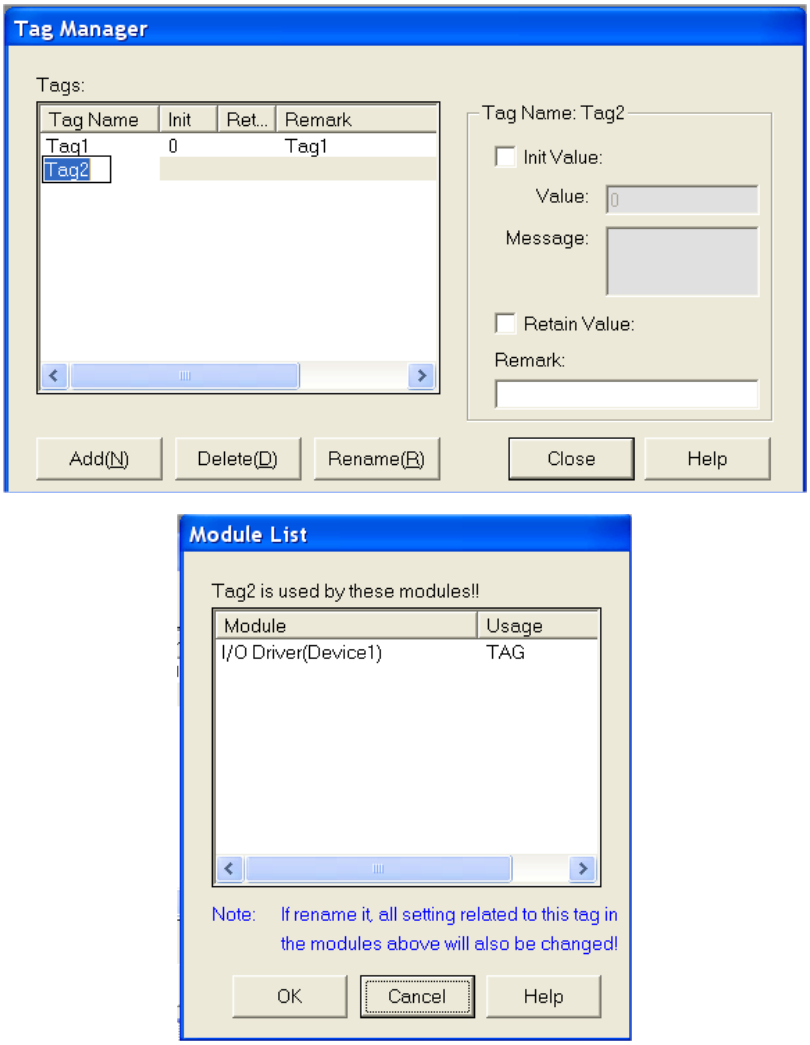
Delete Tag



Note: When a Tag is deleted, only the setting related to the Tag in currently editing workstation will be deleted. If other workstation also uses this Tag, you may need to do the deletion in that workstation separately. Tag settings in panel file are also not affected by the deletion mode here. If needed, you should modify object setting in each panel file by yourself.

Rename Tag

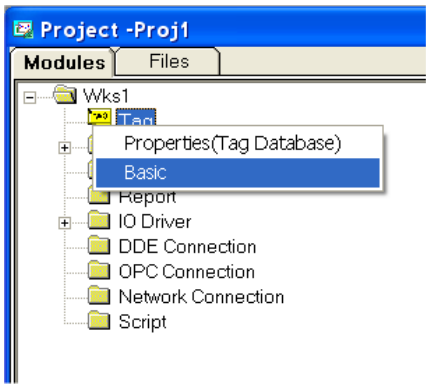
Select a Tag from the **Tags** list and press **Rename** button to rename the Tag. If the Tag is already used by other modules, a message box showing which modules are using it appears to request for confirmation on the renaming. Press **OK** button to rename the Tag or press **Cancel** button to cancel the operation. If **OK** is pressed, the message will disappear to allow you to edit the Tag name directly on the **Tags** list. When you finish editing, pressed “Enter” key on your keyboard and settings related to the Tag in all the modules will be modified to reflect the change. If the Tag is not used by any module, it can be renamed without the confirmation.

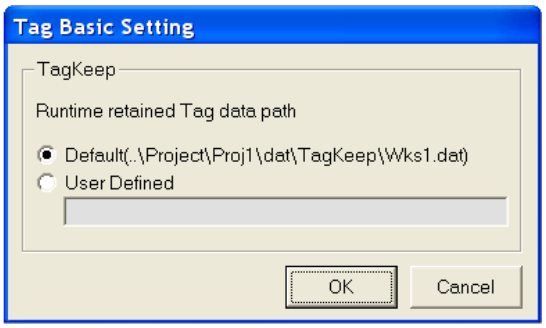


Note: When a Tag is renamed, only the setting related to the Tag in currently editing workstation will be deleted. If other workstation also uses this Tag, you may need to do the renaming in that workstation separately. Tag settings in panel file are also not affected by the renaming mode here. If needed, you should modify object setting in each panel file by yourself.

Tag Basic Setting

Right click on **Tag** node and select **Basic** from the popup menu, a dialog appears. You can define where the retained Tag value is stored in the dialog. Selecting **Default Path** indicates that you want to use the system default location for the retained value file. If **User Defined** is selected, you should enter a path in the field below which will be used to store the retained Tag value.



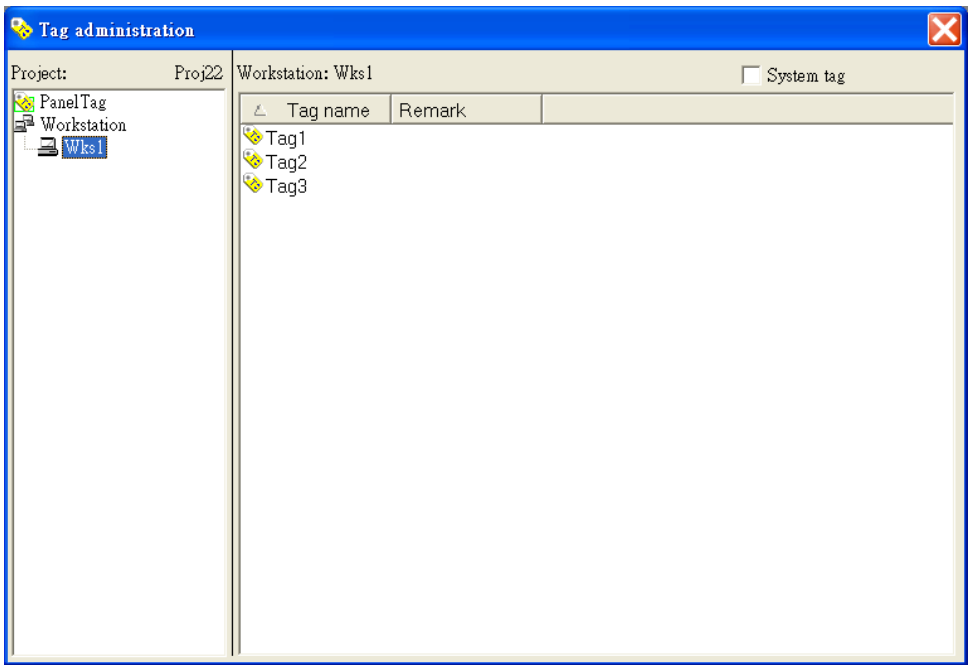


Tag Admin

Click on the **Tag Admin** button 

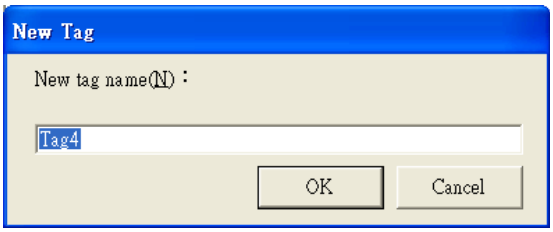
on the toolbar, the **Tag Administration** window will appear. This tool can be used to add, delete or rename tags for each workstation. It can also be used to manage Panel Tags and copy tags among workstations.

Left half of the Tag Administration windows list all the workstations in the project. Click on a workstation, its tags will be shown on the right half of the window. Click on the Panel Tag node on top of the workstation list will show all panel tags in this project. The **System tag** check box on the upper right corner of the windows can be is used to switching whether the system tags of the selected workstation will be shown or not. To close the Tag Administration windows, click on the **X** button on upper right corner of the window.

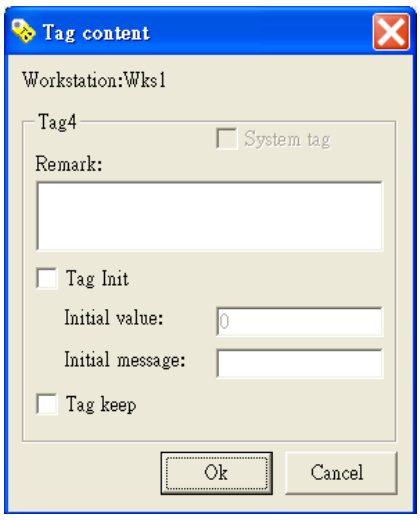


Tag Administration windows provide the following tag operations:

- New: After selecting a workstation, right click on the right half of the window and select **New** from the popup menu, the **New Tag** dialog will appear.

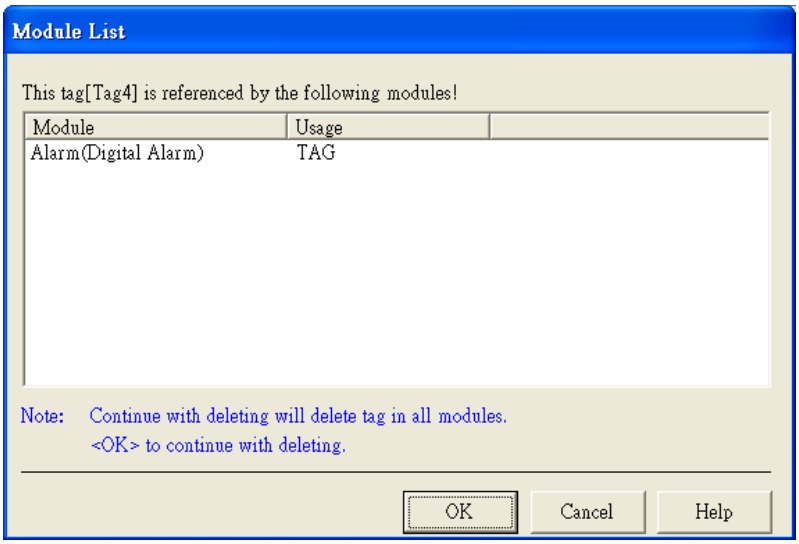


Enter a new tag name and press **OK**. **Tag content** dialog appear to allow detail setting of the new tag. Finish detail setting and press **OK**, the new tag will appear in the tag list of the workstation.



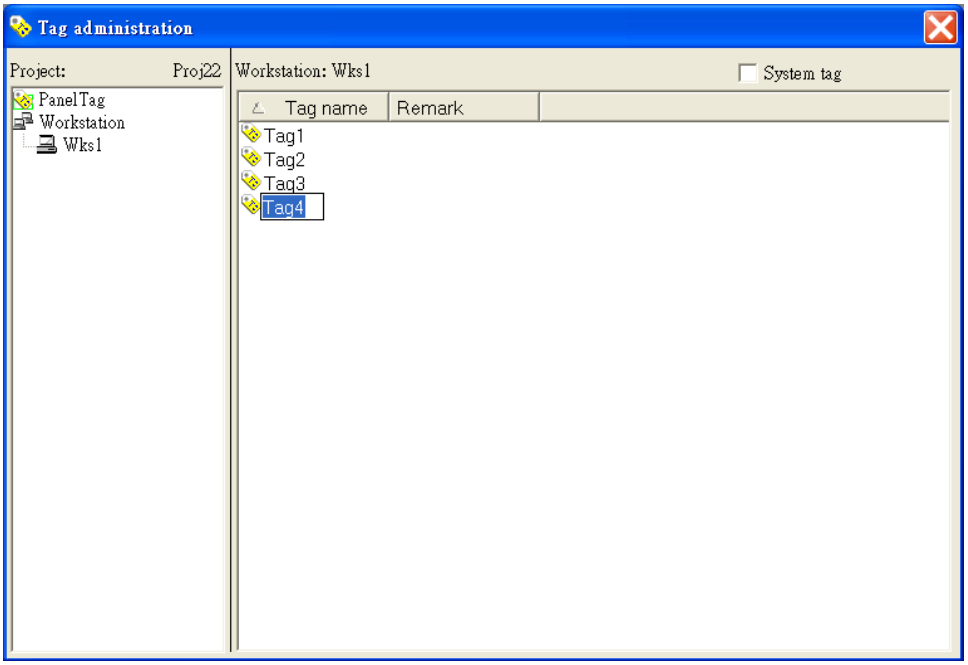
- Delete: Right click on a tag in the tag list and select **Delete** from the popup menu, a message appears to request confirmation for deleting the selected tag. Press **OK** to confirm and delete the tag, or press **Cancel** to cancel the operation.

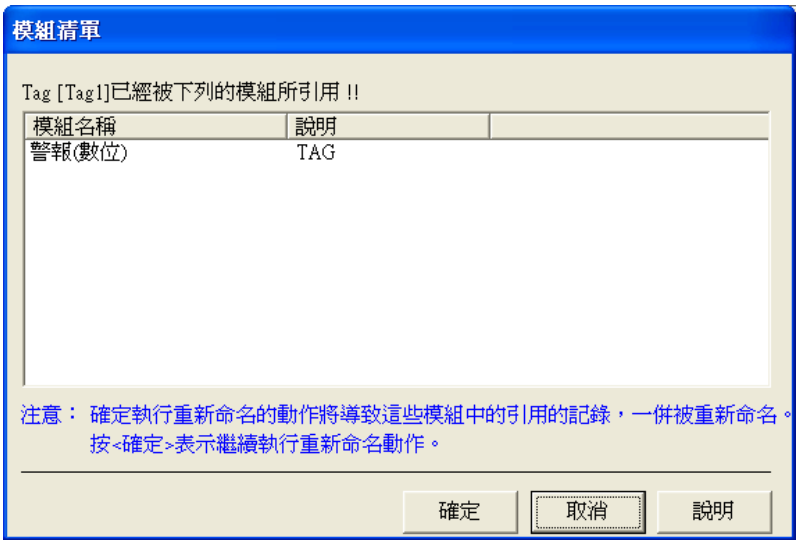
If the tag to be deleted has been defined or referenced in any of the module of the workstation, the delete operation will cause the **Module List** window to appear. The windows will show which modules have used this tag and request the confirmation to delete the tag.



If **OK** button is pressed, any setting related to the tag in each of the shown modules will all be deleted. Please note that the removal of module definition of the deleted tag is restricted to the selected workstation only. Any reference to this tag in other workstation will not be affected by this operation.

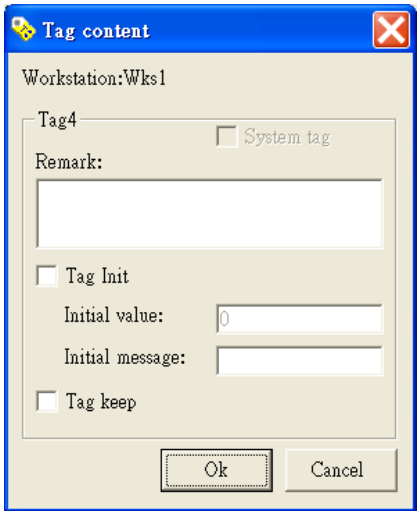
- Rename: Select the tag to be renamed from the tag list. Right click on it and select **Rename** from the popup menu. The selected tag will be high lighted and an editing cursor will appear on it to allow editing of its name using the keyboard. After a new name is entered, press <Enter> key on the keyboard to complete the operation.





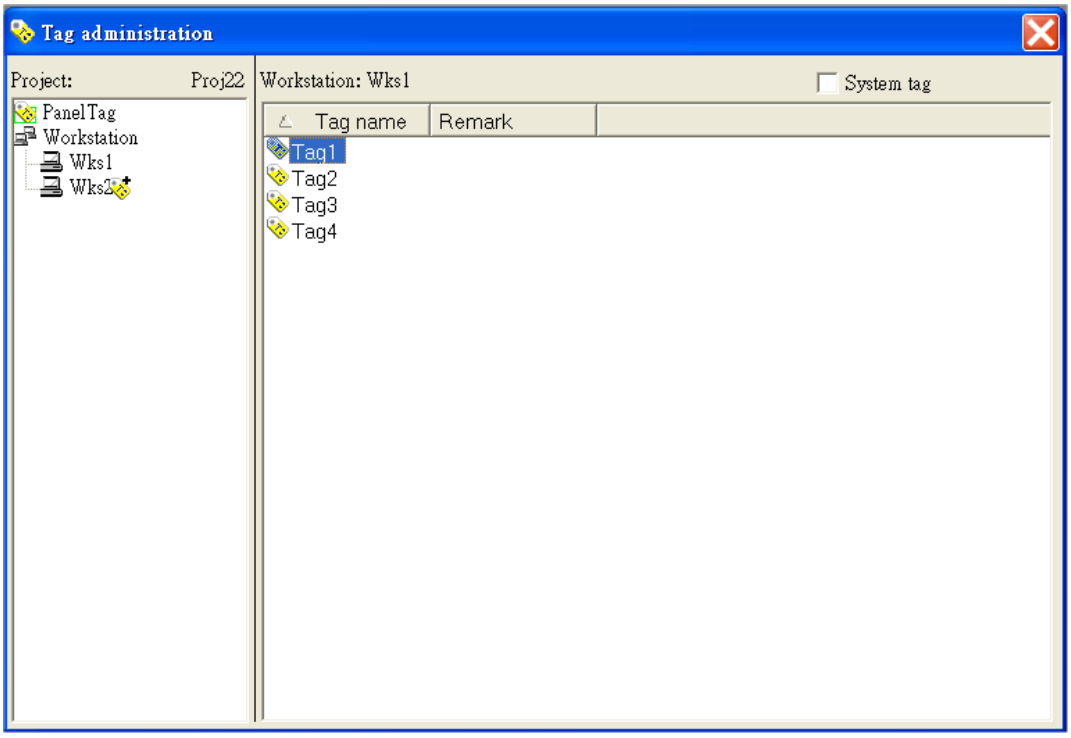
Similar to the delete operation, if the renamed tag has be used in any of the module setting, a **Module List** will appear to show which modules have used the tag request for confirmation. If the operation is confirmed, all setting regarding the tag will be renamed as well. This operation is also restricted to the workstation under modification only.

- Open: By right clicking a tag in the tag list and selecting **Open** from the popup menu, its **Tag content** dialog will be opened. After editing of its detail setting, press **OK** to complete the editing, or press **Cancel** to discard the operation.

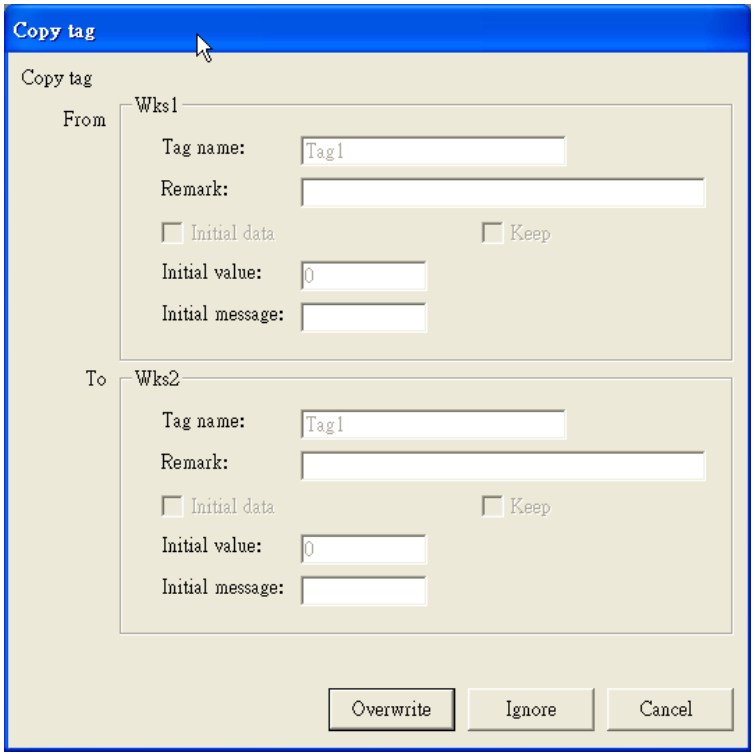


Double click on a tag can also open the **Tag content** dialog.

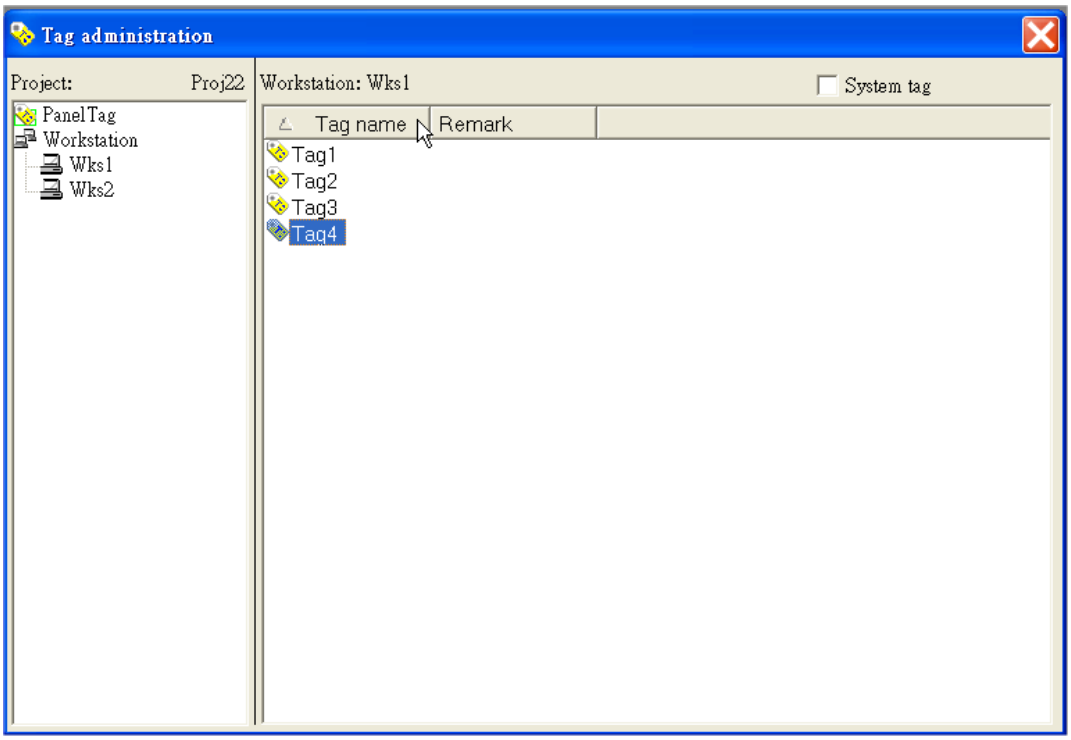
- Copy: Select a tag from the tag list and drag it to another workstation in the workstation list can copy the tag to the workstation.



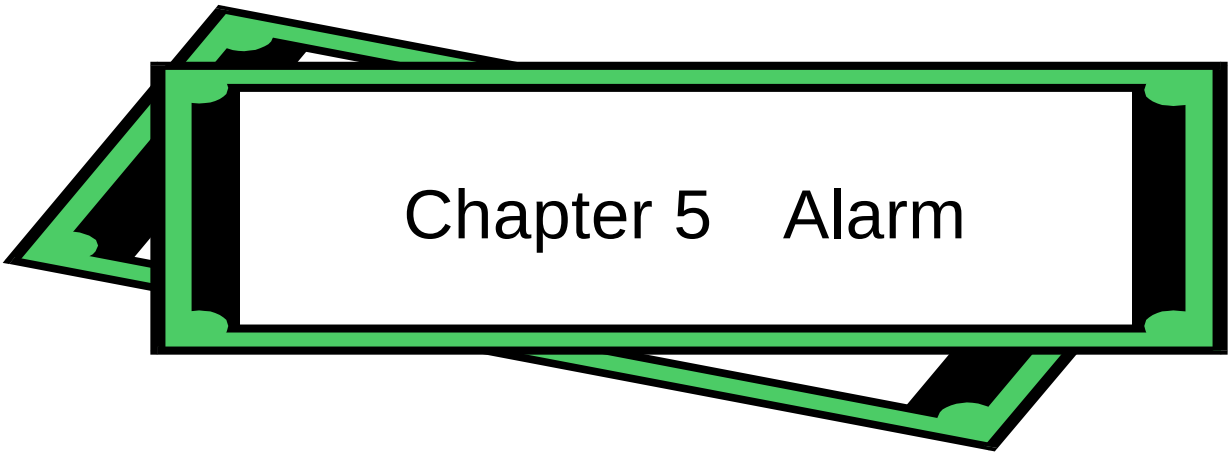
If the copied tag is already defined in the target workstation, a **Copy tag** dialog will appear to display the detail setting of the tags of the same name in both source and target workstation. Press **OK** to confirm and overwrite the original tag in the target workstation, or press **Cancel** to cancel the operation.



- Sort: To help user easily find a tag, users can click on column titles of the tag list to display tags in ascending or descending order by the selected column.



Left click on **Tag name** column title to sort the tags by their name and a △ symbol appears to indicate that the tags are listed in ascending order. Click on the column title again. A ▽ symbol is shown and the tags are sorted in descending order. Click on the title again and the symbol disappears. The tags will be listed in unsorted order. Similar operation can be performed on the **Remark** column to sort tags according to their remarks.



Chapter 5 Alarm

Introduction

Alarm module is used to provide alarming function in Lab-LINK. User can define alarm condition and how the system should respond to the alarm.

There some special requirements if certain alarm features are used:

- Sound card/interface and speaker are needed if sound or voice annunciation is expected when alarms occur.
- Dot matrix printers are recommended for alarm printing

Features

- Alarm messages are user defined.
- Both I/O Tags and non-I/O Tags can be defined as alarm Tags.
- Alarm can be assigned **Priority** to determine which alarm should be processed first.
- Alarm message can be printout immediately.
- Eight types of alarm condition can be defined.
- Operator can acknowledge alarms when they occur.
- Alarm message and Reset message can be logged in a history file.
- Active alarm and alarm history can be shown separately.
- ***LogView*** alarm report program let user query of alarm records by time or categories and print them as report.
- Various actions can be taken when alarms occur.

Architecture

Same as other modules, Alarm module receive real time Tag data from Tag Manager and can communicate with other modules through Tags. Alarm module can respond with the change of Tag data to reflect its alarm status and send the status to other module if necessary.

Alarm can be divided to two parts:

- Alarm Manager – It is responsible for detecting of any alarm condition and conduct actions when alarms occur.
- Log Manager – It is responsible for the logging of alarm history.

Alarm Processing

There are three stages from the occurrence till the clearing of an alarm:

- Alarm: The state of an alarm Tag changes from normal to abnormal. Alarm action such as printing and alarm output will be taken when an alarm occurs.
- Acknowledge: Operator conduct an operation on Lab-LINK to indicate that it acknowledge the alarm.
- Reset: The state of an alarm Tag changes from abnormal back to normal.

Acknowledging may or may not be conducted during the alarm process. This may due to the alarm reset before any operator has the opportunity to acknowledge it or acknowledgement is never expected. Besides, it is also possible that an alarm is considered reset as soon as it is acknowledged. In this case, it won't have the reset stage.

Alarm Logging

Alarm provide alarm message logging function to record alarm history. There are two alarm logging system in Lab-LINK: **Alarm Database** and **Alarm History File**.

Alarm Database

Alarm Databases are real time databases storing alarm messages in system memory

during Lab-LINK runtime. The databases can be saved to files when **Lab-LINK** ends and the files can be loaded back to memory when **Lab-LINK** starts. You can choose to store **Active Alarm** (alarms that are not reset) and **Alarm History** (records of past alarms that are reset) in two separate databases (**Dual Log**) or in the same single database (**Single Log**). Due to the nature of memory storage, the number of alarm records the databases can hold is limited in either case. A maximum of 1024 records can be stored in either Active Alarm Database or Alarm History Database. Old record will be flushed out on a first in first out base. Records in both databases can be shown using an **Alarm Log** object in ***SmartPanel***.

Alarm History File

Alarm History File is a text file recording the alarm, acknowledge and reset messages records by time. It can be viewed, queried and printed using the add-on module LogView alarm report program.

Alarm Log Format

Messages are logged at each alarms stages, so there are three kinds of messages: alarm message, acknowledge message and reset message

If Single Log is used, a complete reset message contains the following information:

```
Alarm DateTime AlarmName AlarmMessage, AckDateTime Acked by User
↱Reset DateTime AlarmName ResetMessage
```

Ex.

2005/01/02 10:20:05 Reactor Temperature too high, 2005/01/02 10:21:04 Acked by User A
2005/01/02 10:30:25 Reactor Temperature normal

If Dual Log is used, Active Alarm Database contains both alarm and acknowledge message with format:

```
Alarm DateTime AlarmName AlarmMessage, AckDateTime Acked by User
```

When the alarm is reset, the record will be removed from Active Alarm Database, combined with reset message and stored into Alarm History Database with the format:

```
Alarm DateTime AlarmName AlarmMessage, Reset DateTime ResetMessage,
```

↱ AckDateTime Acked by User

Ex.

Reactor Temperature, 2005/01/02 10:20:05 too high, 2005/01/02 10:30:25 normal,
↱2005/01/02 10:21:04 Acked by User A

Note: ↱ mean the text behind should be part of the previous line

Alarm Types

There are eight different types of alarm conditions:

- **Digital Alarm**: Suitable for digital Tags. Can be further divided to two sub types **D1** and **D0**. **D1** alarm occurs when Tag value is “1” and **D0** alarm occurs when Tag value is “0”.
- **High/Low Alarm**: Suitable for analog Tags. A high limit and a low limit can be defined. When Tag value is greater than or equal to the high limit, High alarm occurs. If Tag value is smaller than or equal to the low limit, Low alarm occurs.
- **HH/H/L/LL Alarm**: Suitable for analog Tags. Similar to **High/Low alarm** but with a second set of limits. When Tag value is greater than the high-high limit, **HH** alarm occurs. If Tag value is smaller than the low-low limit, **LL** alarm occurs.
- **Rate of Change Alarm**: Suitable for analog Tags. Alarm occurs when the speed of change of alarm Tag value exceed a specified limit.
- **Deviation Alarm**: Suitable for analog Tags. Based on a specified **Base** value, alarm occurs when the different of the **Base** value and the alarm Tag value is greater than or equal to the specified **Deviation**.
- Timeout Alarm: Suitable for digital Tags. A **Reference Tag** is compared with the alarm Tag. The alarm Tag value must change as the **Reference Tag** within a specified time limit. Otherwise, alarm occurs. This type of alarm can be further divided into two subtypes: **T0** and **T1**. **T0** alarm occurs if alarm Tag and the **Reference Tag** are at the same state after the time limit. **T1** alarm occurs if alarm Tag and the **Reference Tag** are at the opposite state after the time limit. There is no automatic reset for **Timeout alarm**.
- Trip Alarm: Suitable for digital Tags. A **Reference Tag** is compared with the alarm Tag. It is further divided into three subtypes: **X0**, **X1** and **XC**. **X0** alarm occurs if the **Reference Tag** is at the same state when the alarm Tag changes. **X0** alarm occurs if the **Reference Tag**

is at the same when the alarm Tag changes. **X1** alarm occurs if the **Reference Tag** is at the opposite state when the alarm Tag changes. **XC** alarm occurs if the alarm Tag change but the **Reference Tag** doesn't.

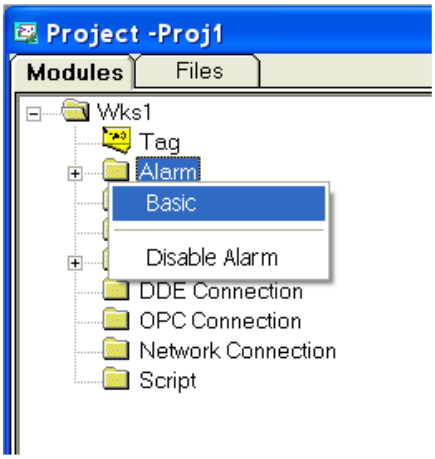
- Event: Suitable for digital Tags. Any state change of the alarm Tag is recorded as an event. There is no reset for an event.

Expand and Collapse of Alarm Node

In Project Window, click on ⊞ before the Alarm node to expand alarm module and show the eight alarm types as nodes in the tree view. To collapse the Alarm node, click on ⊟ before the Alarm node.

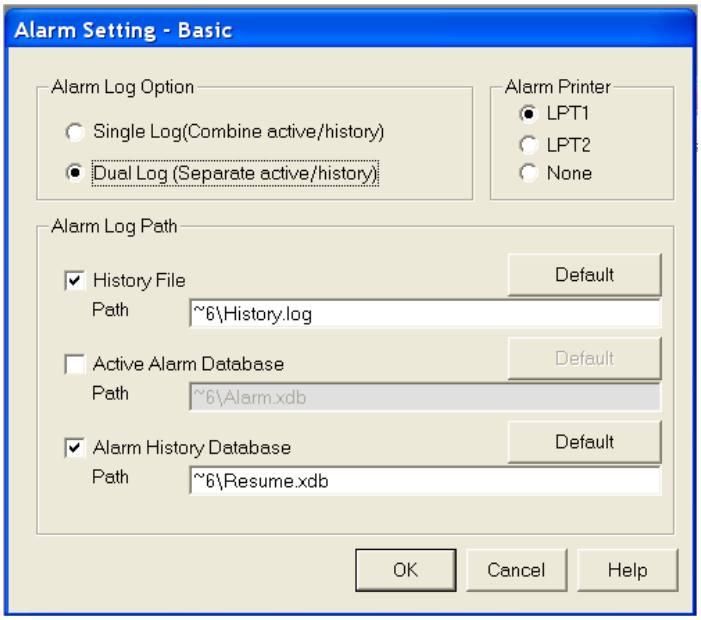
Basic Setting

Right click on **Alarm** node and select **Basic** from the popup menu to open its **Basic Setting** dialog.



Select Basic Setting

The Dialog is used to set alarm logging and printing:



Basic Setting Dialog

Alarm Log Option

Single Log (Combine Active/History)

Combine active alarm messages and alarm history in the same database. Alarm, acknowledge and reset messages are all recorded in this database in the sequence of occurring time.

Dual Log (Separate Active/History)

Active alarm and alarm history are store separately in two different databases. Alarm and acknowledge message of any active alarm is kept in the **Active Alarm Database**. When an alarm reset, its alarm and acknowledge messages are removed from the Active Alarm Database, combined with the reset message, and stored in the Alarm History Database as a history record.

Alarm Printer

Alarm messages can be printed immediately by setting **Print Message** in alarm action setting. The setting is used to specify which printer will be used for alarm message printing. A dot matrix printer is recommended for this application due to its line printing

nature. Since alarm messages code is sent directly to the printer bypassing Windows' Print Manager, if non English messages are used, it is expected that the printer has appropriate code and fonts built in.

Three options are available for this setting:

- **LPT1** — Use the printer connected to printer port LPT1.
- **LPT2** — Use the printer connected to printer port LPT2.
- **None** — No alarm printing despite the setting in alarm action of alarm Tags.

You may need to remap a network printer to LPT1 or LPT 2 if one is used.

Note: Be sure to set up at least one printer for the printer port specified in Windows Printer Setting. Otherwise, your system will appear hung and cease to respond for a period as long as several minutes when an alarm occurs and the system try to locate a printer to print out the message. To prevent this, please select **None** if alarm printing is not used.

Alarm Log Path

History File

Besides the alarm log databases discussed in **Alarm Log Option**, there is another alarm logging choice – alarm **History File**. This is a text file used to record alarm history. If this logging option is selected in alarm Tags' **Action** setting, alarm, acknowledge and reset messages will all be logged into this file. Add-on module **LogView** can then be used to view, query and print the log.

Click on **History File** checkbox to select storing alarm history file. Default Path of **History File** is "..\Project*ProjectName*\dat\Histort.log", located at the "dat" sub folder under project folder that is also denoted as **Reference Folder** "~6\". Users can change this default location by keying a different path. To reset the path to its default, press **Default** button.

Active Alarm Database

Click on the checkbox to store **Active Alarm Database** into a file using Lab-LINK proprietary format. The file can contain up to 1024 latest alarm records. **Active Alarm Database** won't be stored if this option is not selected, and all active alarm records will

be flushed away from memory when Lab-LINK ends. However, not storing **Active Alarm Database** won't an issue if **Dual Log** is used since it reflect the real time alarm condition and will be detected again when Lab-LINK is started. Therefore, this option is not selected as default when using **Dual Log**. For **Single Log**, this is the only alarm database file used and should usually be selected to keep alarm database records.

Default Path of **Active Alarm Database** is "..\Project*ProjectName*\dat\Alarm.xdb", located at the "dat" sub folder under project folder that is also denoted as **Reference Folder** "~6\". Users can change this default location by keying a different path. To reset the path to its default, press **Default** button.

Content of can be view using **Alarm Log** object in ***SmartPanel***.

Alarm History Database

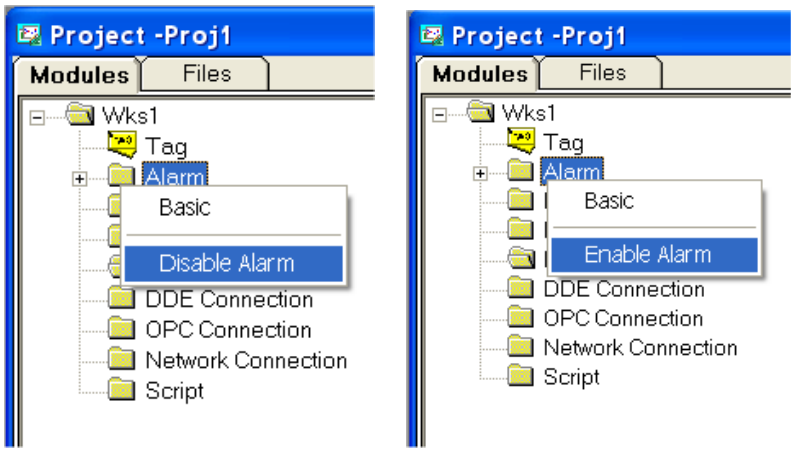
Click on the checkbox to store **Alarm History Database** into a file using Lab-LINK proprietary format. The file can contain up to 1024 latest alarm records. **Alarm History Database** won't be stored if this option is not selected, and all alarm history records will be flushed away from memory when Lab-LINK ends. Therefore, this option is selected as default. This option has effect only if **Dual Log** is used.

Default Path of **Alarm History Database** is "..\Project*ProjectName*\dat\Resume.xdb", located at the "dat" sub folder under project folder that is also denoted as **Reference Folder** "~6\". Users can change this default location by keying a different path. To reset the path to its default, press **Default** button.

Content of can be view using **Alarm Log** object in ***SmartPanel***.

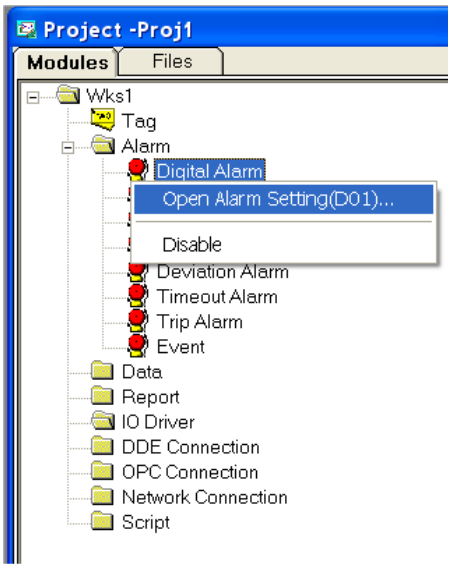
Disable Alarm

Right click on **Alarm** node and select **Disable** from the popup menu to disable all alarm function. Regenerate the project and **Alarm** module won't run next time the project is started. To enable **Alarm** module again, right click on Alarm node to select **Enable** and regenerate the project.



Alarm Properties Setting

Alarm Setting varies for different alarm types. Right click on the node of a particular alarm type and select **Properties** to open its alarm setting dialog. The following sections provide detail discussion on alarm setting for each alarm type.

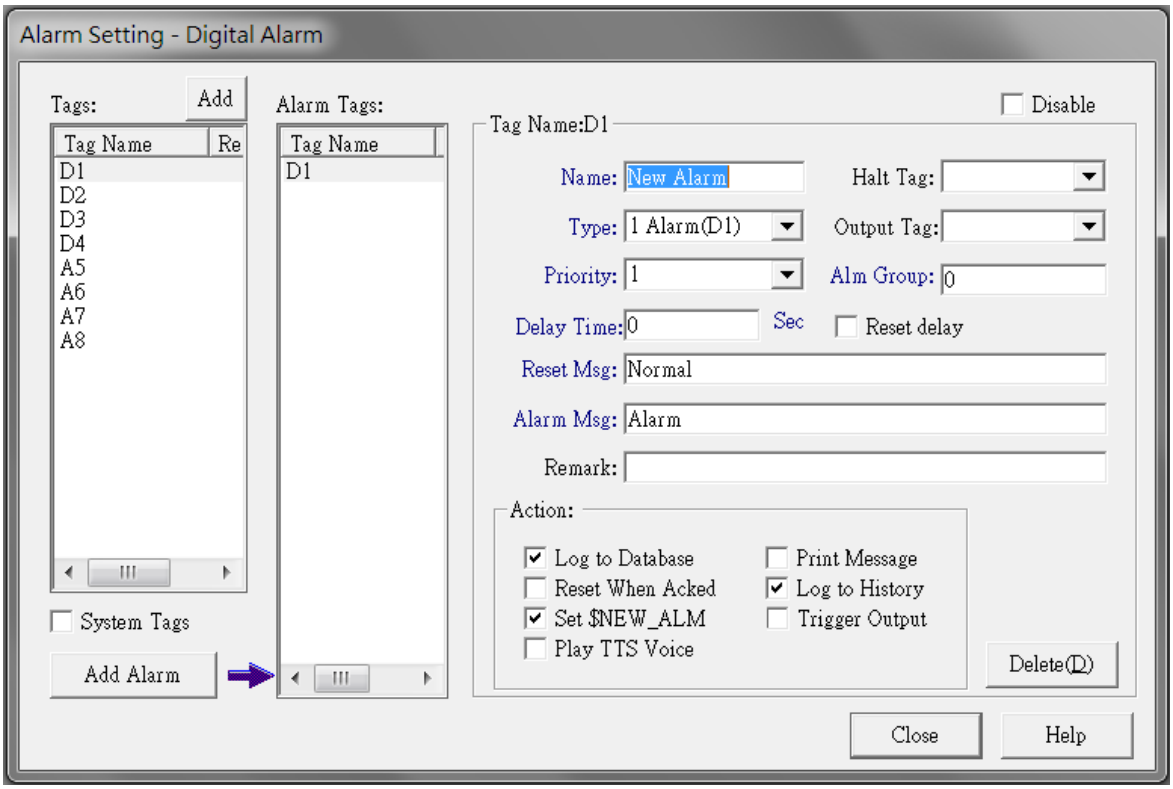


Alarm Setting

Note: Each can only be added into an alarm type. For example, it Tag 1 added to Digital Alarm, it can not be added to any other alarm type.

Digital Alarm Setting

Suitable for digital Tags, this alarm type can be further divided into two sub types: **D1**and **D0**. **D1** alarm occurs when Tag value is “1” and **D0** alarm occurs when Tag value is “0”



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Select a Tag in the Alarm Tags list and its alarm setting appears on the right half of the dialog.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Electrical System|Area A] Power panel VCB-1" and alarm message "Trip" may display its alarm message as:

2006/01/01 12:00:00 [Electrical System|Area A] Power panel VCB-1 Trip

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Electrical System" and minor category of "Area A".

Type (mandatory field)

This parameter specifies sub type of digital alarm:

- **D1** — Alarm occurs when Tag value is "1".
- **D0** — Alarm occurs when Tag value is "0".

Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to "1", processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this

setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to “1”, system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to “1” after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to “0”, alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users’ Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message. It is a string with length limit of 80 characters.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be

effective. Be sure to install appropriate printer driver also.

- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

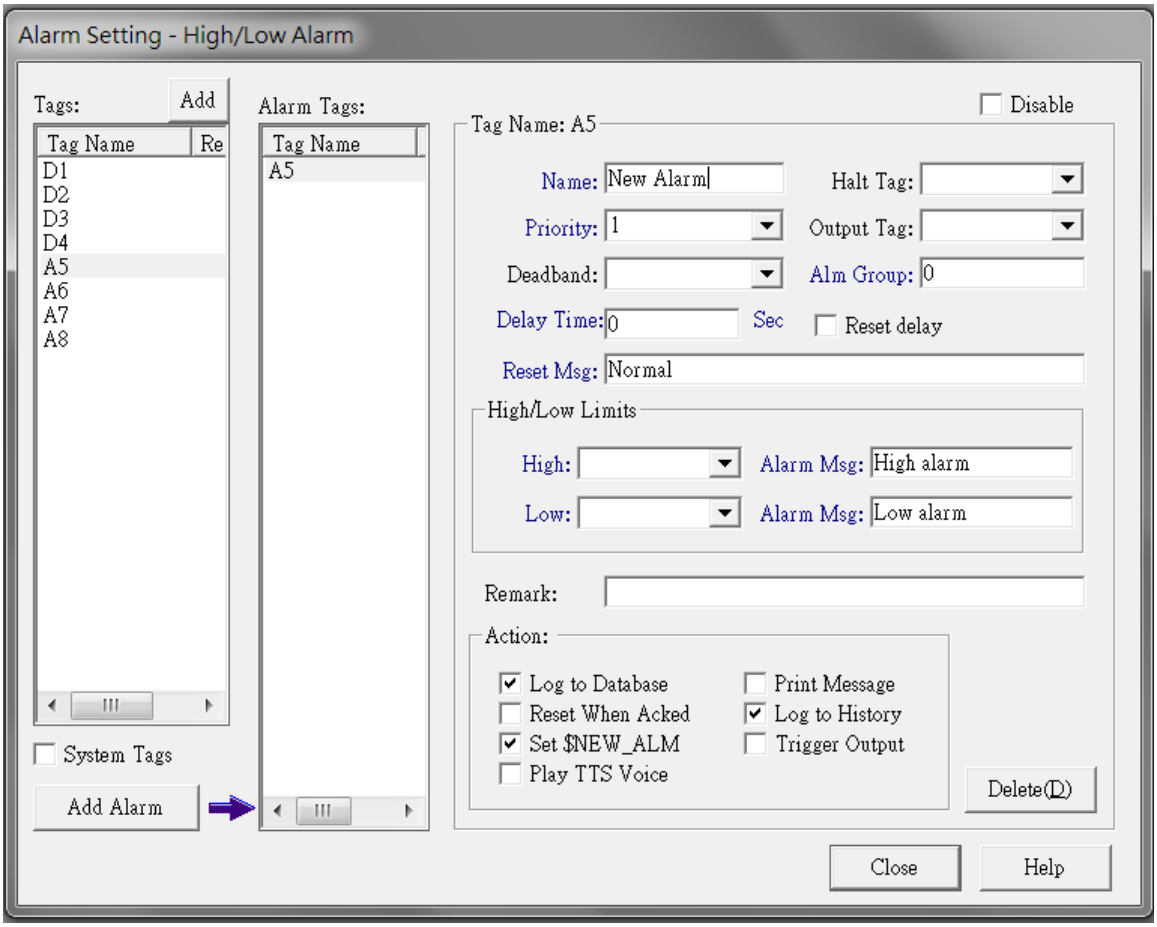
Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

High/Low Alarm Setting

Suitable for analog Tags. A high limit and a low limit can be set in this alarm. **High** alarm occurs when the value of alarm tag is grater than or equal to high limit and **Low** alarm occurs when the alarm tag value is smaller than or equal to the low limit.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Area A|Reactor] Temperature" and alarm message "too high" may display its alarm message as:

2006/01/01 12:00:00 [Area A|Reactor] Temperature too high

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Area A" and minor category of "Reactor".

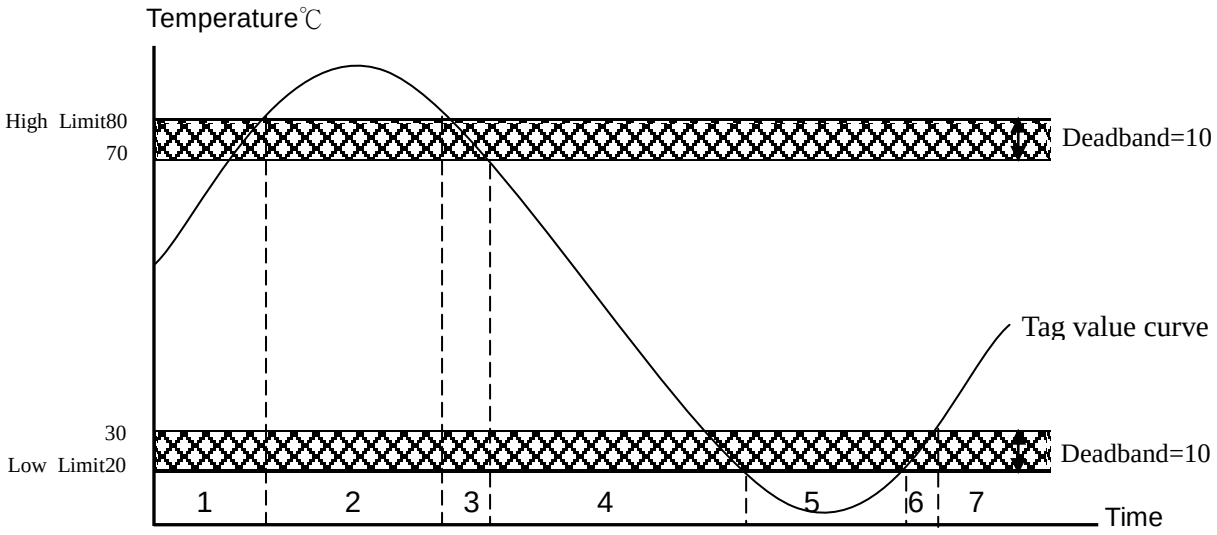
Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Deadband (optional field)

This parameter specifies a dead band range. Dead band is designed to avoid the annoyance of frequent alarm and reset of an analog alarm whose value is close to the alarm limit. As shown in the figure below, the shaded area within alarm limits are the dead bands.



Alarm status of the Tag with dead band:

Stage	Temperature Value	Alarm Status	Description
1	Tag <80	Normal	
2	Tag≧80	High Alarm	Exceed high limit
3	80> Tag≧70	High Alarm	Below high limit but still within deadband
4	70> Tag > 20	Normal (Reset)	Below high limit and dead band
5	Tag≦20	Low Alarm	Below low limit
6	30> Tag≧20	Low Alarm	Above low limit but still within deadband
7	Tag≧30	Normal	Above low limit and dead band

If a Deadband is set, the alarm will not reset although alarm tag value is within alarm limit but still inside the dead band. The alarm is reset only after the tag value is within alarm limit and also out of the dead band. Without this setting, if the tag value oscillating at the edge of the alarm limit will cause the alarm to occur and reset frequently. Besides a constant value, a Tag name can also be set in this parameter.

Either a constant value or a Tag name can be set to this parameter. If a tag name is set, the value of that tag at run time will be used as the deadband value and thus can be changed by operators using a ***SmartPanel*** object.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to “1”, processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this

setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to "1", system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to "1" after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to "0", alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to "1". When the alarm is acknowledged or reset, its value will be set to "0". If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users' Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

High/Low Limit

High (mandatory field)

High limit of the alarm tag. If the value of the alarm tag is greater than or equal to the limit, **High Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as high limit.

Alarm Msg

This parameter specifies the message content of the high alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **High Alarm** is disabled.

Low (mandatory field)

Low limit of the alarm tag. If the value of the alarm tag is smaller than or equal to the limit, **Low Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as low limit.

Alarm Msg

This parameter specifies the message content of the low alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **Low Alarm** is disabled.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some

languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

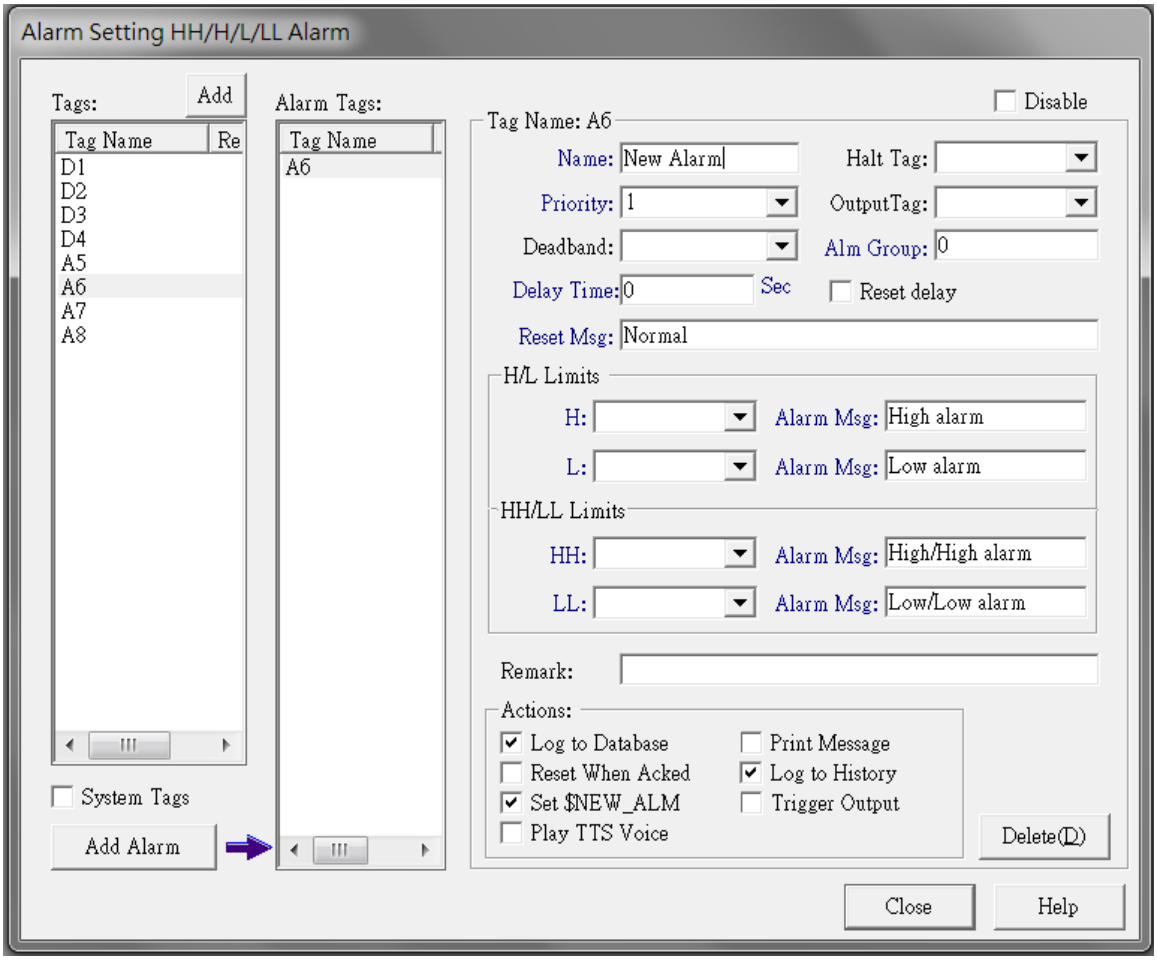
Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

HH/H/L/LL Alarm Setting

Suitable for analog Tags. Two sets of high limits and low limits can be set in this alarm. **High-High** alarm occurs when the value of alarm tag is grater than or equal to high-high limit; **High** alarm occurs when the value of alarm tag is grater than or equal to high limit but smaller than the high-high limit; **Low** alarm occurs when the alarm tag value is smaller than or equal to the low limit but greater than the low-low limit; **Low-Low** alarm occurs when the alarm tag value is smaller than or equal to the low-low limit.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Area A|Reactor] Temperature" and alarm message "too high" may display its alarm message as:

2006/01/01 12:00:00 [Area A|Reactor] Temperature too high

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Area A" and minor category of "Reactor".

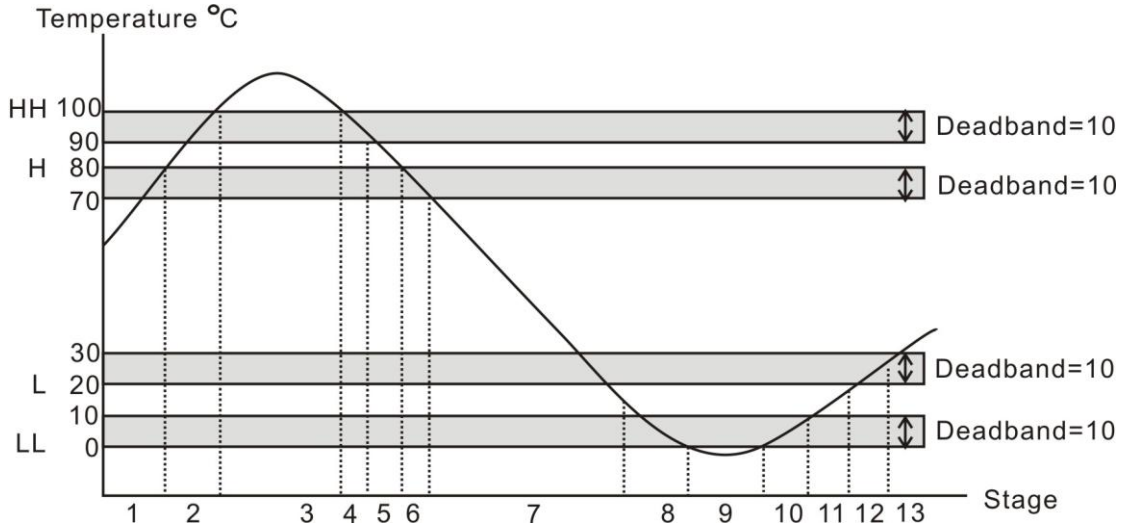
Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Deadband (optional field)

This parameter specifies a dead band range. Dead band is designed to avoid the annoyance of frequent alarm and reset of an analog alarm whose value is close to the alarm limit. As shown in the figure below, the shaded area within alarm limits are the dead bands.



Alarm status of the Tag with dead band:

Stage	Temperature Value	Alarm Status	Description
1	Tag <80	Normal	
2	Tag≧80	High Alarm	Exceed high limit but below high-high limit
3	Tag≧ 100	High-High Alarm	Exceed high-high limit
4	90 > Tag≧ 100	High-High Alarm	Below high-high limit but still within deadband
5	90 > Tag≧ 80	High Alarm	Below high-high limit and deadband but still above high limit
6	80 > Tag≧ 70	High Alarm	Below high limit but still within deadband
7	70 > Tag≧ 20	Normal (Reset)	Below high limit and dead band
8	20 > Tag≧ 0	Low Alarm	Below low limit but above low-low limit
9	Tag < 0	Low –Low Alarm	Below low-low limit
10	10 > Tag≧ 0	Low –Low Alarm	Above low-low limit but still within deadband
11	20 > Tag≧ 10	Low Alarm	Above low-low limit and deadband but still below low limit
12	30≧ Tag > 20	Low Alarm	Above low limit but still within deadband
13	70 > Tag > 30	Normal (Reset)	Above low limit and deadband

If a **Deadband** is set, the alarm will not reset although alarm tag value is within alarm limit but still inside the dead band. The alarm is reset only after the tag value is within

alarm limit and also out of the dead band. Without this setting, if the tag value oscillating at the edge of the alarm limit will cause the alarm to occur and reset frequently. Besides a constant value, a Tag name can also be set in this parameter.

Either a constant value or a Tag name can be set to this parameter. If a tag name is set, the value of that tag at run time will be used as the deadband value and thus can be changed by operators using a ***SmartPanel*** object.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to "1", processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to "1", system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to "1" after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to "0", alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to "1". When the alarm is acknowledged or reset, its value will be set to "0". If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users' Manual for detail

on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

H/L Limit

H (mandatory field)

High limit of the alarm tag. If the value of the alarm tag is greater than or equal to the limit, **High Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as high limit.

Alarm Msg

This parameter specifies the message content of the high alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **High Alarm** is disabled.

L (mandatory field)

Low limit of the alarm tag. If the value of the alarm tag is smaller than or equal to the limit, **Low Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as low limit.

Alarm Msg

This parameter specifies the message content of the low alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **Low Alarm** is disabled.

HH/LL Limit

HH (mandatory field)

High-High limit of the alarm tag. If the value of the alarm tag is greater than or equal to the limit, **High-High Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as high-high limit.

Alarm Msg

This parameter specifies the message content of the high-high alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **High-High Alarm** is disabled.

LL (mandatory field)

Low-Low limit of the alarm tag. If the value of the alarm tag is smaller than or equal to the limit, **Low-Low Alarm** occurs. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as low-low limit.

Alarm Msg

This parameter specifies the message content of the low-low alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **Low-Low Alarm** is disabled.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some

languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

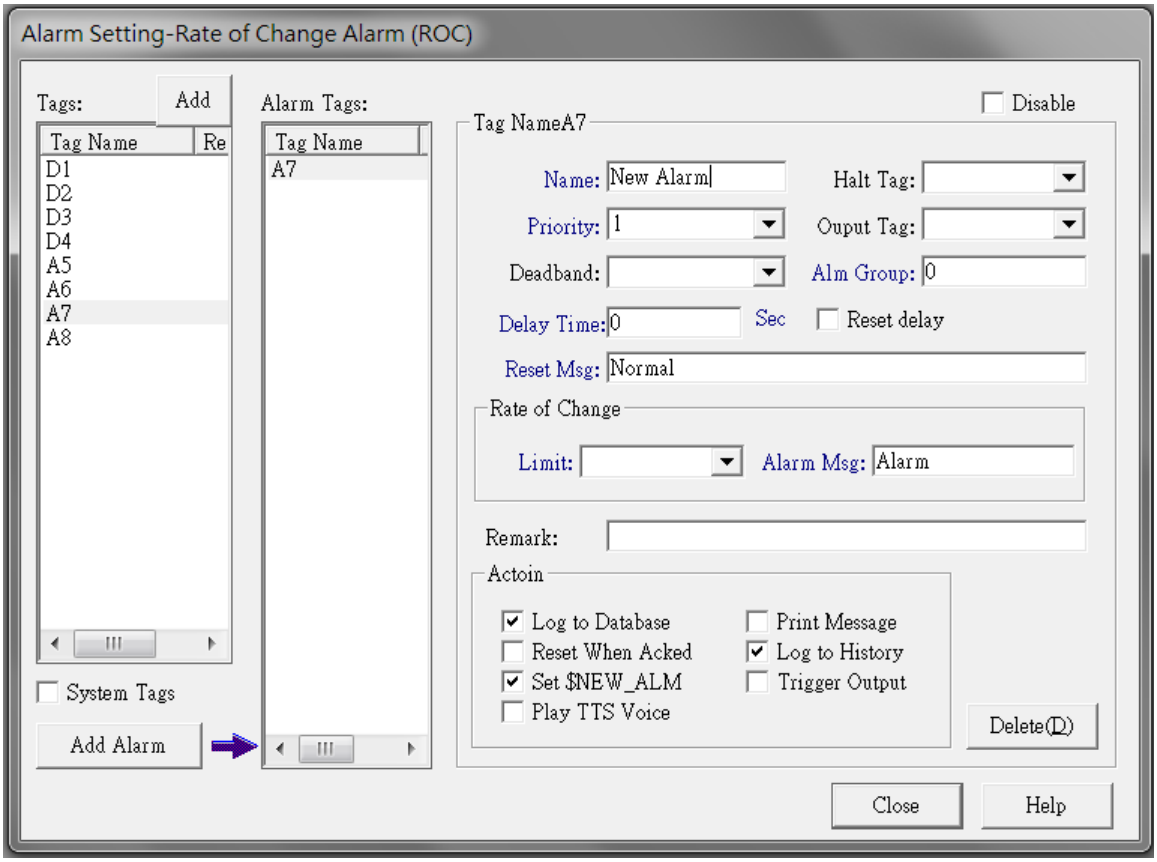
Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

Rate of Change Alarm Setting

Suitable for analog Tags. The alarm occurs when the rate of change of the alarm tag value is greater than a specified limit.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Area A|Reactor] Temperature" and alarm message "change too fast" may display its alarm message as:

2006/01/01 12:00:00 [Area A|Reactor] Temperature change too fast

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Area A" and minor category of "Reactor".

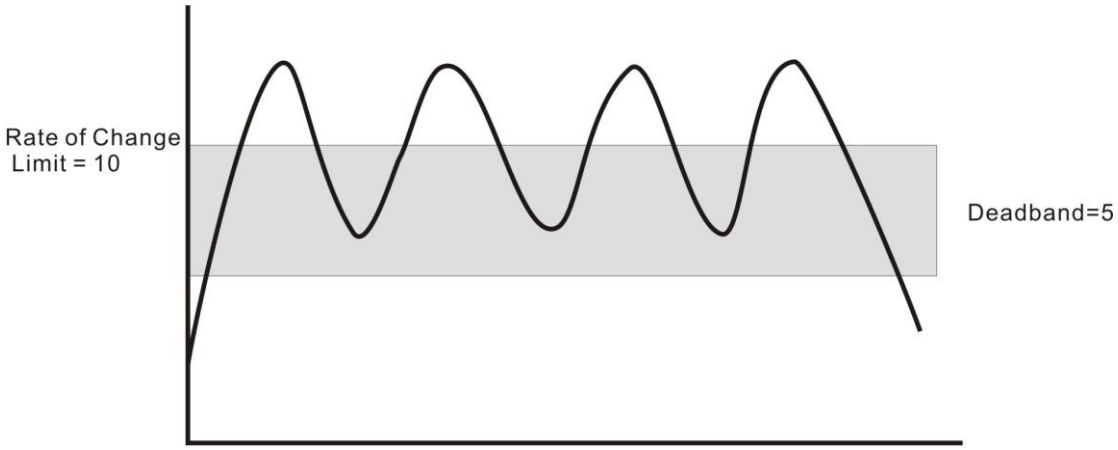
Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Deadband (optional field)

This parameter specifies a dead band range. Dead band is designed to avoid the annoyance of frequent alarm and reset of an analog alarm whose value change rate is close to the alarm limit. As shown in the figure below, the shaded area within alarm limits are the dead bands. Alarm resets only after its change rate is below the deadband.



Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to “1”, processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to “1”, system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to “1” after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to “0”, alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users' Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

Rate of Change

Limit (mandatory field)

Limit on the change rate of the alarm tag's value. Alarm occurs when tag value changes faster than or equal to the limit. The limit has the time unit of seconds (change per second). This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as limit.

Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message. It is a string with length limit of 80 characters.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS

(Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

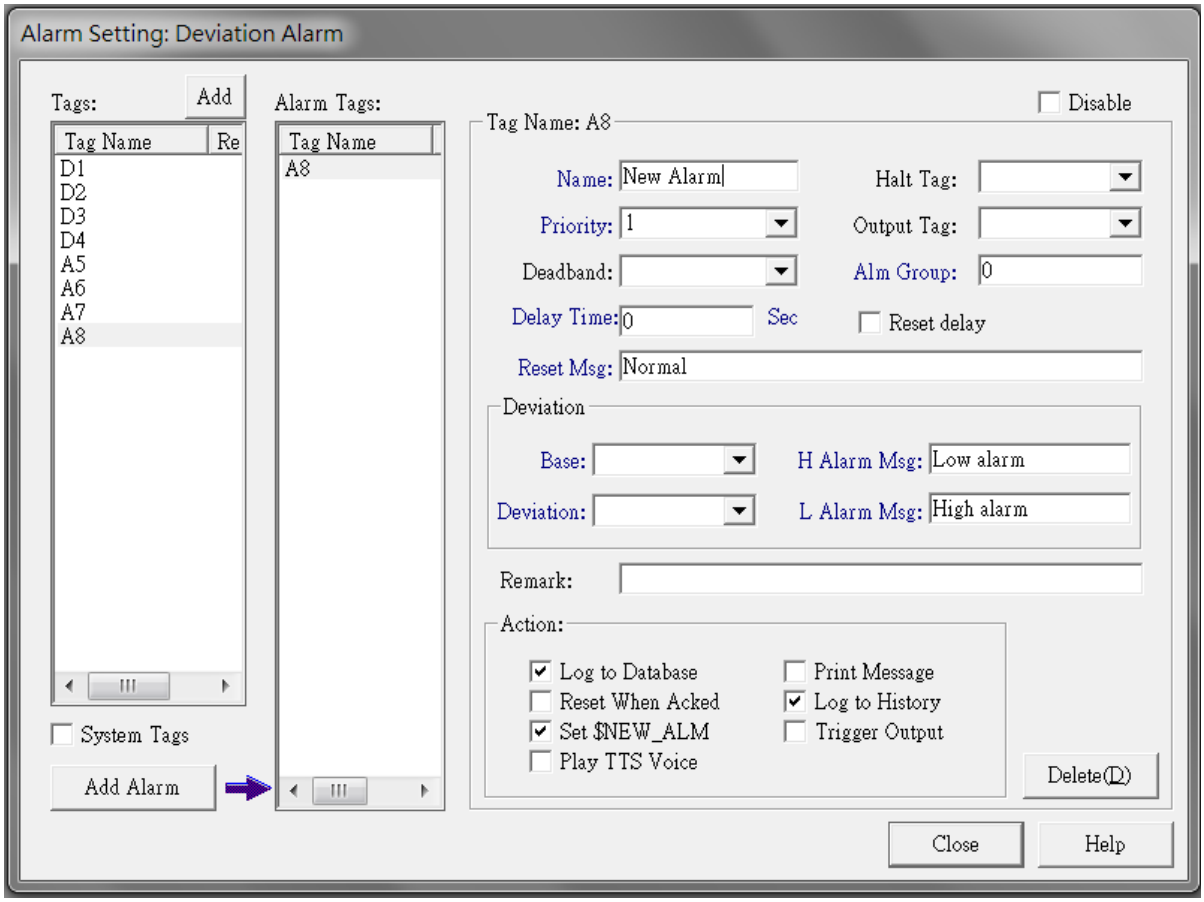
Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

Deviation Alarm Setting

Suitable for analog tags. A base value and a deviation value are set in this type of alarm. High alarm occurs if the alarm tag value is greater than the **Base** value and the difference is more than or equal to **Deviation** value. Low alarm occurs if the alarm tag value is smaller than the **Base** value and the difference is more than or equal to **Deviation** value.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Area A|Reactor] Temperature" and alarm message "too high" may display its alarm message as:

2006/01/01 12:00:00 [Area A|Reactor] Temperature too high

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Area A" and minor category of "Reactor".

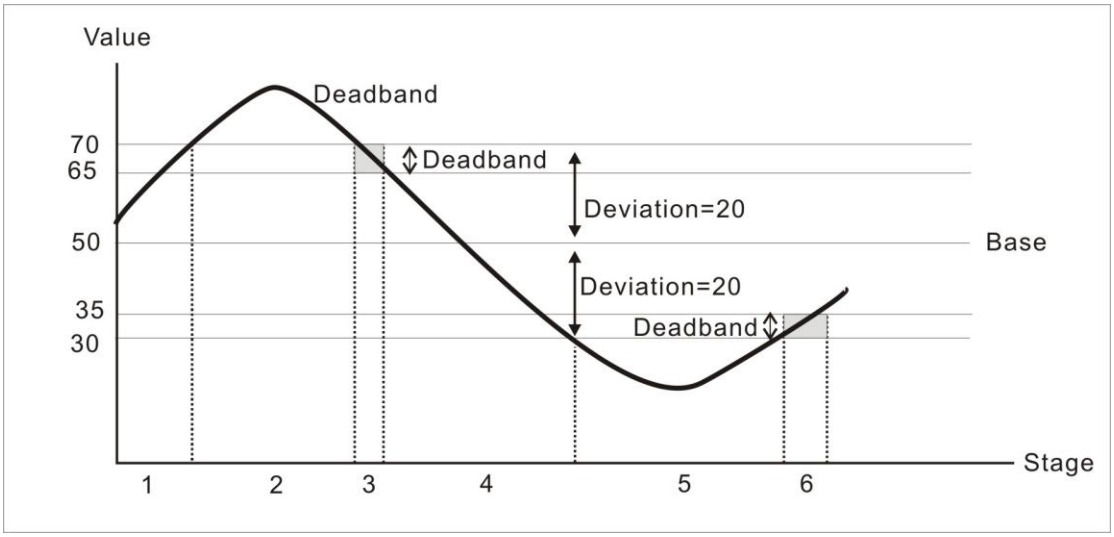
Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Deadband (optional field)

This parameter specifies a dead band range. Dead band is designed to avoid the annoyance of frequent alarm and reset of an analog alarm whose value is close to the alarm limit. As shown in the figure below, the shaded area within alarm limits are the dead bands.



Alarm status of the Tag with dead band: (Base=50, Deviation=20, Deadband=5)

Stage	Temperature Value	Alarm Status	Description
1	70 > Tag > 30	Normal	
2	Tag≧70	High Alarm	Exceed high limit
3	70 > Tag≧65	High Alarm	Below high limit but still within deadband
4	65 > Tag > 30	Normal (Reset)	Below high limit and dead band
5	Tag≦30	Low Alarm	Below low-low limit
6	35> Tag≧30	Low Alarm	Above low limit but still within deadband
7	70 > Tag > 30	Normal (Reset)	Above low limit and deadband

If a **Deadband** is set, the alarm will not reset although alarm tag value is within alarm limit but still inside the dead band. The alarm is reset only after the tag value is within alarm limit and also out of the dead band. Without this setting, if the tag value oscillating at the edge of the alarm limit will cause the alarm to occur and reset frequently.

Either a constant value or a Tag name can be set to this parameter. If a tag name is set, the value of that tag at run time will be used as the deadband value and thus can be changed by operators using a ***SmartPanel*** object.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to “1”, processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to “1”, system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to “1” after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to “0”, alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users’ Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

Deviation

Base (mandatory field)

The base value for Deviation alarm. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as high limit.

H Alarm Msg

This parameter specifies the message content of the high alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **High Alarm** is disabled.

Deviation (mandatory field)

The deviation value for Deviation alarm. This parameter can either be a constant value or a tag name. If a tag name is set, the value of that tag at run time is used as high limit.

L Alarm Msg

This parameter specifies the message content of the low alarm message. It is a string with length limit of 80 characters. If no message is defined (the field is left blank), **Low Alarm** is disabled.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some

languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

Press **Close** button to end alarm setting and close the dialog.

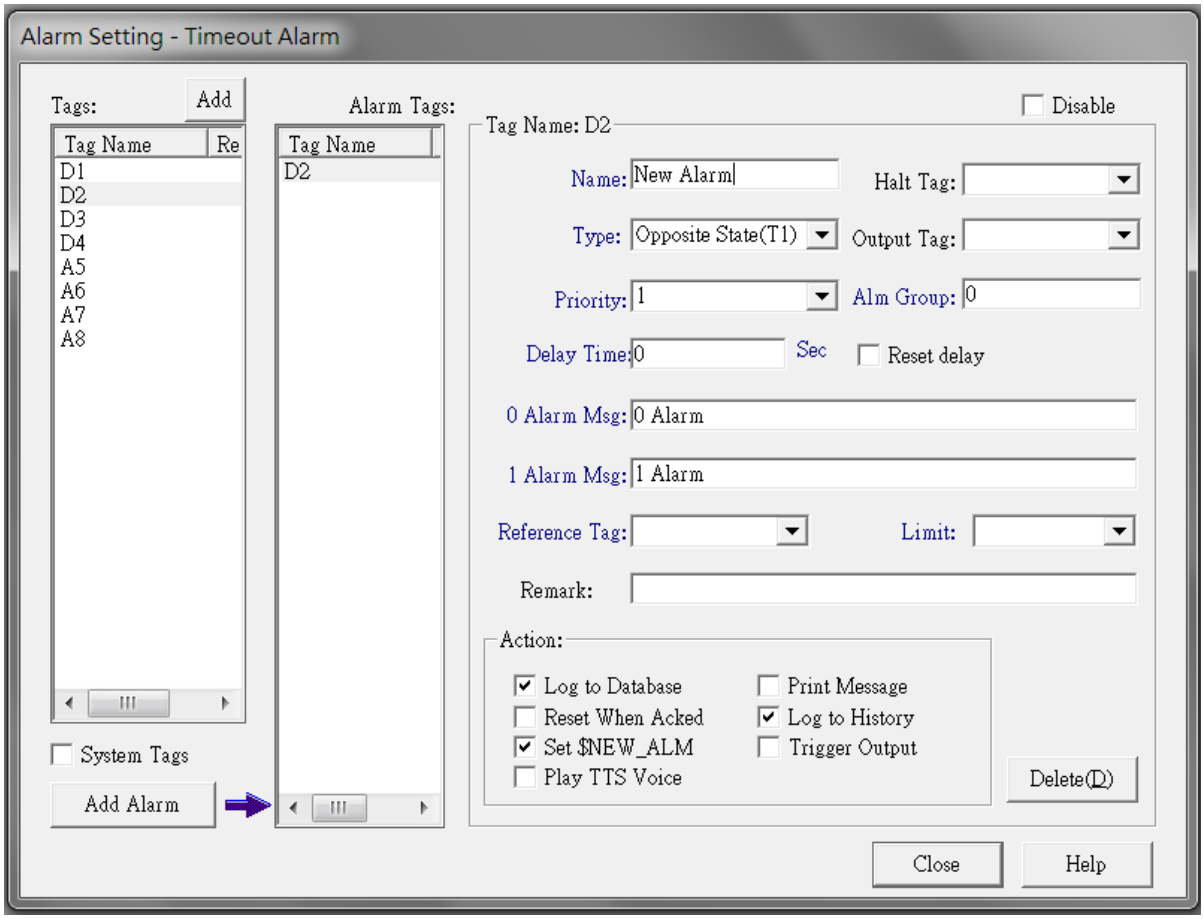
Help

Press **Help** button to open help document related to this topic.

Timeout Alarm Setting

Suitable for digital Tags. When the value of the alarm tag changed, it is compared with the value of a **Reference Tag**. If the value of the **Reference Tag** doesn't change with the alarm tag in a specified manner within a specified time limit, **Timeout Alarm** will occur. This alarm type is further divided into two sub types: **T0** and **T1**. **T0** alarm occurs if the **Reference Tag**'s value is still the same as the value of the alarm tag after timeout. T1 alarm occurs if the **Reference Tag**'s value is still different from the value of the alarm tag after timeout.

This alarm type is usually to determine whether a control output (the alarm tag) is completed successfully or not by checking it with a feedback input (the **Reference Tag**). Due to its nature, **Timeout Alarm** cannot reset by itself based on the change of alarm tag value. Therefore, please always check on the **Action** option of **Reset When Acked** and use user acknowledgement to rest this type of alarm.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Select a Tag in the Alarm Tags list and its alarm setting appears on the right half of the dialog.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Electrical System|Area A] Power panel VCB-1" and alarm message "operation failed" may display its alarm message as:

2006/01/01 12:00:00 [Electrical System|Area A] Power panel VCB-1 operation failed

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Electrical System" and minor category of "Area A".

Type (mandatory field)

This parameter specifies sub type of digital alarm:

- T0 — Alarm occurs when the value of the Reference Tag is still the same as the value of the alarm tag after timeout.
- T1— Alarm occurs when the value of the Reference Tag is still different from the

value of the alarm tag after timeout.

Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to “1”, processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to “1”, system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to “1” after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to “0”, alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a

number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users' Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

0 Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message when the alarm occurs and the value of alarm tag is "0". It is a string with length limit of 80 characters.

1 Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message when the alarm occurs and the value of alarm tag is "1". It is a string with length limit of 80 characters.

Reference Tag (mandatory field)

The Tag used to compare with the alarm tag to determine its alarm status.

Timeout (mandatory field)

The time limit within which the corresponding response of **Reference Tag** following the change of alarm tag is expected. If the Reference Tag doesn't change with the alarm tag after this amount of time, Timeout alarm occurs. This parameter is in unit of second.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.

Note: This **Action** should always be selected for **Timeout Alarm**.

- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

Trip Alarm Setting

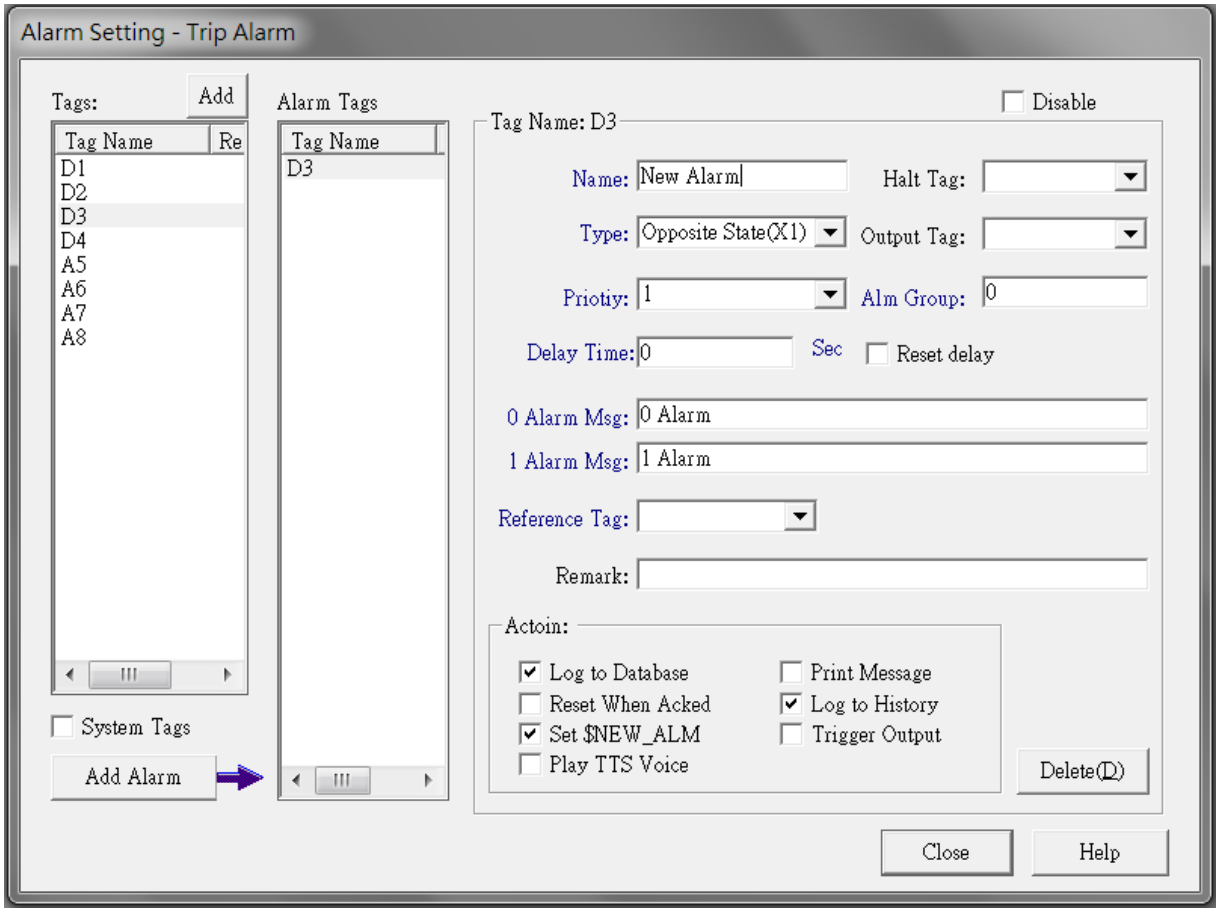
Suitable for digital Tags. When the value of the alarm Tag changed, the value of a Reference Tag is examine. It is expected that the change of the alarm tag is due the action of the Reference Tag. If there is no previous value change on the Reference Tag to induce the change of alarm tag, the alarm occurs.

This alarm type can be further divided into three sub types:

X0 – Alarm occurs if the value of the alarm tag is the same as the Reference Tag.

X1 - Alarm occurs if the value of the alarm tag is different from the Reference Tag.

XC – Alarm occurs if the value of the alarm tag changes but there is no change on the value of the Reference Tag.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show

system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Select a Tag in the Alarm Tags list and its alarm setting appears on the right half of the dialog.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Electrical System|Area A] Power panel VCB-1" and alarm message "Trip" may display its alarm message as:

2006/01/01 12:00:00 [Electrical System|Area A] Power panel VCB-1 Trip

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Electrical System" and minor category of "Area A".

Type (mandatory field)

This parameter specifies sub type of digital alarm:

- X0 – Alarm occurs if the value of the alarm tag is the same as the Reference Tag when alarm tag value changes.
- X1 - Alarm occurs if the value of the alarm tag is different from the Reference Tag when alarm tag value changes.
- XC – Alarm occurs if the value of the alarm tag changes but there is no change

on the value of the Reference Tag.

Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to “1”, processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to “1”, system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to “1” after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to “0”, alarm processing of this alarm tag can then be restored and the system will determine whether the alarm should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a

number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users' Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit of 80 characters.

0 Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message when the alarm occurs and the value of the alarm tag is "0". It is a string with length limit of 80 characters.

1 Alarm Msg (mandatory field)

This parameter specifies the message content of the alarm message when the alarm occurs and the value of the alarm tag is "1". It is a string with length limit of 80 characters.

Reference Tag (mandatory field)

The Tag used to compare with the alarm tag to determine its alarm status.

Remark (optional field)

A short description of the alarm tag. It's a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won't be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to "1" if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won't be recorded in the history file. **History File** checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.
- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in

alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

Press **Close** button to end alarm setting and close the dialog.

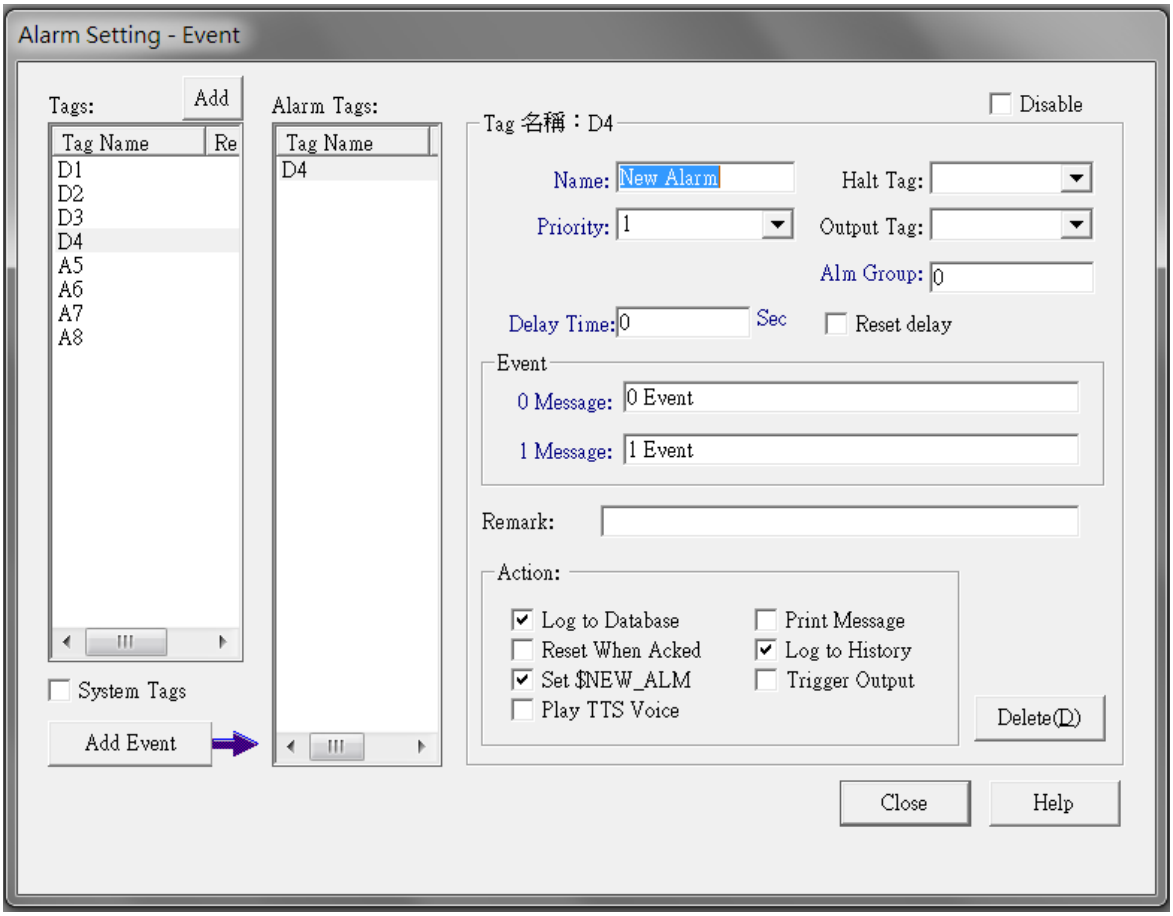
Help

Press **Help** button to open help document related to this topic.

Event Setting

Suitable for digital Tags. Any change on the value of the alarm tag is considered an event.

In general, this type is considered as an event instead of an alarm. Therefore, Log to History is usually the Action that is selected for this alarm type to log event records but not to induce the usually alarm processing. ***LogView,*** the Alarm Report add-on module, can be used to view and print the event records.



Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Select a Tag in the Alarm Tags list and its alarm setting appears on the right half of the dialog.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

A string enclosed in a pair of square brackets can appear in the beginning of **Name** and a "|" character can be used in the category string to separate main category and sub-category. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Electrical System|Area A] Power panel VCB-1" and alarm message "Trip" may display its alarm message as:

2006/01/01 12:00:00 [Electrical System|Area A] Power panel VCB-1 Trip

LogView will have two levels of categories for queries. User can search for alarm records with major categories of "Electrical System" and minor category of "Area A".

Tags: Add

Tags list shows all the Tags in Tag database. Click on the check box **System Tag** to show system Tags in the list if one of system Tags needs to be used as a digital alarm. You can also add a new Tag by pressing **Add** button on top of the Tags list.

Alarm Tags

Select a Tag and press **Add Alarm** button to add it as a digital alarm Tag. The Tag will appear in the **Alarm Tags** list.

Select a Tag in the Alarm Tags list and its alarm setting appears on the right half of the dialog.

Alarm Setting

Name (mandatory field)

This parameter defines the name of the alarm Tag when it appears in the alarm message. The limit on the length is 80 characters.

One or two string enclosed in a pair of square brackets can appear in the beginning of **Name**. The strings will be used by the add-on ***LogView*** alarm report module as categories for queries. For example, the message for an alarm Tags with **Name** "[Electrical System][Area A] Power panel VCB-1" and alarm message "turned on" may display its alarm message as:

2006/01/01 12:00:00 [Electrical System][Area A] Power panel VCB-1 turned on

LogView will have two levels of categories for queries. User can search for event records with major categories of "Electrical System" and minor category of "Area A".

Priority (mandatory field)

When more than one alarm occurs at the same time, **Priority** is used to determine which alarm will be handled first. **Priority** should be between 1~255 with the higher value representing higher priority.

A system tag **$ALM_PRI** is used to show the highest Priority value in all active unacknowledged alarms.

Halt Tag (optional field)

This parameter specifies a tag name. If the tag is set to "1", processing of the alarm tag will be halted. Neither the occurrence nor the reset of alarm will be detected. If this setting is omitted, the alarm tag is always effective.

The tag name set in this field cannot be identical to the Tag name in **Output Tag** field.

When the value of the **Halt Tag** is set to "1", system will suspend all alarm functions of the alarm Tag including alarming, acknowledgement and reset. Therefore, if the **Halt Tag** is set to "1" after the occurrence of an alarm, the alarm will remain even when its alarm condition is cleared. Only after the **Halt Tag** is set to "0", alarm processing of this alarm tag can then be restored and the system will determine whether the alarm

should be reset or not.

Output Tag (optional field)

This parameter specifies a tag name. If the alarm occurs, the value of **Output Tag** will be set to “1”. When the alarm is acknowledged or reset, its value will be set to “0”. If this setting is omitted, no alarm output action will be performed.

The tag name set in this field cannot be identical to the Tag name in **Halt Tag** field.

Setting of this parameter is effective only when **Trigger Output** is also set in alarm **Action**.

Alm Group (mandatory field)

This parameter specifies the Alarm Group the alarm tag belongs to. Alarm Group is a number between 0~65535 and will be used by Alarm WAV Player object to determine which wave file should be played. Please refer to ***SmartPanel*** Users’ Manual for detail on the object.

Delay Time (optional field)

This parameter specify the time in seconds an alarm Tag reach its alarm condition before the system recognize its alarm status and activate the subsequent alarm actions. Delay Time is a number between 0~65535.

If **Reset Delay** option of the alarm tag is also checked, delay of the same time will also be applied to alarm reset. When the alarm condition is cleared, the same amount of time will also be waited before the system reset the alarm.

Reset Delay (optional field)

This parameter specifies whether the **Delay Time** setting will be applied to alarm reset. If checked, alarm will not be reset until the specified delay time elapsed after alarm condition is cleared. If this option is not checked, an alarm will be reset as soon as its alarm condition is cleared.

Reset Msg (mandatory field)

This parameter specifies the content of the reset message. It is a string with length limit

of 80 characters.

0 Message (mandatory field)

This parameter specifies the message content of the event message when the value of the alarm tag changes from “1” to “0”. It is a string with length limit of 80 characters.

1 Message (mandatory field)

This parameter specifies the message content of the event message when the value of the alarm tag changes from “0” to “1”. It is a string with length limit of 80 characters.

Remark (optional field)

A short description of the alarm tag. It’s a string used for descriptive purpose only.

Action (optional field)

These are options specifying what actions will be taken when the alarm occurs. Some Actions may need the accompany setting of other fields.

- **Log to Database**: Messages of the alarm will be logged to **Active Alarm Database** and **Alarm History Database**. If this Action is not selected, message of this alarm won’t be shown in **Alarm Bar** and **Alarm Log** objects in ***SmartPanel***. However **Annunciator** and **Group Annunciator** objects will still reflect the alarm status of this alarm.
- **Reset When Acked**: Acknowledging this alarm will also reset it.
- **Set $NEW_ALM**: Set the value of system tag **$NEW_ALM** to “1” if this alarm occurs.
- **Print Message**: Print messages (including alarm, acknowledge and reset messages) immediately when alarm condition of this alarm changed. A valid printer port must be selected in **Alarm Basic Setting** for the option to be effective. Be sure to install appropriate printer driver also.
- **Log to History**: Log messages (including alarm, acknowledge and reset messages) of this alarm to the **Alarm History File**. If this option is not selected, messages of this alarm won’t be recorded in the history file. **History File**

checkbox must be selected in **Alarm Basic Setting** for this parameter to have effect.

Note: This is usually the only **Action** option selected for an event.

- **Trigger Output**: Set the value of **Output Tag** to "1" when the alarm occurs. This setting is effective only when an **Output Tag** name is also specified.
- Play TTS Voice: When the alarm occurs, read the alarm message using TTS (Text to Speech). Operating system must support TTS of the language used in alarm messages for this setting to be effective.

Note: TTS needs the support of Windows Speech API (SAPI). Windows XP support SAPI but Windows 2000. Besides, Windows XP only support TTS in some languages.

Delete(D)

Press Delete(D) button to delete an alarm tag from Alarm Tags list and remove its alarm settings.

☐ Disable

If the checkbox is checked, the alarm setting of this alarm tag is disabled and no alarm processing is performed on the tag at runtime. The disabled alarm tag will also appear in gray color in the Alarm Tags list.

Close

Press **Close** button to end alarm setting and close the dialog.

Help

Press **Help** button to open help document related to this topic.

Alarm Related System Tags

Some of the system tags are used to provide key information of the whole alarm system. The system tags related to alarm includes:

$ALARM

Its value is the number of active alarms. The number includes those alarms that are acknowledged but not reset. Its message is the alarm message of the unacknowledged alarm with the highest priority in the system. Its value is “0” if all alarms reset.

$ALM_PRI

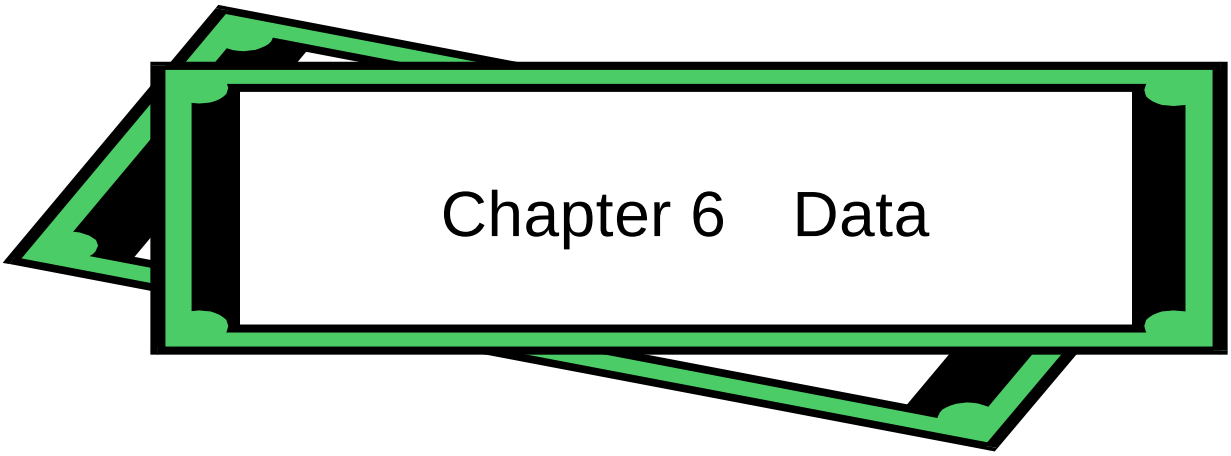
$ALM_PRI 的數 Its value is the priority of the active and unacknowledged alarm tag with the highest priority value. If all alarm tags are reset or acknowledged, its value will be “0”.

When an **Alarm Wav Player** object is used to play a sound file when alarm occurs, **$ ALM_PRI** is recommended to be used as the **Control** tag of this object. The sound file will be played when there are still some unacknowledged alarms. The sound will stop playing when all active alarms are acknowledged or reset.

$NEW_ALM

Its value is set to “1” whenever a new alarm occurs. Users can set this tag to “0” using ***SmartPanel*** objects or any other means, but it will be set to “1” again if another new alarm occurs. Whether an alarm will trigger the setting of **$NEW_ALM** depends on its **Action** setting. **Set $NEW_ALM** must be selected in an alarm’s **Action** setting for it to set this tag to “1”.

When an **Alarm Wav Player** object is used to play a sound file when a new alarm occurs, **$NEW_ALM** is recommended to be used as the **Control** tag of this object. The sound file will be played when a new alarm occurs and can be turned off by an operator by setting this tag back to “0”.



Chapter 6 Data

Introduction

Data module is used to record data at specific intervals in a Lab-LINK system. Tags can be grouped into Data Groups and stored at different intervals to different data files. Up to 64 Data Groups can be created and there is no limit on the number of Tags that can be stored in a Data group. Data can either be stored in Lab-LINK format (XXF) and presented using a trend object or Lab-LINK report or saved as standard text files (TXT) and used by other application such as spreadsheets or data base.

Data module receives real time tag data from Tag Manager, perform aggregation and calculation at specified intervals and save the data to files with format specified.

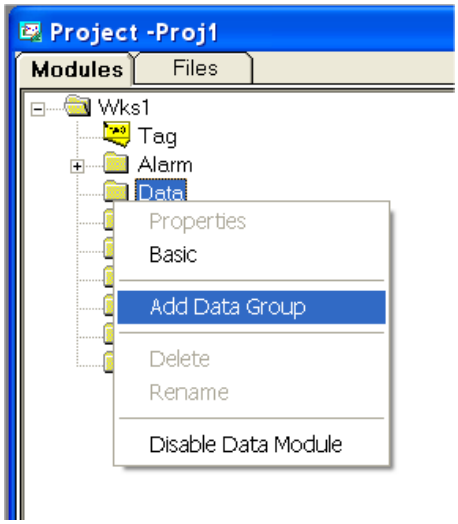
Features

- ❒ Both I/O tag and non I/O tag data can be stored.
- ❒ User defined data storage intervals.
- ❒ Tags can be stored using different intervals and save to different files.
- ❒ Change data file on a daily basis.
- ❒ Data can be set to expire after a month, a year or never. Expired data files are automatically overwritten to save storage space.
- ❒ Daily data are automatically combined to generated monthly data file.
- ❒ Monthly data are automatically combined to generated yearly data file.
- ❒ Various aggregations can be used to process data before storing them.
- ❒ Linear conversion can be performed on aggregated data before saving them to files.
- ❒ Aggregated and calculated data can redirect to other tags.
- ❒ Stored data can be used by SmartPanel trend object and Lab-LINK report.

Expand and Collapse Data Node

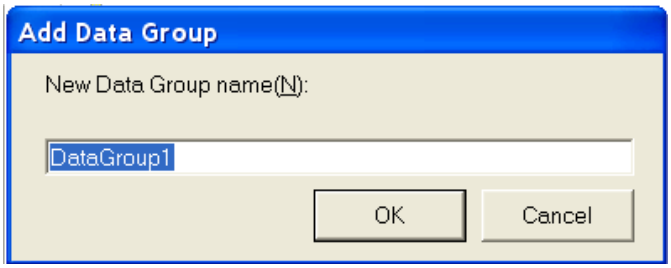
Click on ⊞ next to Data node in Project window to expand it and shows all the Data Groups in this module. To collapse the node, click on ⊟ next to Data node after it is expanded.

Add Data Group



Add a new Data Group

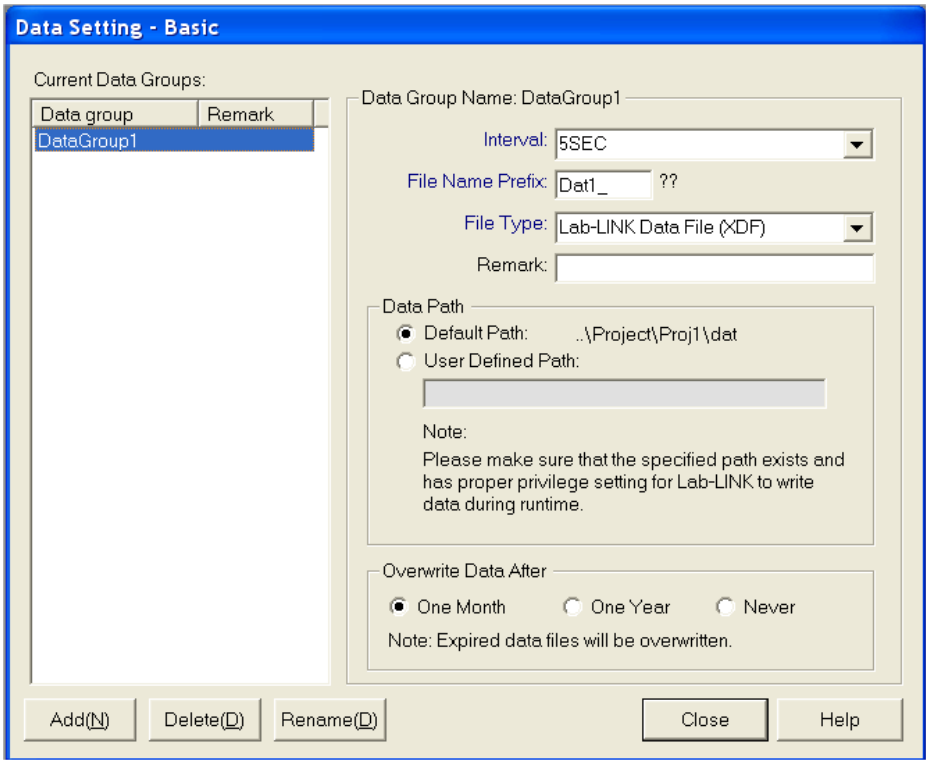
Right click on **Data** node and select **Add Data Group** from the popup menu, a dialog appears to request for a **Data Group** name. Enter a name and press **OK** button. A "**Data – Basic Setting**" dialog appears. After the basic setting is finished, the newly created **Data Group** will appear under the **Data** node in the **Project** window. New **Data Group** can also be added by pressing the **Add** button in the "**Data – Basic Setting**" dialog.



Enter Data Group name

Basic Setting

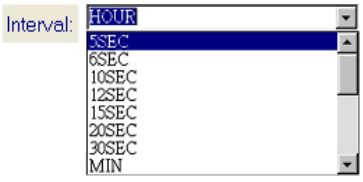
Right click on the **Data** node and select **Basic** from the popup menu to open the "**Data – Basic Setting**" dialog. Left side of the dialog is the **Data Groups** list that shows all existing **Data Groups**. Select a **Data Group** from the list, and the basic setting for that group appears on the right side of the dialog. Basic setting of a **Data Group** includes:



Data Group Basic Setting

Interval

Select the time between two data savings. Possible intervals are shown in the table below:



Interval	Description	Time when data are saved
5sec	1 data per 5 seconds	At second 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 of each minute

6sec	1 data per 6 seconds	At second 0, 6, 12, 18, 24, 30, 36, 42, 48, 54 of each minute
10sec	1 data per 10 seconds	At second 0, 10, 20, 30, 40, 50 of each minute
12sec	1 data per 12 seconds	At second 0, 12, 24, 36, 48 of each minute
15sec	1 data per 15 seconds	At second 0,15, 30, 45 of each minute
20sec	1 data per 20 seconds	At second 0, 20, 40 of each minute
30sec	1 data per 30 seconds	At second 0, 30 of each minute
min	1 data per minute	At second 0 of each minute
2min	1 data per 2 minute	At second 0 of minute 0, 2, 4, 6,…58 of each hour
3min	1 data per 3 minute	At second 0 of minute 0, 3, 6, 9,…57 of each hour
4min	1 data per 4 minute	At second 0 of minute 0, 4, 8, 12…56 of each hour
5min	1 data per 5 minute	At second 0 of minute 0, 5, 10, 15…55 of each hour
6min	1 data per 6 minute	At second 0 of minute 0, 6, 12, 18…54 of each hour
10min	1 data per 10 minute	At second 0 of minute 0, 10, 20, 30, 40, 50 of each hour
12min	1 data per 12 minute	At second 0 of minute 0, 12, 24, 36, 48 of each hour
15min	1 data per 15minute	At second 0 of minute 0, 15, 30, 45 of each hour
20min	1 data per 20 minute	At second 0 of minute 0, 20, 40 of each hour
30min	1 data per 30 minute	At second 0 of minute 0, 30 of each hour
hour	1 data per hour	At second 0 of minute 0 of each hour

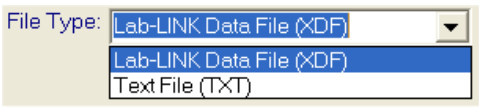
File Name Prefix

Specify the prefix of the data file names created by the Data Group. The prefix has a length limit of 6 characters.

The actual file name used by the Data Group with combine the Prefix with the date (indicated as “??” next to the prefix in the dialog) when data is stored. For example, if the Prefix is “Dat1_”, the data file name on the first day of each month will be”Dat1_01”.

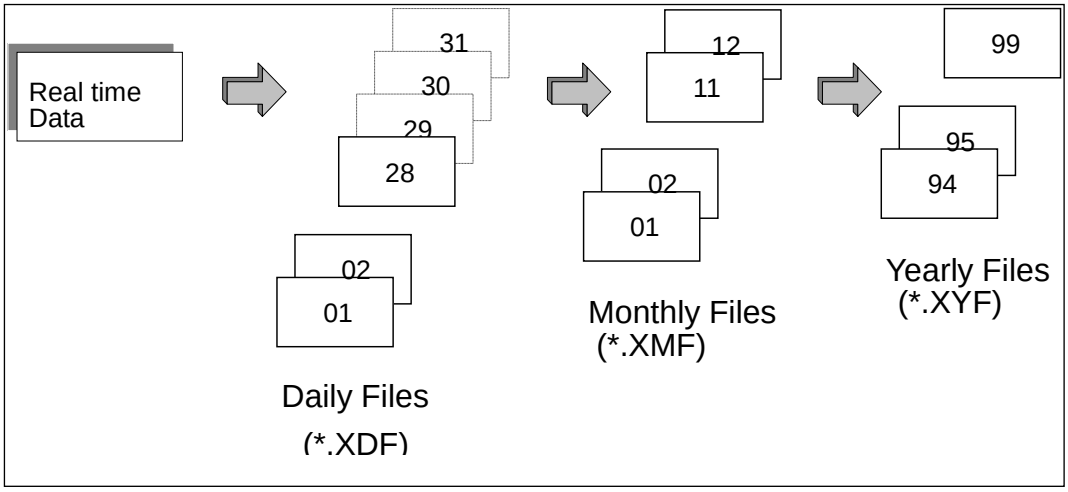
File Type (Data File Format)

Two File Types are supported by Data module of Lab-LINK:



❒ Lab-LINK Data File (XDF): Store data in Lab-LINK proprietary data file format. This is the file type used by ***SmartPanel*** Data Trend object and Lab-LINK Report. Be sure to select this type if you are using them.

XDF is the daily Lab-LINK data file holding the data of one day. Data module can generating monthly data files automatically by aggregating the data in a daily file into a record in the monthly file. In the same manner, data in a monthly file can be aggregated automatically as a record and stored into a yearly file. Monthly file names will combine the same prefix with the month it is created and with the extension name of XMF (ex. Dat1_01.XMF). Similarly, yearly files are named with the prefix combining with the last two digit of the year but with extension name of XYF (Ex. Dat1_06.XYF).



❒ Text File (TXT): Store data in standard text file with data separated by comma in each data line. It is easy for a database or spreadsheet application to import this file format. The TXT data files are also daily files. Their file names are similar to the Lab-LINK data files but use extension name TXT.

Note: Text files do not provide the monthly and yearly file generation function.

Each line in the Text File (TXT) is a data record. Its format is as follows:

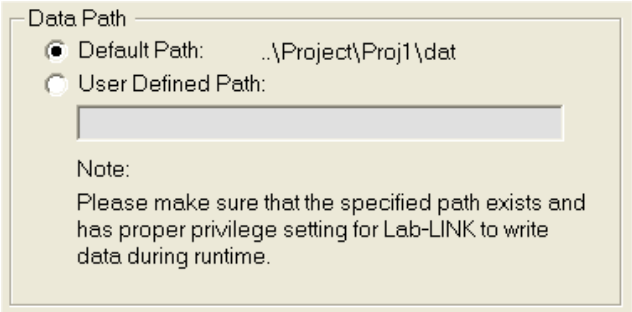
Data Date, Data Time, Data Value 1, Data Value 2, Data Value 3, …… , Data Value N

Ex:

01/01/2004,16:25:45,	3.689861,	8.609298,	13.516841,	18.456700
01/01/2004,16:25:50,	4.923448,	9.852841,	14.746981,	19.665003
01/01/2004,16:25:55,	4.592776,	9.781235,	14.925730,	19.978451
01/01/2004,16:26:00,	3.311509,	8.777505,	14.236629,	19.483108

The format of date is in “Month/Day/Year” and the format of time is in “Hour:Minute:Second”. Twenty four hour system is used in the time notation.

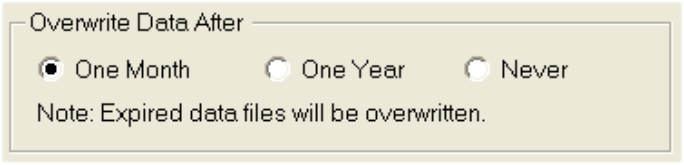
Data File Path



Use Default Path: Select this option to store data under the default data folder “dat” under the project folder.

User Defined Path: Specify a user defined path to store the data. Please make sure that the specified path exists and has proper privilege setting for Lab-LINK to write data during runtime.

Data File Expire after

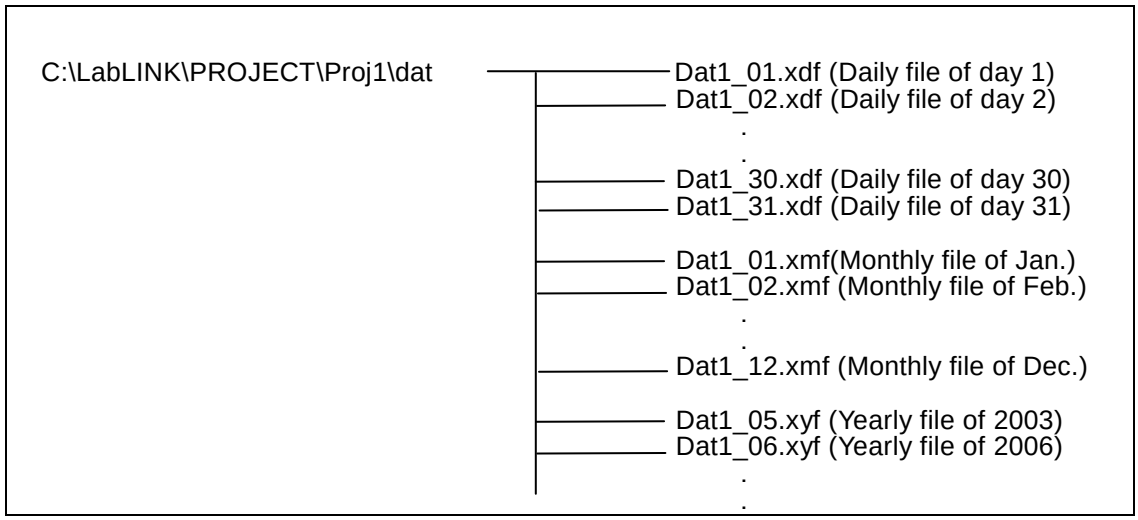


Data are stored in daily files. In other word, a data file can contain data of one day and a new file is used every day. Since data files are named using Prefix and the day of month it is created, it is obvious that these file name will repeat very month and the new files may overwrite the old ones every month. **Lab-LINK** use subfolder to separate data file with the same name to preserve and control the expiration old data files.

There are three expiration period selections for data files:

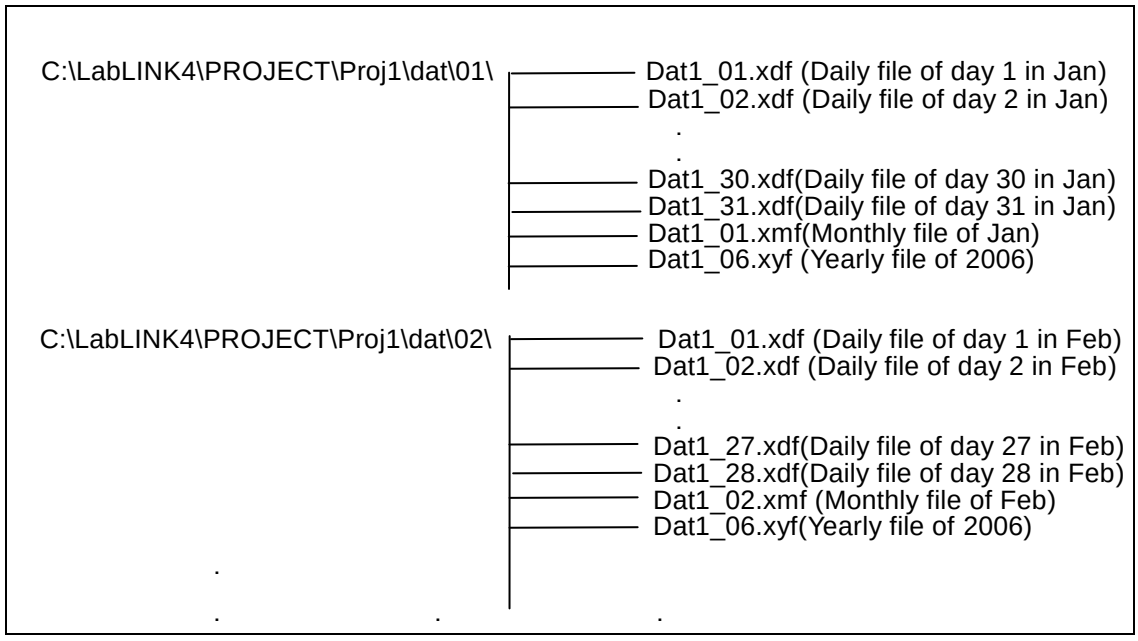
A Month

If **A Month** is selected, all data files in the **Data Group** are stored directory under the folder specified in **Data File Path**. Data files are created every day in the folder and new file overwrite the old ones ever month.



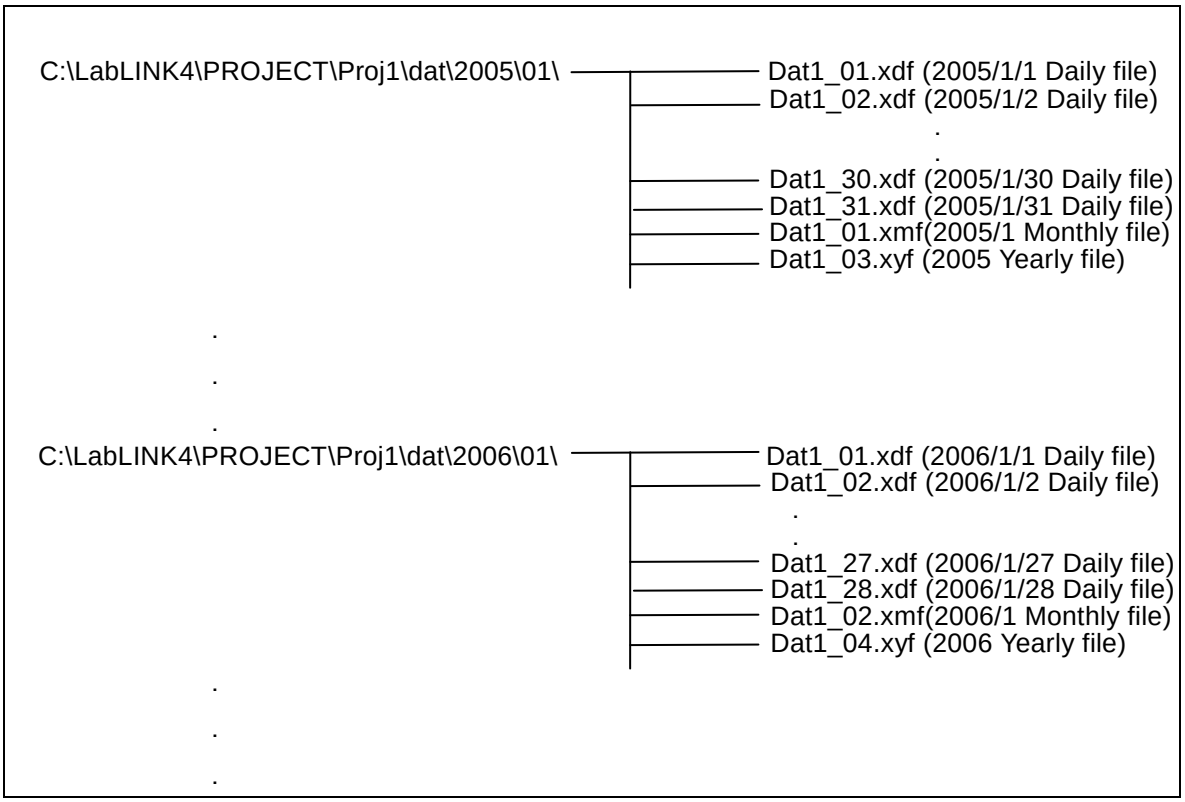
A Year

If **A Month** is selected, Month folders (01, 02…, 12) are created under the folder specified in **Data File Path**. Data files in the **Data Group** are then stored in the month folder according to the month they are created. New files will overwrite the old ones that are created on the same month in the previous year.



Never

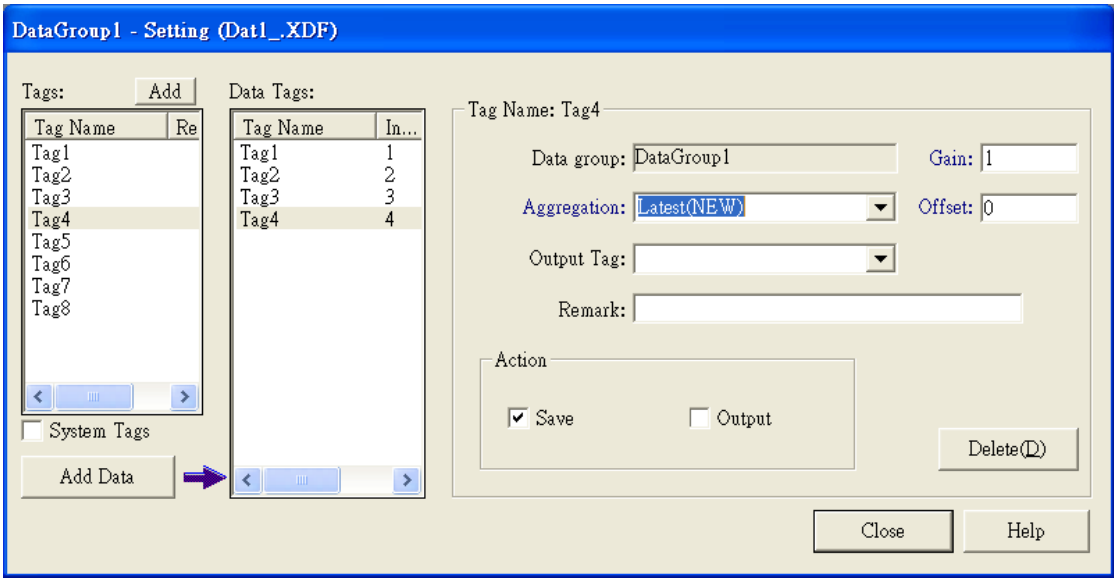
If **Never** is selected, Yearly folder (Ex. 2006, 2007,…) are created under the folder specified in **Data File Path,** and month folder (01, 02…, 12) are created in each yearly folder. Data files in the **Data Group** are then stored in the month folder according to the month they are created. New files will never overwrite any of the old ones because they reside in different folder.



Data Group Setting

Right click on a **Data Group** and select **Properties** from its popup menu to open its dialog. Left side of the dialog is Tags list showing all the tags in the workstation. A second **Data Tags** list next to the **Tags** list shows the tags that are already added into this **Data Group**. Select any of the tag in the **Data Tags** list, its setting is shown on the right side of the dialog.

Note: A tag can be added into more than once in one or more Data groups to save the same tag at different intervals using different aggregation methods. For examples, you may save the maximum and minimum value of a tag every minute but save its average every 5 minutes,



Data Tag Setting

To add a tag into the **Data Group**, select its tag name from the **Tags** list and press **Add** button. The tag will be added into **Data Tags** list and an index is assigned to it. The index will be used by Data Trend object to locate data from **Lab-LINK** data files. Please refer to "***SmartPanel*** User's Manual" for details.

To delete a data tag, select it from the **Data Tags** list and press **Delete** button,

Setting for data tags are discussed as follows:

TAG

Name of the tag that is being configured as a data tag.

Data Group

Name of the Data Group that the data tag belongs to.

Aggregation

Since more than one tag value may be acquired during the specified data saving interval, an Aggregation method must be selected to determine how the tag values should be processed and stored. Selections include:

❒ Latest (NEW) — Save the newest tag value within this saving interval.

- ❒ Oldest (OLD) — Save the oldest tag value within this saving interval.
- ❒ Minimum (MIN) — Save the minimum tag value within this saving interval.
- ❒ Maximum (MAX) — Save the maximum tag value within this saving interval.
- ❒ Average (AVG) — Save the average tag value within this saving interval.
- ❒ Difference (DLT) — Save the difference between the last tag value within this saving interval and the last tag value in the previous saving interval.
- ❒ Integral (INT) — Save the integration of the tag values within this saving interval. The values are integrated against time with time unit of hours.
- ❒ Count for rising edge (CT1) — Save the number of times the tag changes from “0” to “1” within this saving interval.
- ❒ Count for falling edge (CT0) — Save the number of times the tag changes from “1” to “0” within this saving interval.

Note: CT1 and CT0 are used for digital tags and all other types are used for analog tags.

The Aggregation method will also be applied to the aggregation when daily data are combined into a record in the monthly files and when monthly data are combined into a record in the yearly files as well/

Output Tag

This parameter specifies a tag name. Its value will be set as the aggregation and calculation result of the Data tag at **Data Group** intervals. This setting is effective only when **Send to Output** is also selected in the **Action** option of this data tag.

Gain and Offset

These parameters are used for linear conversion on the aggregation result. The aggregation result of the **Data** tag will be multiplied by **Gain** and **added** with Offset before stored to data files or set to **Output Tag**. Possible application of these parameters may be unit or percentage conversion. You can ignore the setting by leaving these parameters to its default of 1 and 0. In that case, no conversion will be performed.

Remark

A short text string can be entered here for the description on the **Data** tag. It is recommended to

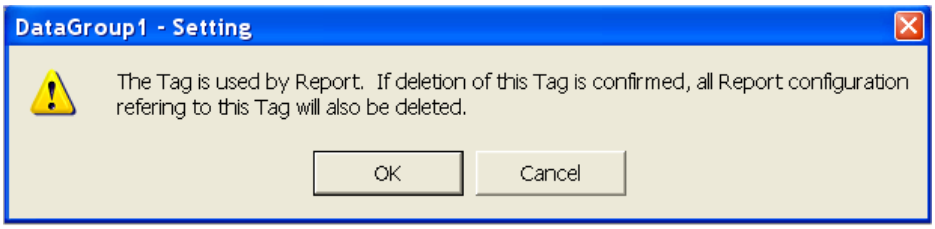
add description on Data tag for distinction especially when a tag is added to the **Data Tags** list more than once using different aggregation.

Action

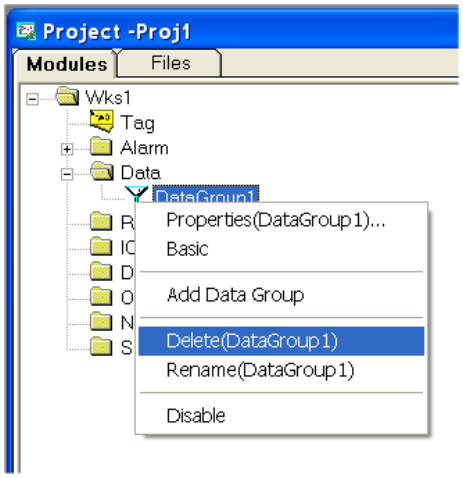
- **Save to Files**: Store the aggregation and conversion result to the data file of the Data group.
- **Sent to Output**: Set the aggregation and conversion result to the value of the tag specified by Output Tag. If no Output Tag is set, this setting will be ignored.

Delete

Select a tag name from the **Data Tags** list and press **Delete** button to remove it from the **Data Group**. If the data tag is already used by a **Report** as its data source, a warning message box will appear to indicate its usage. Press **OK** button to confirm the deletion and all report setting related to this data tag will also be deleted. Press **Cancel** button to cancel the operation.

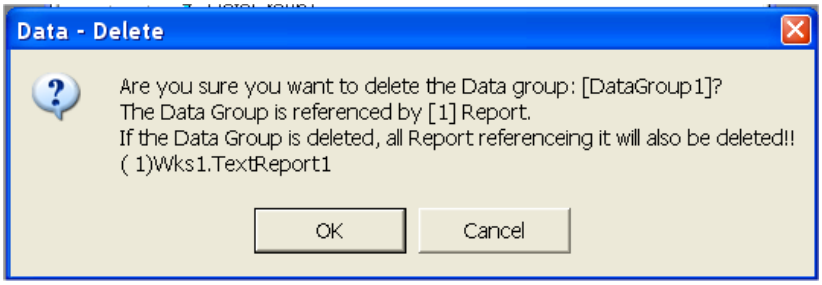


Delete a Data Group



Delete a Data Group

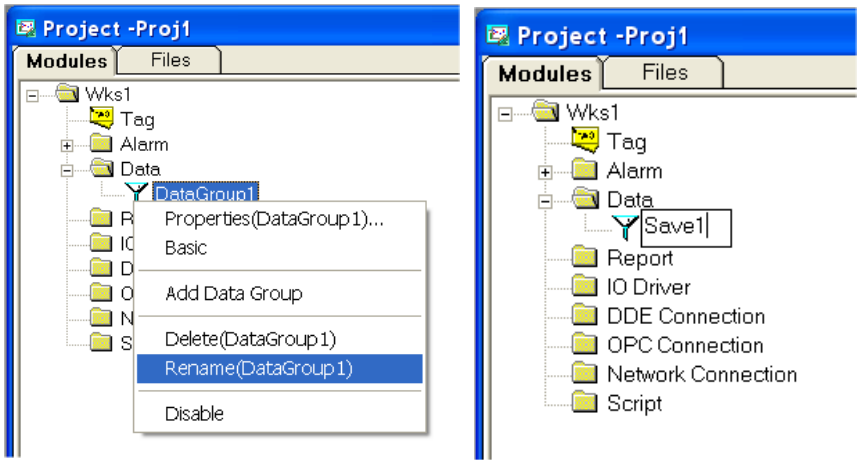
Right on a **Data Group** and select **Delete** from its popup menu to delete it. A message box will appear to ask for confirmation. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation. If the **Data Group** has been used by any **Report** as its data source, the report uses this **Data Group** will also be deleted.



Confirm the deletion of a Data group

Rename a Data Group

Right on a **Data Group** and select **Rename** from its popup menu. You can then rename the Data Group by editing its name directly. Press <Enter> key on your keyboard to finish editing. If the **Data Group** has been used by any **Report** as its data source, the data source setting in the report will be modified to reference the new **Data Group** name.

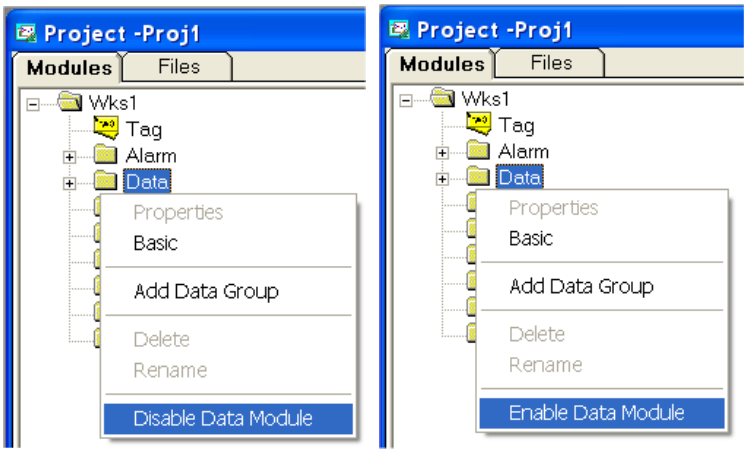


Rename a Data Group

Disable

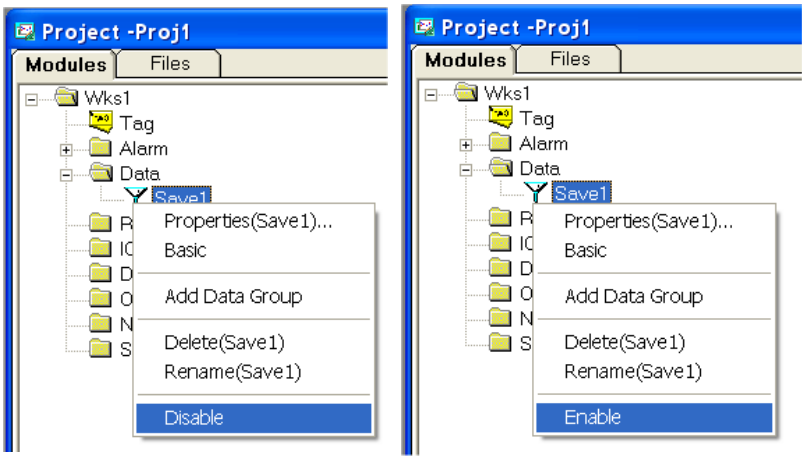
Disable the Data Module

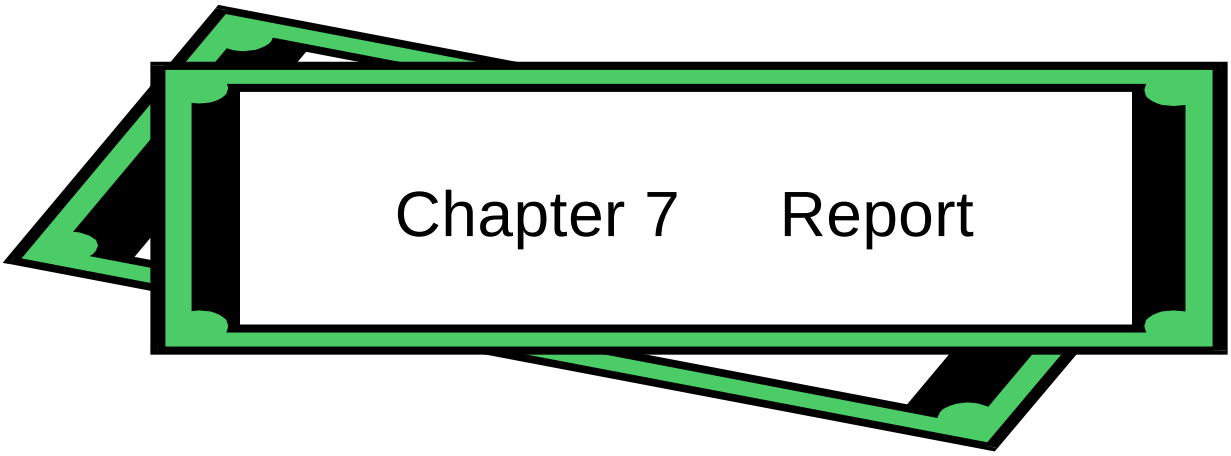
Right click on the **Data** node and select **Disable Data Module** from its popup menu to disable all data storage function of the workstation. No data in any **Data Group** will be stored for the workstation if the whole **Data** module is disabled..



Disable a Data Group

Right click on a **Data Group** and select **Disable Data Group** from its popup menu to disable it. Only the disabled **Data Group** will stop data storing during runtime and other Data Groups are not affected.


Project -Proj1
Modules
Files
Wks1
Tag
Alarm
Data
Save1
Properties(Save1)...
Basic
Add Data Group
Delete(Save1)
Rename(Save1)
Disable
Project -Proj1
Modules
Files
Wks1
Tag
Alarm
Data
Save1
Properties(Save1)...
Basic
Add Data Group
Delete(Save1)
Rename(Save1)
Enable



Chapter 7 Report

Introduction

Report module provides report function for Lab-LINK. It read data files generated by Data module and present the data as text or trend reports to users.

Lab-LINK project developer can configure reports easily in SmartPAM by specifying report type, data source and other setting. User can then use the reports to display and print out historical data at runtime.

Unlike other modules, Report doesn't receive real time data from Tag Manager. Instead, it reads historical data from Lab-LINK data files generated by Data module and creates text or trend report to display these data to users.

Features

- Can define up to 64 text or trend reports.
- User can specify report type and data time range at run time.
- Table column content or trend curve can be easily configured.
- Historical data can be aggregated using different time intervals before generating the reports.
- Users can preview or pint the reports.
- Daily, monthly or yearly statistics can be shown for Daily, Monthly or Yearly Reports respectively.

Report Types

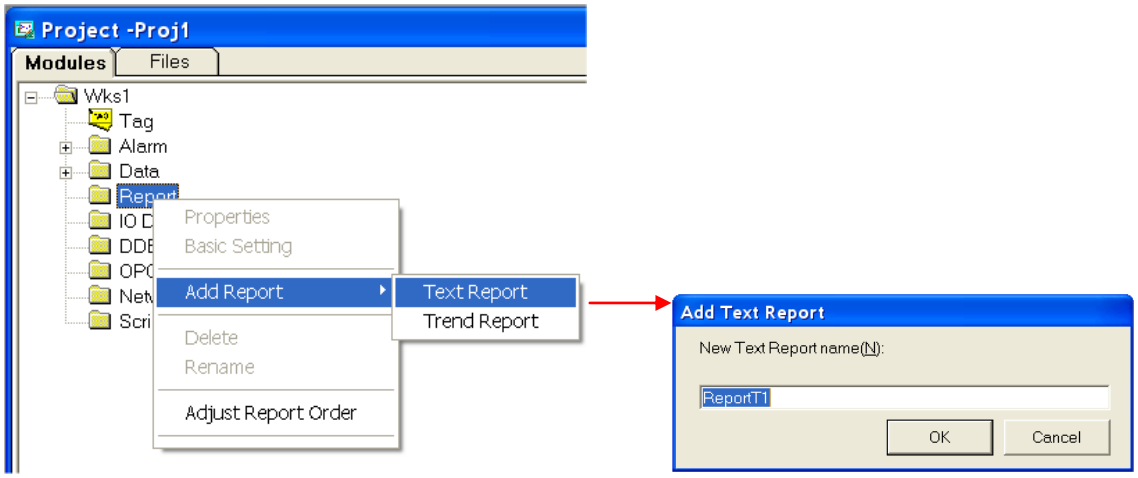
In term of time range displayed by reports, there are three types or reports:

- Daily Report
- Monthly Report
- Yearly Report

Reports can also be classified into two types based on the format it present data:

- Text Report: Present data in a table to shows values of multiple tags in columns. It also provide statistic summary for each column.
- Trend Report: Present data using a trend char to display data as curve to show how they change with time.

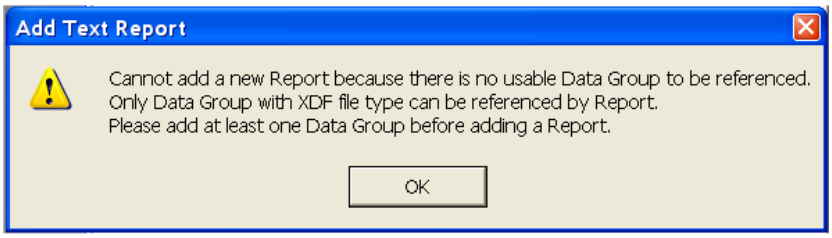
Add a Text Report



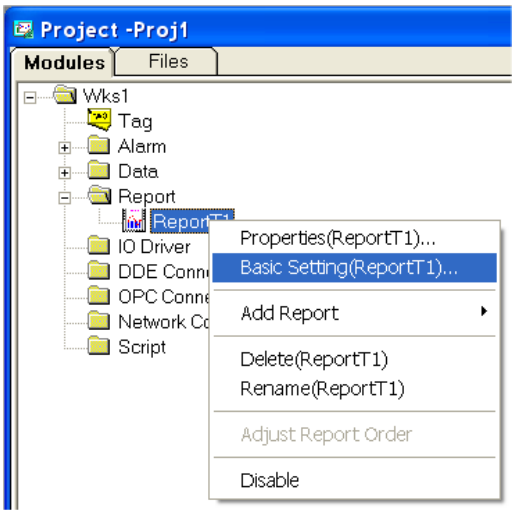
Add a Text Report

Right click on the **Report** node in the **Project** windows and select **Add/Text Report** to add a new **Text Report**. A dialog appears to request for a report name. Enter a name and press **OK** button to show Basic Setting dialog. Finishing the basic setting and a new text report is created.

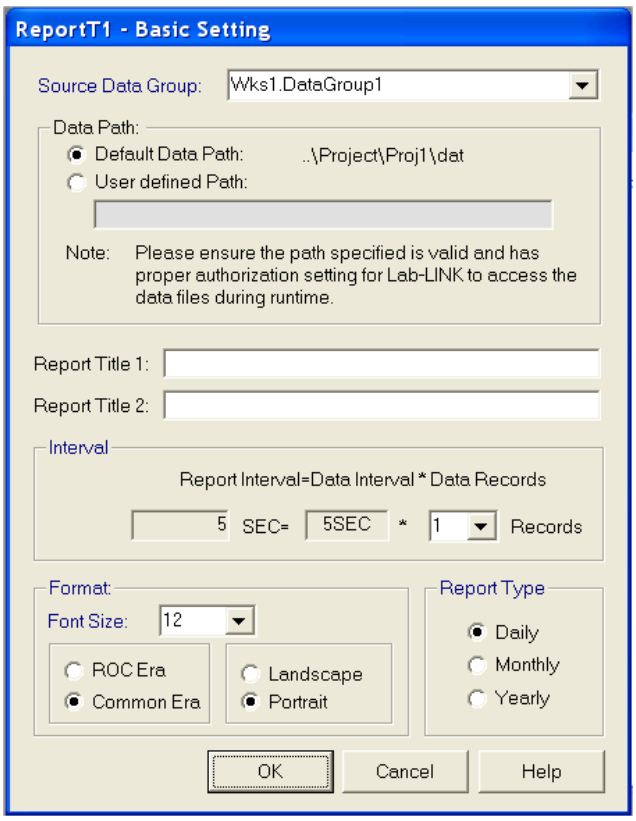
If no **Data Group** has been created for any workstation in the project, a message box will appear to warn that a **Report** cannot be generated since there is no available **Data Group**. Please finish the configuration for **Data** module first before attempting to add a report.



Basic Setting of Text Report



Right Click on a **Text Report** and select **Basic Setting** from its popup menu to show its **Basic Setting** dialog. Basic setting includes:



Basic Setting of a Text Report

Source Data Group

Select a **Data Group** from any workstation in the project to be used as the data source of the **Report**. Only **Data Groups** whose **File Type** settings are **Lab-LINK Data Files (XDF)** are shown in the drop down list. In other words, only Lab-LINK proprietary XDF format data files can be used to generate reports.

In a networked SCADA application, it is possible to have a workstation generating its reports using data files generated by another workstation. As can be seen in **Source Data Group** drop down list, data groups of all the workstations are shown and denoted in the form [Workstation.DataGroup] to indicate which workstation does the **Data Group** belongs to.

Ex. Wks1.DATA

Wks1 is the workstation name and DATA is the data group name.

Data Path

Path of the data files. Please set the path based on the setting in source Data Group.

Note: If the data files are generated by a remote workstation, the path defined here should be defined from the view of the workstation running the report at runtime. The path is usually a network path on the source workstation.

Default Data Path:

Use the path defined in the **Source Data Group**'s **Basic Setting**. If the source **Data Group** is from the local workstation (the workstation running the report), this is usually the case.

User Defined Path:
Use the path specified below as data file path. If a source **Data Group** from a remote workstation is used (it is not the workstation running the report), it is highly possible this option should be used. Since the default data path is set from the point of view of the workstation storing data instead of the workstation running the report, the report workstation might not be able to locate the data files according to default path.

Report Title1, Report Title 2

Define the two lines of texts to be shown above the report. The titles have the length limit of 80 characters.

Interval

Specify how many consecutive records in the data file will be combined as a data record in the report. Since data are usually recorded in a shorter interval (Ex. 1 minute) but report usually only needs a longer interval (Ex. 1 Hour), report module will combined the multiple records in the data file using the aggregation method specified (discussed in later section) into a record on the report. This can reduce the amount of data and make the report more readable for the users. This setting can be expressed as:

Report Interval=Data Interval * Data Records

Report Interval: The time between two consecutive data on the report. It is a multiple of the Data Interval.

Data Interval: The time between two consecutive data records in the data files. This is the same interval of the source **Data Group** on the report uses. This value is automatically given based on the setting in source **Data Group**. It can only be changed if the setting in **Data Group** is changed.

Data Records: Number of consecutive data records in data file that will be aggregated into a data in the report.

Format

These settings define the format of the report when it is printed:

- Font Size: The font size of the data in the **Report**.
- ROC Era: Use Taiwan year system in date display.
- Common Era: Use the standard year system in data display.
- Landscape: Set the paper orientation of the report printout to Landscape.
- Portrait: Set the paper orientation of the report printout to Portrait.

Report Type

Based on the time range of data, reports can be classified into three types:

- Daily Report: Contains data of one day, the time between data is specified by **Report Interval**.
- Monthly Report: Contains data of one month. Each data represent the aggregation of one day.
- Yearly Report: Contains data of one month. Each data represent the aggregation of one day.

Please refer to Data module chapter for details on how monthly or yearly data are aggregated.

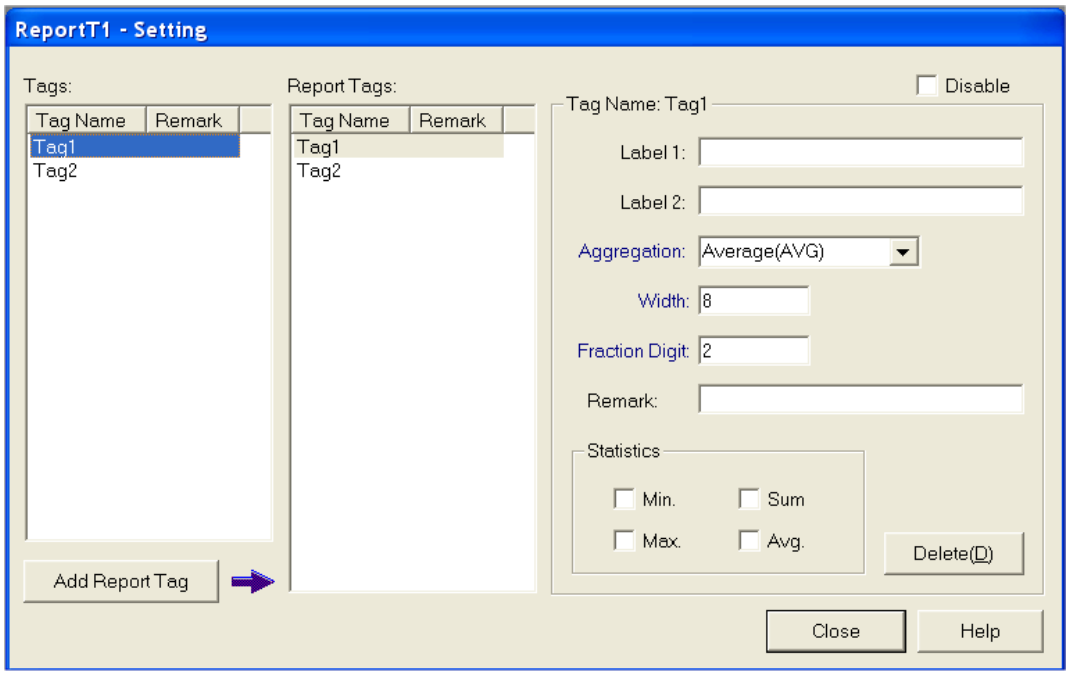
Text Report Setting

Right click on a **Report** and select **Properties** from its popup menu to open the Setting dialog. Left of the dialog is **Tags** list that shows all available tags in the source **Data Group** the Report references. These are the tags can be used in the report. Next to **Tags** list is the **Report Tags** list which lists the tags already added to the **Report**.

Select a tag from the **Tags** list and press **Add Report Tag** button to add the data tag to the report. It will then appear in the **Report Tags** list. The same tag can be added to the report more than once to be shown in different column. This allows the report to display a tag using different aggregation methods. To distinguish report tag referring to the same tag name, it is recommended to enter remark text for each report tag.

To remove a tag from the report, select the tag from the **Report Tags** list and press **Delete** button

Select a tag from the **Report Tags** list and its setting is shown on the right half of the dialog. These setting are:



TAG Name

When a tag is selected from the **Report Tags** list, its name will be displayed indicating the settings below belongs to this tag.

Label 1, Label 2

You can specify two label texts for each column in the report. Labels will be shown on top of each column. The length limit of each label text is 80 characters.

Note: The width of each column is determined by the property **Width**. It is possible that the label cannot be displayed completely due to a small width setting.

Aggregation

In **Interval** setting, if a **Data Records** larger than one is set (**Report Interva**l is greater than the Data Interval), an aggregation method is needed to combine multiple data records into one report record. For example, if data are stored at 1 minute interval but report shows data at 30 minutes interval, Report module will combine the 30 data records into a data in the report using the method specified by this property. There are six aggregation methods can be selected from:

- NEW —The newest data in the report interval.
- OLD — The oldest data in the report interval.
- MIN — The minimum data in the report interval.
- MAX — The maximum data in the report interval.
- AVG — The average of all the data in the report interval.
- SUM — The sum of all the data in the report interval.

Width

Width of the column in number of characters.

Fraction Digit

The number of fractional digits of the data to be displayed in the report.

Remark

A short text can be entered for descriptive purpose. This is for reference to the developer and will not be shown in the report.

Statistic

Report can show statistic of each column of data at the bottom of the report. They will be daily statistic for daily report, monthly statistic for monthly report, yearly statistic for yearly report. Four kinds of statistic can be selected separately for each column:

- Min.: The minimum data in the column.
- Max.: The maximum data in the column.
- Sum: The sum of all data in the column.

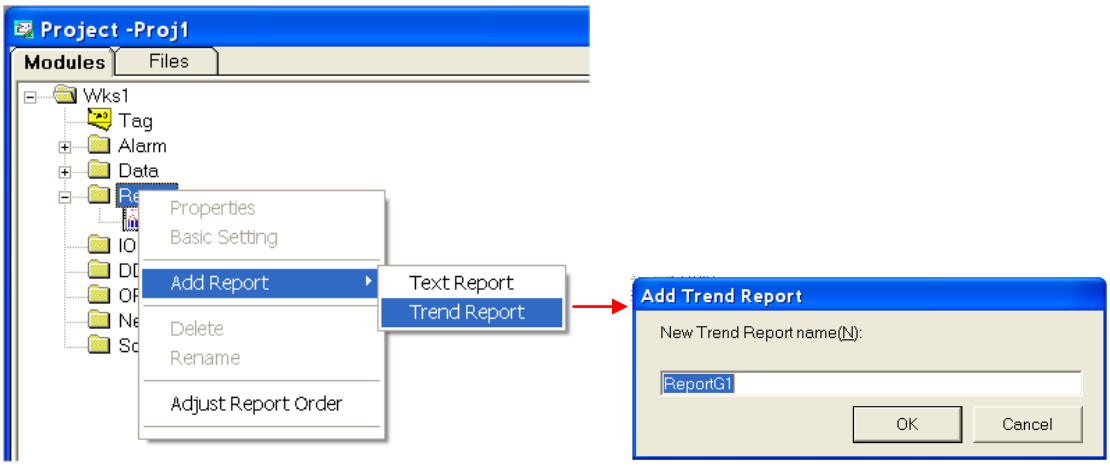
❑ Avg.: The average of all data in the column.

More than on statistic can be selected for each column,

Disable

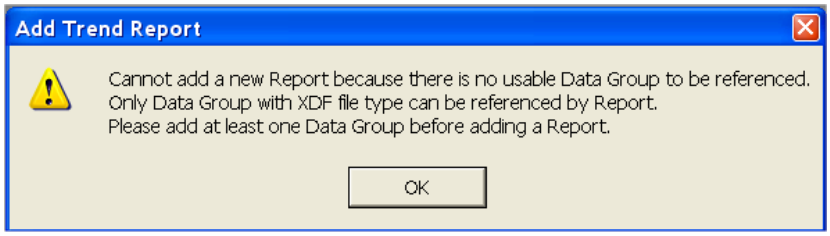
Disable the column. A disabled column won't be shown at runtime.

Add a Trend Report



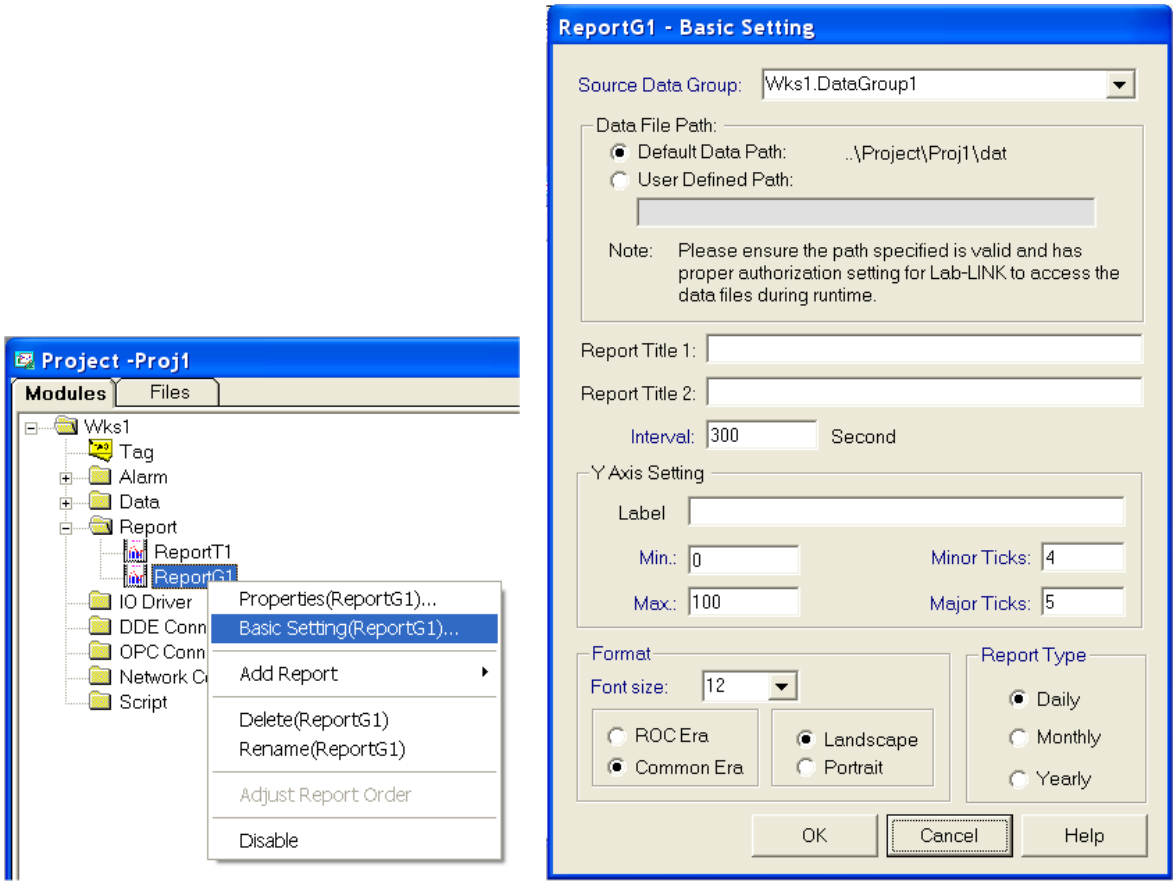
Right click on the **Report** node in the **Project** windows and select **Add/Trend Report** to add a new **Trend Report**. A dialog appears to request for a report name. Enter a name and press **OK** button to show **Basic Setting** dialog. Finishing the basic setting and a new text report is created.

If no **Data Group** has been created for any workstation in the project, a message box will appear to warn that a **Report** cannot be generated since there is no available **Data Group**. Please finish the configuration for **Data** module first before attempting to add a report.



Basic Setting of Trend Report

Right Click on a **Trend Report** and select **Basic Setting** from its popup menu to show its **Basic Setting** dialog. Basic setting includes:



Source Data Group

Select a **Data Group** from any workstation in the project to be used as the data source of the **Report**. Only **Data Groups** whose **File Type** settings are **Lab-LINK Data Files (XDF)** are shown in the drop down list. In other words, only Lab-LINK proprietary XDF format data files can be used to generate reports.

In a networked SCADA application, it is possible to have a workstation generating its reports using data files generated by another workstation. As can be seen in **Source Data Group** drop down list, data groups of all the workstations are shown and denoted in the form [Workstation.DataGroup] to indicate which workstation does the **Data Group** belongs to.

Ex. Wks1.DATA

Wks1 is the workstation name and DATA is the data group name.

Data Path

Path of the data files. Please set the path based on the setting in source Data Group.

Note: If the data files are generated by a remote workstation, the path defined here should be defined from the view of the workstation running the report at runtime. The path is usually a network path on the source workstation.

Default Data Path:

Use the path defined in the **Source Data Group**'s **Basic Setting**. If the source **Data Group** is from the local workstation (the workstation running the report), this is usually the case.

User Defined Path:
Use the path specified below as data file path. If a source **Data Group** from a remote workstation is used (it is not the workstation running the report), it is highly possible this option should be used. Since the default data path is set from the point of view of the workstation storing data instead of the workstation running the report, the report workstation might not be able to locate the data files according to default path.

Report Title1, Report Title 2

Define the two lines of texts to be shown above the report. The titles have the length limit of 80 characters.

Interval

The property has different meaning in **Trend Report**. When drawing a data curve, if two consecutive data records on the data file have time difference larger than this value, the two data point won't be connected in the trend chart. The unit of **Interval** is second.

Note: The value of this property should never be smaller than the **Data Interval** setting of the source **Data Group**. Otherwise, the trend curve cannot be drawn correctly since all data points are not connected.

The unit of **Interval** is second. This property is ignored if the report is a monthly or yearly report.

Y Axis Setting

Label

The label text of the Y axis. Its length limit is 80 characters.

Max., Min.

The maximum and minimum value of the Y axis.

Major Ticks, Minor Ticks

Used to define the ticks on the Y axis. **Minor Ticks** defined the length between two neighboring **Minor Ticks** in the same unit of the data. **Major Ticks** define how many **Minor Ticks** length are between two neighboring **Major Ticks**.

Format

These settings define the format of the report when it is printed:

- Font Size: The font size of the data in the **Report**.
- ROC Era: Use Taiwan year system in date display.
- Common Era: Use the standard year system in data display.
- Landscape: Set the paper orientation of the report printout to Landscape.
- Portrait: Set the paper orientation of the report printout to Portrait.

Report Type

Based on the time range of data, reports can be classified into three types:

- Daily Report: Contains data of one day, the time between data is specified by **Report Interval**.
- Monthly Report: Contains data of one month. Each data represent the aggregation of one day.
- Yearly Report: Contains data of one month. Each data represent the aggregation of one day.

Please refer to Data module chapter for details on how monthly or yearly data are aggregated.

Trend Report Setting

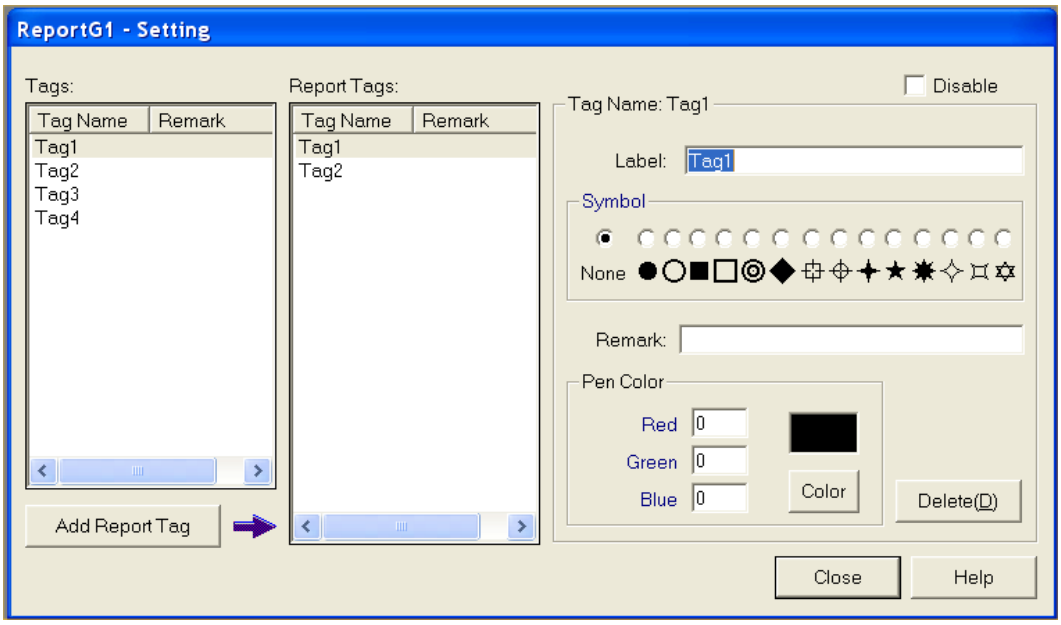
Right click on a **Report** and select **Properties** from its popup menu to open the Setting dialog. Left of the dialog is **Tags** list that shows all available tags in the source **Data Group** the Report references. These are the tags can be used in the report. Next to **Tags** list is the **Report Tags** list

which lists the tags already added to the **Report**.

Select a tag from the **Tags** list and press **Add Report Tag** button to add the data tag to the report. It will then appear in the **Report Tags** list. The same tag can be added to the report more than once to be shown in different data curves. This allows the report to display a tag using different aggregation methods. To distinguish report tag referring to the same tag name, it is recommended to enter remark text for each report tag.

To remove a tag from the report, select the tag from the **Report Tags** list and press **Delete** button

Select a tag from the **Report Tags** list and its setting is shown on the right half of the dialog. These setting are:



Trend Report Setting

Label

Label is a short text that will be displayed in the legend filed in the report to provide description for each curve. The length limit of **Label** is 10 characters.

Symbol

If reports are printed by a monochrome printer, user might not be able to distinguish data curves based on their color. A symbol can be assigned to and printed on each data curve to solve this problem. Clink to select the **Symbol** you wish to display on the data curve. No symbol will be printed on the curve is **None** is selected.

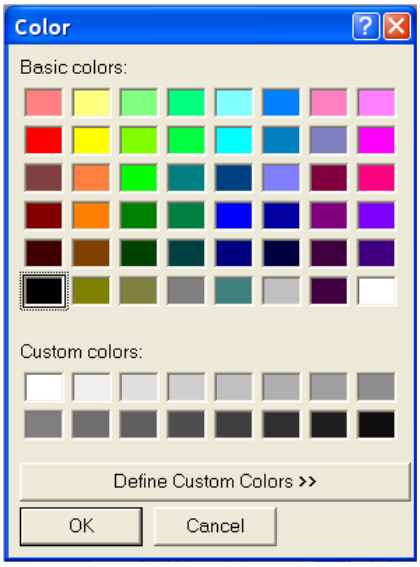
Remark

A short text string used for descriptive purpose.

Pen Color

This property specifies the color of the data curve. There are two ways to select color for the data curve:

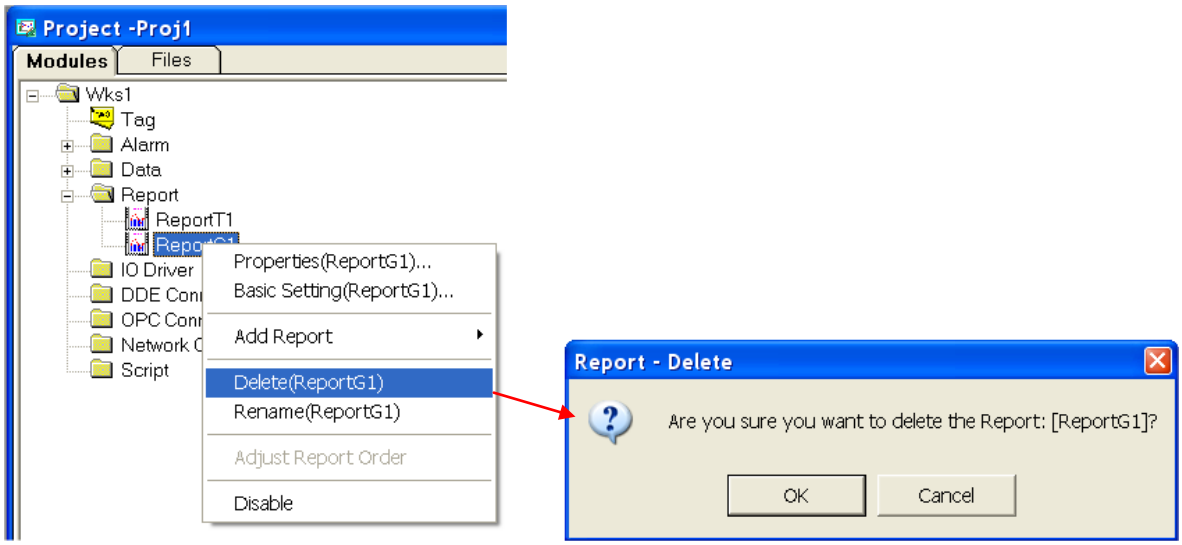
- Enter color composition of **Red**, **Green** and **Blue** in the fields. The range of each color is 0-255.
- Press **Color** button to open the **Color** dialog. Click on a color and press **OK** button to select it. You can define your own color by pressing the **User Color** button.



Color setting

Delete a Report

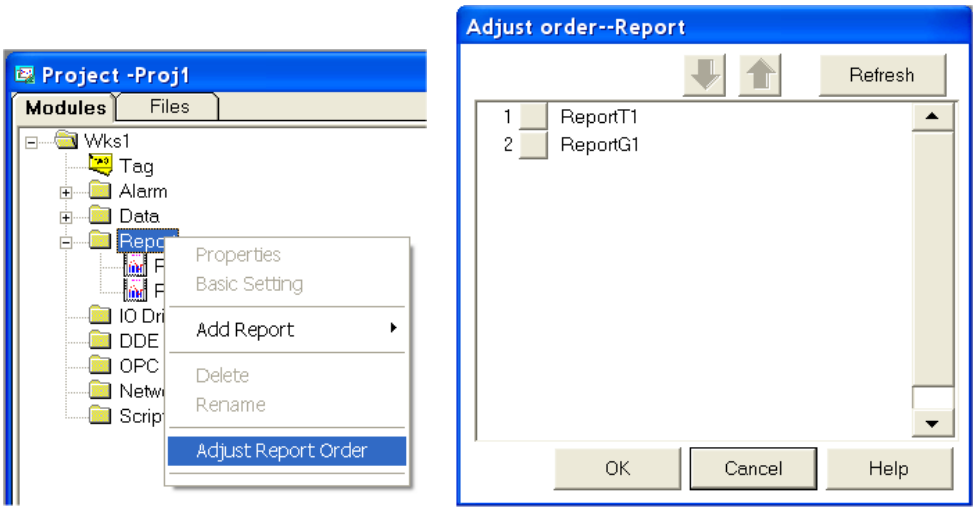
Right click on a **Report** in the **Project** windows and select **Delete** from the popup menu, a message box will appear to request for delete confirmation. Press **OK** button to delete the report or press **Cancel** button to cancel the operation.



Adjust Report Order

It is possible to adjust the order a report appears in the report selecting drop-down list in the runtime **Report** program. Right click on the **Report** node in the **Project** window and select **Adjust Order** from the popup menu. A dialog will appear to allow adjusting or report order.

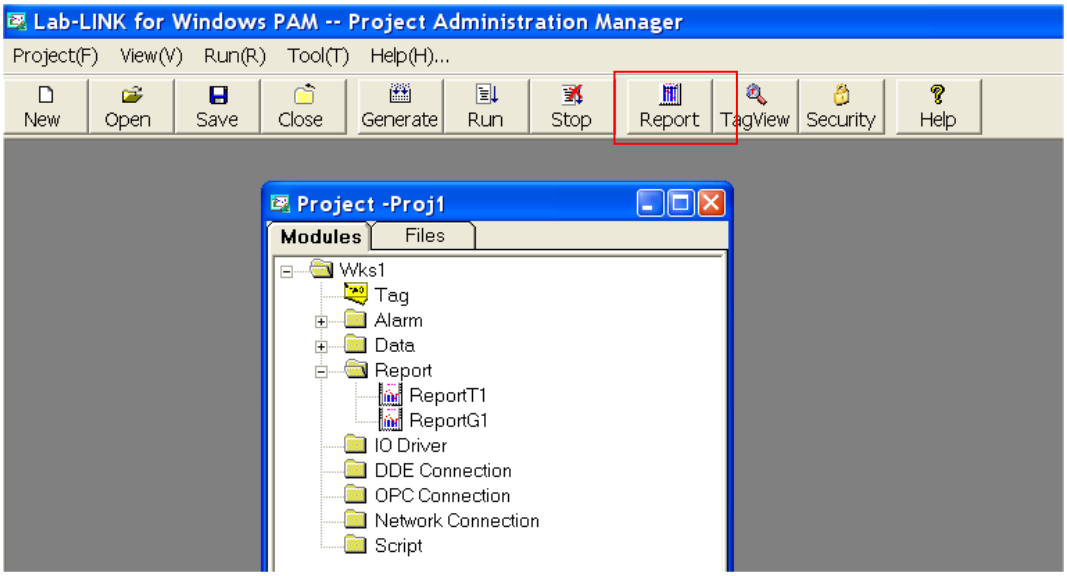
Select a report by clicking its name in the report list, an  icon will appear to indicate the report selected. Press  or  button to move the report downward or upward in the list. When all the adjustment is made, press **OK** button to close the dialog.

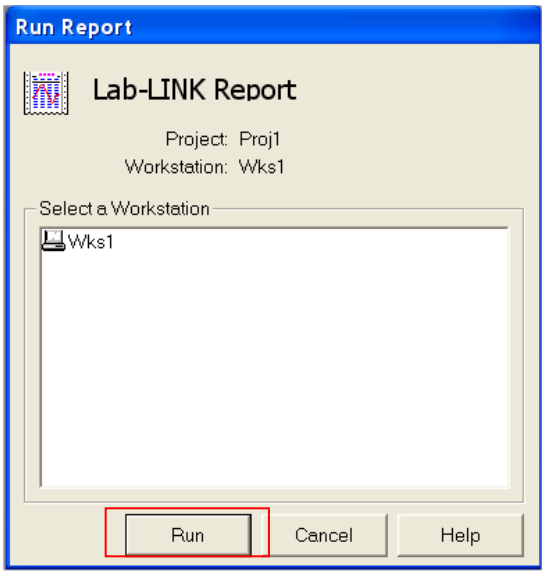


Running the Report Module

Running Report in SmartPAM

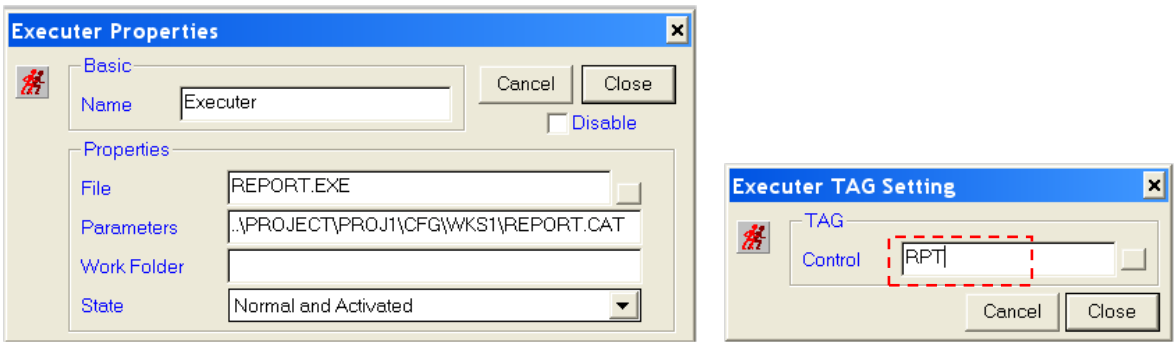
Report can be run directly from ***SmartPAM*** by pressing **Report** button on the toolbar or selecting **Run Report** from the **Run** menu. A dialog appears to allow you to select a workstation to run its report setting. Select a workstation by clicking its name and press **OK** button, the runtime **Report** module is run and the report setting of that workstation is loaded. This method of running **Report** is usually used when the configuration is completed and the project is tested in the **Lab-LINK** Developer environment.





Running Report in Lab-LINK Project

An Executioner object can be defined to run project in a runtime Lab-LINK Project. The properties of the Executioner object should be similar to the followings:



Properties

File: REPORT.EXE

Parameters .\PROJECT***ProjectName***\CFG***WorkstationName***\REPORT.CAT

Tag Setting

Control: A tag related to a control object should be selected. For example, the **Target** Tag of the **Button** object used to run the report.

Please refer to "***SmartPanel*** User's Manual" for details of the **Executioner** object. Command line parameters of runtime Report module will be discussed later.

Running Report with a Windows Shortcut

Report module can be run alone without the runtime Lab-LINK Project. In this case, a shortcut can be created. Command line parameters of runtime Report module will be discussed later.

Command Parameters of Report Module

No matter how the runtime **Report** module is run, the following command parameters should be used:

[***SystemPath***\]REPORT.EXE ***ReportCatPath***,XCord, YCord, Width, Height

[***SystemPath***] is the system folder path of Lab-LINK. If the default installation path is used when you install Lab-LINK, the path should be "c:\LabLINK\System4". REPORT.EXE is the program file of runtime Report module. Other parameters are described as follows:

ReportCatPath

ReportCatPath specifies the path of the Report Catalog File. This file is part of the runtime configuration created when you generate the project. It contains definition of reports you configured for the workstation. It is located at the workstation folder under the project's Cfg folder. Its name is Report.cat by default. The complete path is

"c:\Lablink\project***ProjectName***\cfg***Workstation Name***\report.cat」

, where ***ProjectName*** is the name of the project and ***Workstation Name*** is the name of the workstation.

For example, the command lines to run the report module the two workstations "***Wks1***" and ***Wks2***" of project "***Proj1***" are:

Wks1： REPORT.EXE ..\PROJECT***Proj1***\cfg***Wks1***\report.cat
Wks2：REPORT.EXE ..\PROJECT***Proj1***\cfg***Wks2***\report.cat

XCord, YCord, Width, Height

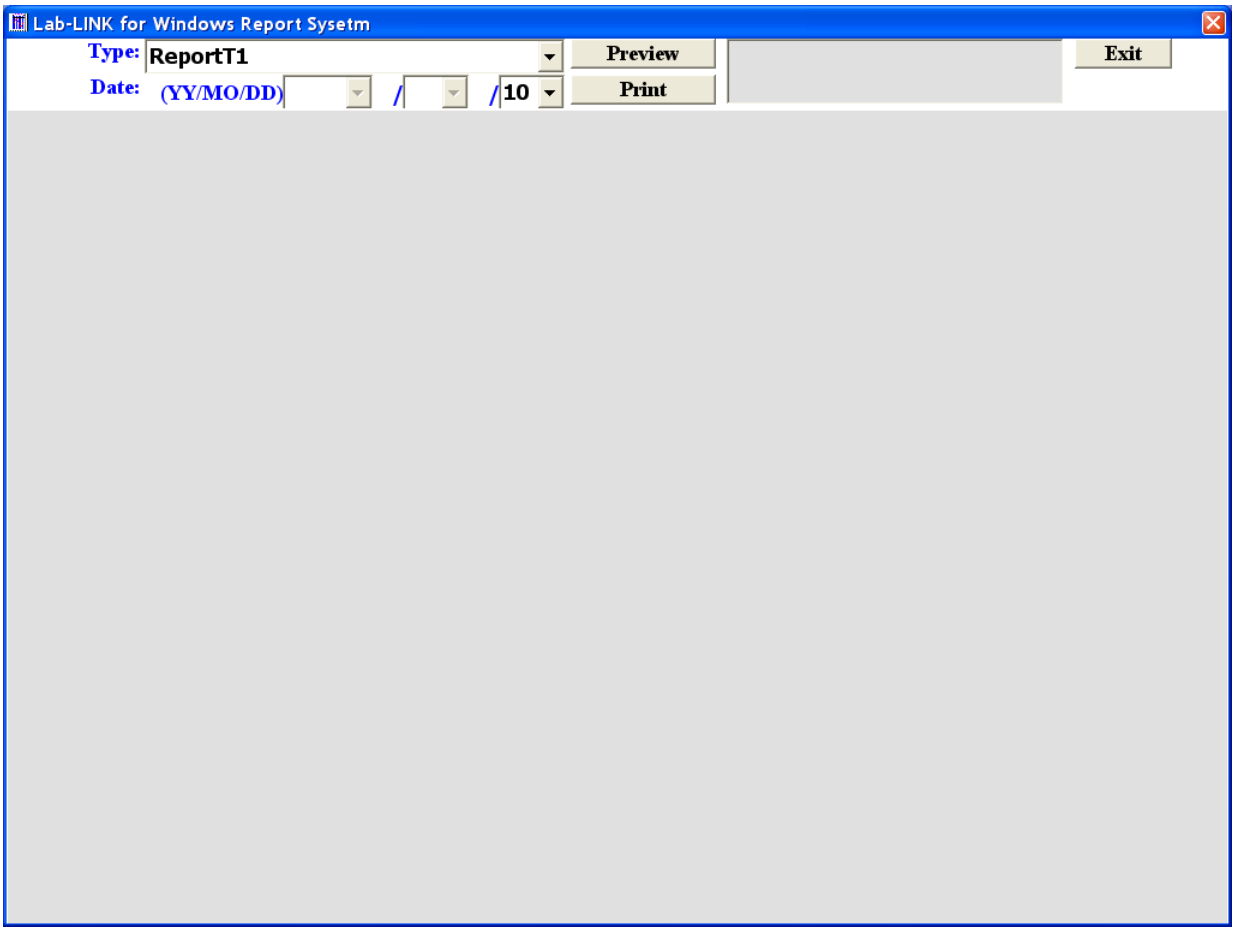
These properties define the position and size of the Report module window. Similar to the **Windows** objects in ***SmartPanel***, the screen is mapped to a logical coordinate system with the origin point at the upper-left corner and the size of the screen is 10000*10000. Please refer to "***SmartPanel*** User's Manual" for explanation on the coordinate system. If these properties are omitted, the runtime **Report** window always occupies the whole screen.

Besides the definition of **Report** window location and size, the existence of these parameters has an implicit meaning. If the report window does not occupies the whole screen, **Report** is

considered being run in a Lab-LINK project and will end when the Lab-LINK project ends. Otherwise **Report** is considered being run alone and users need to press the **Exit** button in **Report** to end its execution.

Runtime Report Operation

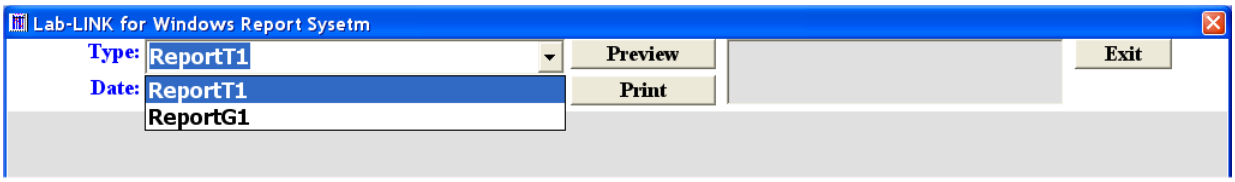
Runtime window of the **Report** module is shown in the figure below. Users can select report and data date to generate the report. The report will then display on the screen and can be printed out. To end the execution of **Report**, Press **Exit** button.



SmartReport runtime operation

Select a Report

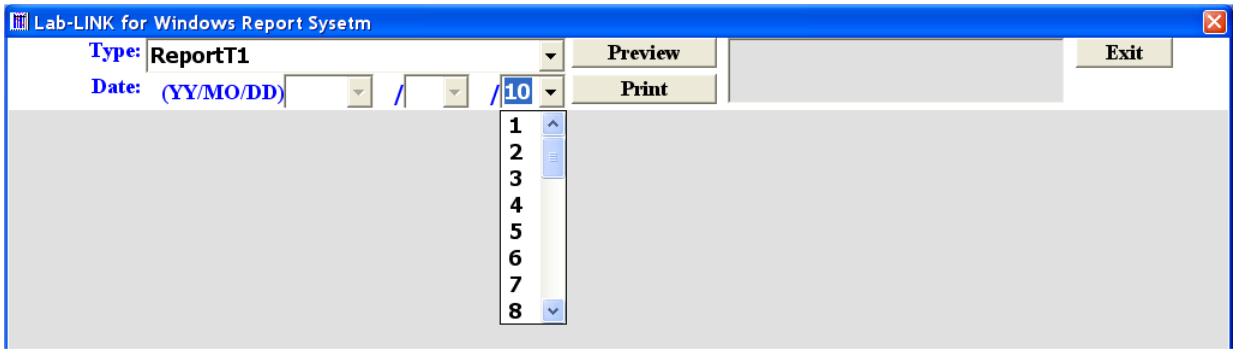
Click on the Report Type drop-down list and a list of configured reports of the workstation is shown. Select a report by clicking on its name. The name of the report selected appears on the top of the list.



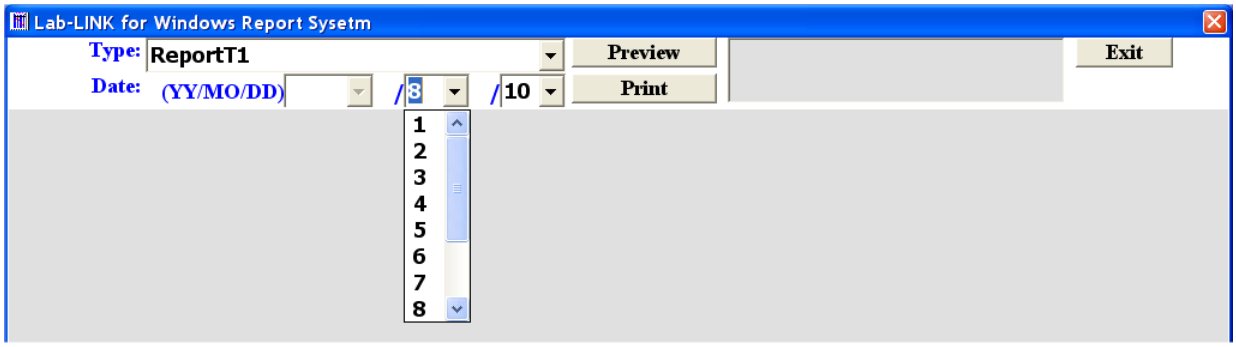
Select a Date

After the selection of a report, a date must be select to locate the data to be retrieved. Click on the year, month, and day drop-down list to select a date. Day and month selection may be disabled if the report is a monthly or yearly report.

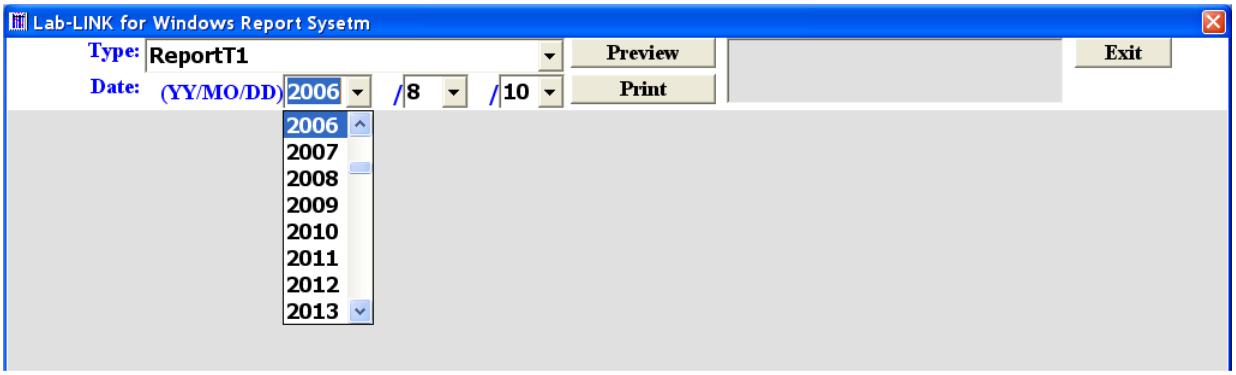
If data expiration setting in **Data Group** is **One Month**, the selection of year and month will be disabled.



If data expiration setting in **Data Group** is **One Year**, the selection of year will be disabled.

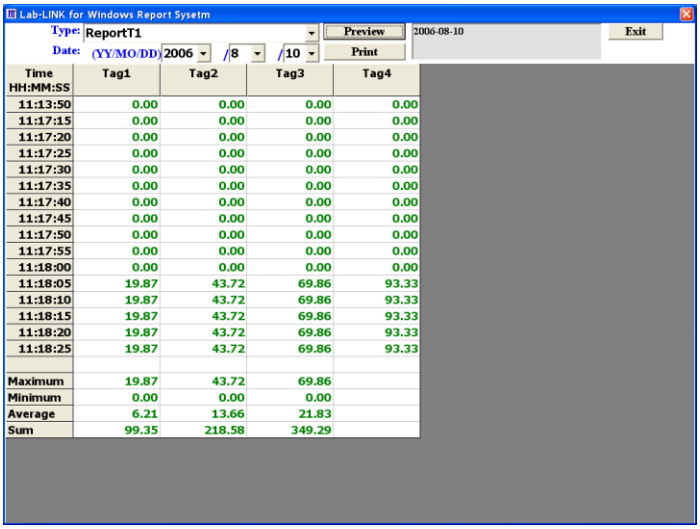


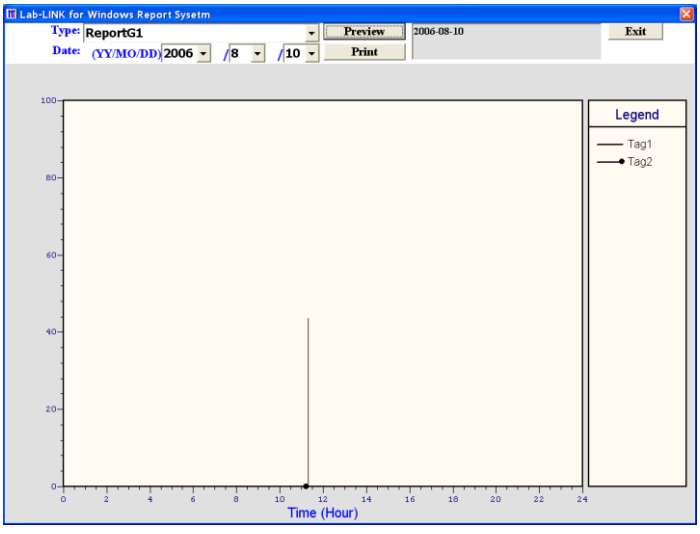
If data expiration setting in **Data Group** is **Never**, year, month and day all must be selected.



Preview and Print

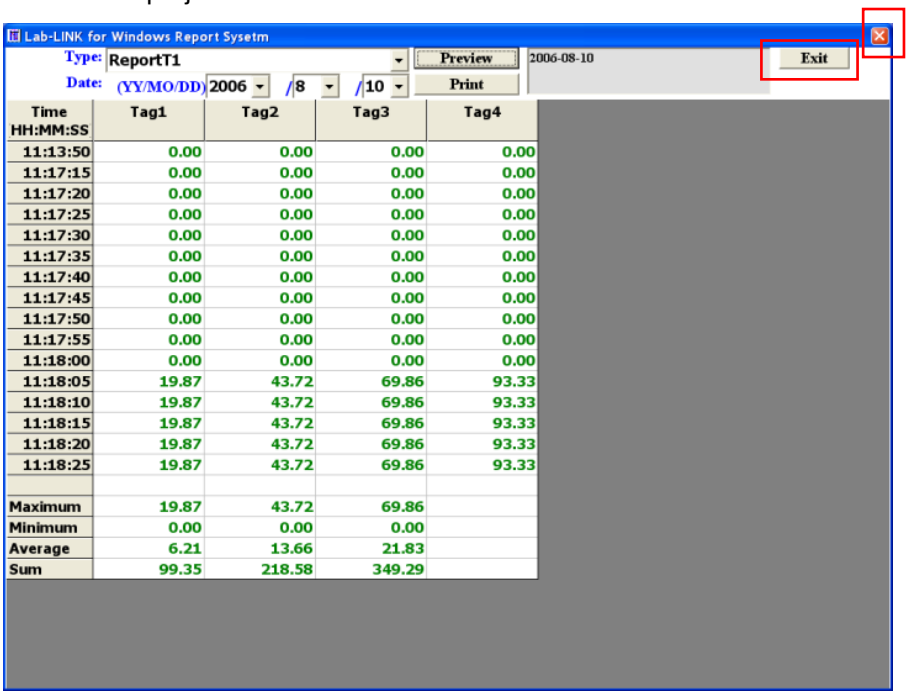
After a report and a date are selected, press **Preview** button to retrieve the data and show them on the screen. Drag the vertical scroll bar in a text report is it exceeds the display. Column statistics are shown at the bottom of the text report. To print the report, press **Print** button.





Exit Report

If **Report** is run alone (window location and size are not specified in command parameters), there will be an **Exit** button on top of report. Press the button to exit **Report**. If **Report** is run in a **Lab-LINK** project (window location and size are specified in command parameters), **Report** will end when the **Lab-LINK** project ends.



Time HH:MM:SS	Tag1	Tag2	Tag3	Tag4
11:13:50	0.00	0.00	0.00	0.00
11:17:15	0.00	0.00	0.00	0.00
11:17:20	0.00	0.00	0.00	0.00
11:17:25	0.00	0.00	0.00	0.00
11:17:30	0.00	0.00	0.00	0.00
11:17:35	0.00	0.00	0.00	0.00
11:17:40	0.00	0.00	0.00	0.00
11:17:45	0.00	0.00	0.00	0.00
11:17:50	0.00	0.00	0.00	0.00
11:17:55	0.00	0.00	0.00	0.00
11:18:00	0.00	0.00	0.00	0.00
11:18:05	19.87	43.72	69.86	93.33
11:18:10	19.87	43.72	69.86	93.33
11:18:15	19.87	43.72	69.86	93.33
11:18:20	19.87	43.72	69.86	93.33
11:18:25	19.87	43.72	69.86	93.33
Maximum	19.87	43.72	69.86	
Minimum	0.00	0.00	0.00	
Average	6.21	13.66	21.83	
Sum	99.35	218.58	349.29	

Exit Report

Network Application

If a remote source Data Group is specified in a Report's basic setting, this indicates that Report need to retrieve the data file from another computer on the network at runtime. Care should be taken when assigning data file path when defining the report in this scenario. An example below is used to illustrate this application.

Project: Report

Workstation: Wks1, Wks2

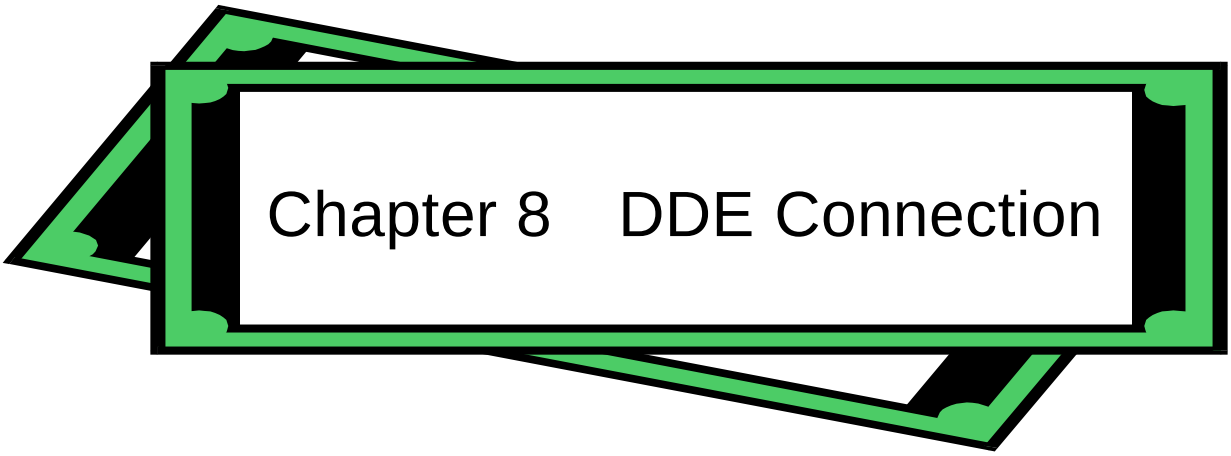
Data Group: Wks1 ─ DataGroup1 , Wks2 ─ None

Wks1 Network settings: Computer name ─ W1, IP address: 192.168.1.1, Folder shared: Lab-link

Wks2 Network settings: Map Lab-link folder of computer W1 (Workstation Wks1) to network drive F:

Report settings:

Item	Wks1	Wks2
Source Data Group	Wks1.DataGroup1	Wks1.DataGroup1
Data Path	Default Data Path ..\project\Report\dat	User Defined Path f:\Project\Report\dat or \\W1\LabLINK\Project\Report\dat or \\192.168.1.1\LabLINK\Project\Report\dat
Report Command Parameters	..\PROJECT\Report\cfg***Wks1***\report.cat	..\PROJECT\Report\cfg***Wks2***\report.cat
Share folder	Lab-link	Not required



Chapter 8 DDE Connection

Introduction

Dynamic Data Exchange (DDE) is a standard interface between Windows application to exchange real time data. **Lab-LINK** provides DDE function to share real time Tag data with any Windows application that supports DDE. For example, real time data collected by **Lab-LINK** can be sent to Excel for further analysis. Lab-LINK provides full DDE support. It can be either a DDE server or a DDE client, or both at the same time.

Features

- Exchange data with any Windows application supporting DDE.
- Can be both a DDE client and a DDE server.
- All data field in a Tag can be exchanged using DDE.
- No configuration is needed except enable the function when Lab-LINK is DDE server.

DDE Connection Format

The following information must be specified to build a **DDE Connection**:

ApplicationName|TopicName!ItemName

- **ApplicationName**: Name of the DDE server application.
- **TopicName**: Name of the topic on DDE server.
- **ItemName**: Name of the data item on DDE server.

These names are defined by the DDE server and should be specified by the DDE client when it tries to build the connection.

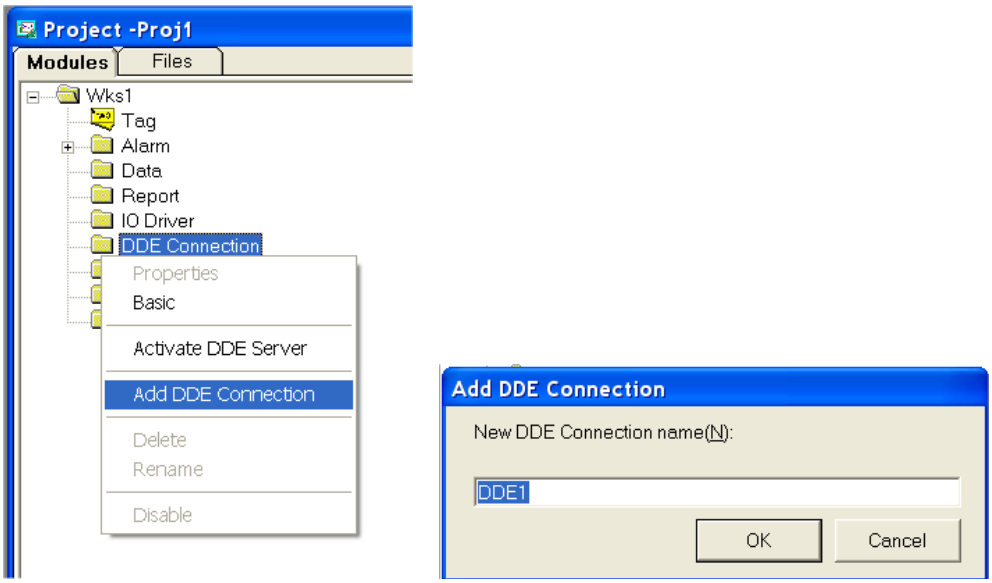
If Lab-LINK is the DDE server, a DDE client can request Lab-LINK tag data in the following format:

LABLINK|TAGINFO!*TagName*.*TagFieldName*

- **LABLINK**: The application name of Lab-LINK as a DDE server.
- **TAGINFO**: The topic name of Lab-LINK tag data.
- ***TagName*.*TagFieldName***: The item name of a **Lab-LINK** tag. ***TagName*** Is the name of the tag whose data is to be received. ***TagFieldName*** is the name of a Lab-LINK data field. Applicable data field name will be discussed later.

Note: Since Lab-LINK tag name is case sensitive, take care when specifying item names. Application name, topic name and tag data field name are not case sensitive.

Add a DDE Connection



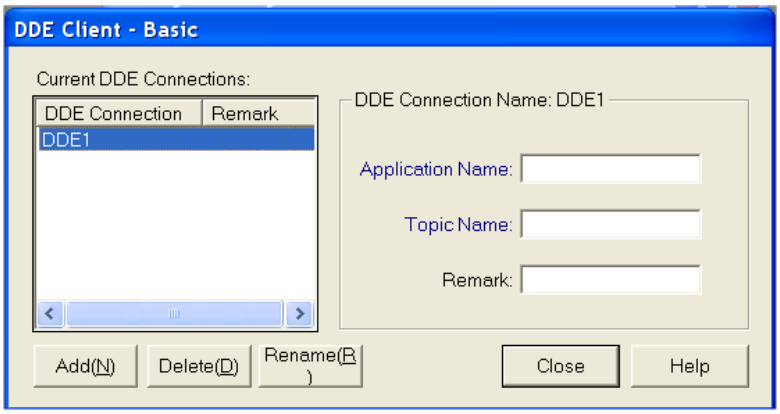
Right click on the **DDE Connection** node and select **Add DDE Connection** from the popup menu. A dialog appears to request for a connection name. Enter a name and press OK button to edit connection setting. Finish the setting to create a new DDE Connection.

Up to 32 DDE Connections can be created. In other word, it is possible for Lab-LINK to receive data from 32 applications.

Basic Setting of a DDE Connection

Right click on a **DDE Connection** in the **Project** window and select **Basic Setting** from the popup menu to show the dialog below. Left of the dialog is **Existing DDE Connections** list showing all the DDE connections that are already defined. Select a **DDE Connection** from the list and its

setting is shown on the right half of the dialog. Meanings of the settings are:



Application

Specify the name of the DDE server for this connection. Please refer to the manual of the server application for this name.

Topic

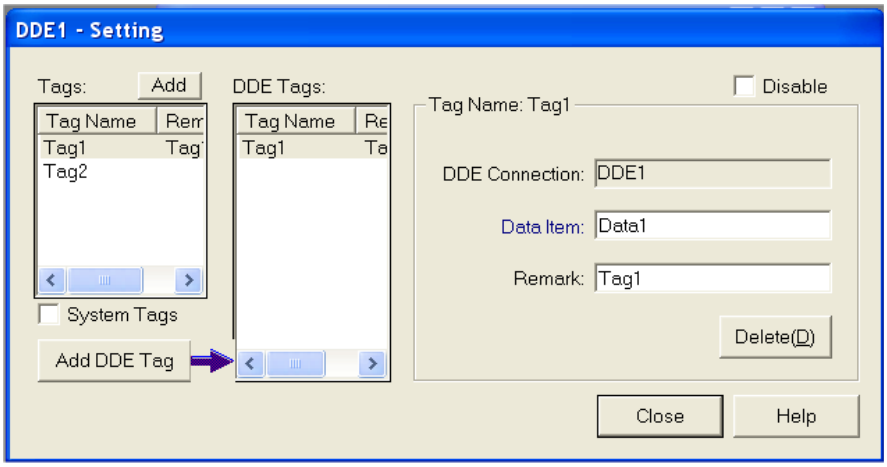
Specify the name of the topic in the DDE server from which data will be received. Please refer to the manual of the server application for this name.

Remark

Enter a short tag to describe the connection.

DDE Connection Setting

Right click on a **DDE Connection** in the **Project** window and select **Properties** from the popup menu to show the dialog below. Left of the dialog is **Tags** list showing all the tags in the workstation. Next to it is the **DDE Tags** list showing all the tags that have been added into this connection. Select a tag from the **DDE Tags** list and its setting is shown on the right half of the dialog.



To add a new DDE tag, select a tag name from the Tags list and press **Add DDE Tag** button. The tag will appear in the **DDE Tags** list and you can edit its setting.

To delete a DDE tag, select it from the **DDE Tags** list and press **Delete** button.

Setting for each DDE tag includes:

Tag Name

Define which tag will be connected to the data item in DDE server.

DDE Connection

Show the name of the DDE Connection that is currently edited.

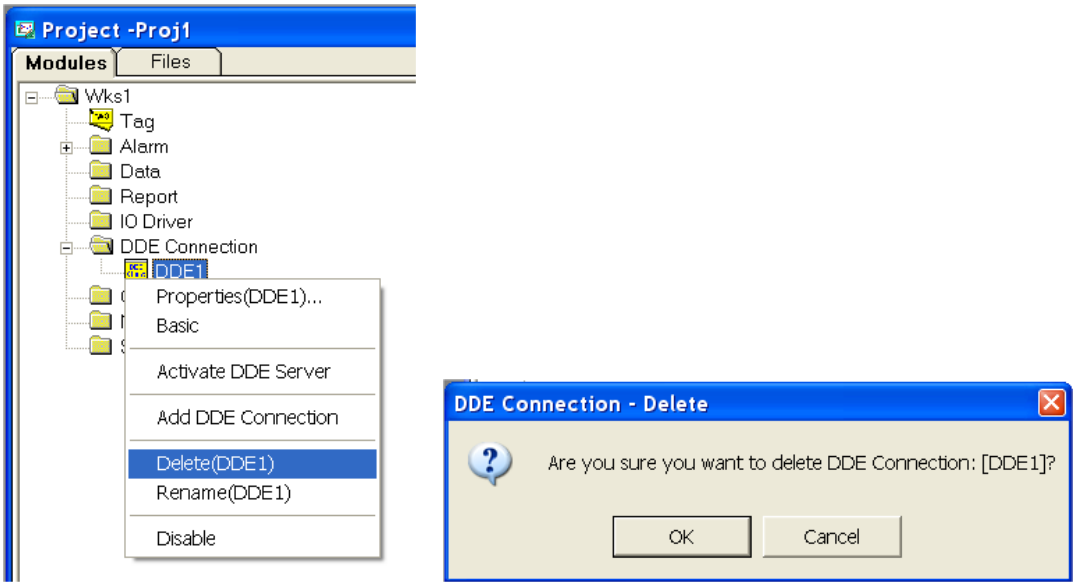
Data Item

Specify the name of the data item in the DDE server whose data will be connected to the DDE tag. Please refer to the manual of the server application for this name.

Remark

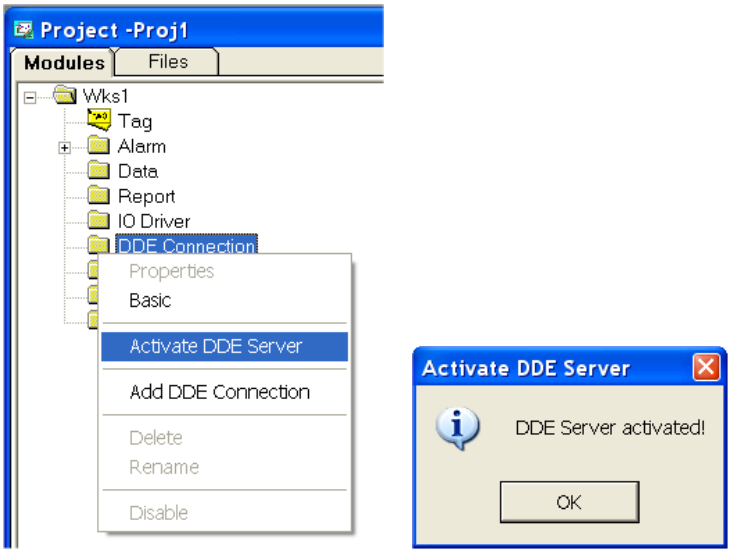
Enter a short text to describe the DDE tag.

Delete a DDE Connection



Right click on a **DDE Connection** in the **Project** window and select **Delete** from the popup menu to delete the connection. A message box will appear to request for confirmation. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation.

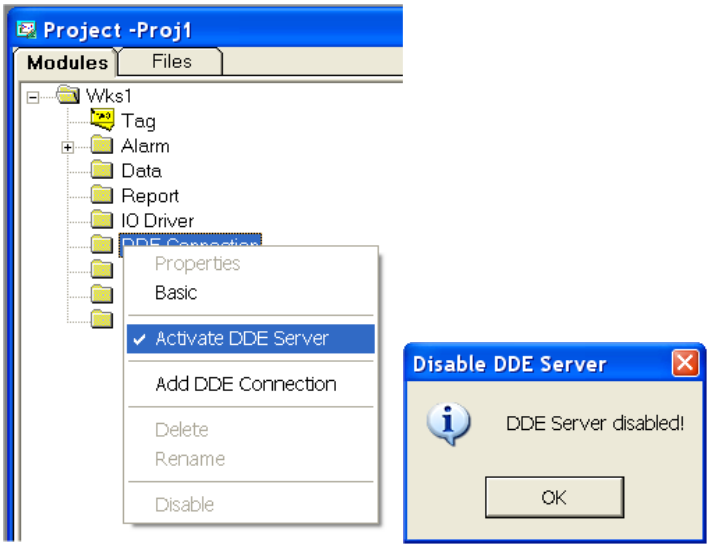
Activate DDE Server



Lab-LINK doesn't activate its DDE server by default. To activate DDE server, right click on **DDE Connection** node in the **Project** window and select **Activate DE Server** from the popup menu. A

message box will appear to request for confirmation. Press **OK** button to confirm the activation or press **Cancel** button to cancel the operation. When the DDE server is activated, a check mark appears in the popup menu item of **Activate DE Server**.

To disable DDE server, right click on the DDE Connection node and select **Activate DE Server** from the popup menu again. If the check mark disappears from the popup menu item of **Activate DE Server**, the DDE server is shut down.



DDE Server Application

All data fields in a Lab-LINK tag can be shared through DDE. Field name must be specified in the item name in a DDE connection request. Lab-LINK tag data fields include:

- ***TagName***.Value — Acquire the value field of the tag.
- ***TagName***.Date — Acquire the date field of the tag.
- ***TagName***.Time — Acquire the time field of the tag.
- ***TagName***.Message — Acquire the message field of the tag.

If tag value is requested, filed name can be omitted by specifying the tag name only.

An example to request Lab-LINK data in excel is used to illustrate this application as follows:

Please follow the steps:

1. Run **Lab-LINK** project first. Make sure its DDE server is activated and the project is

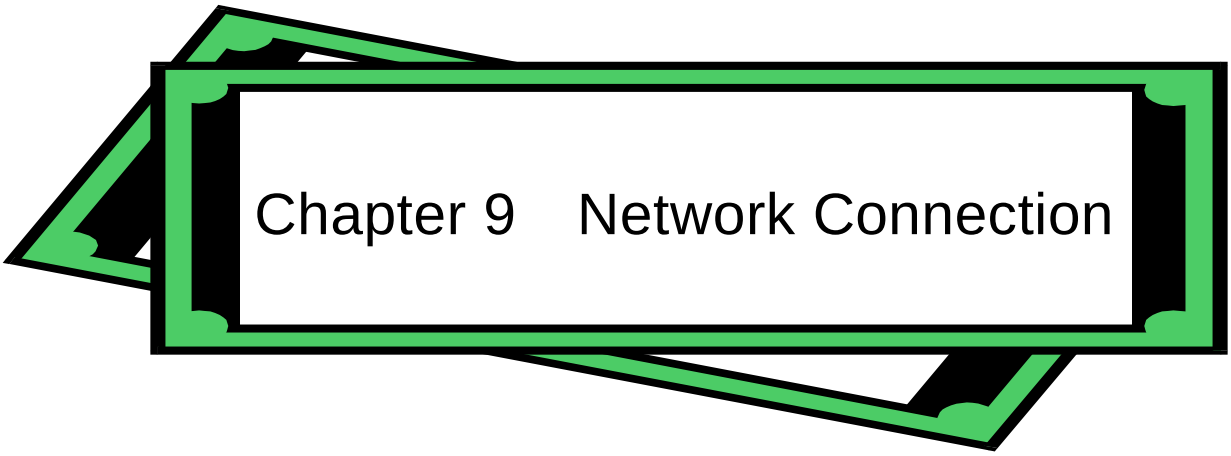
regenerated after the activation.

2. Run Excel and open a worksheet.
3. Create DDE connection in Excel by entering a formula in cells:

Formula	Format	Description
=LABLINK|TAGINFO!'***TagName***'	Number	Tag's value
=LABLINK|TAGINFO! '***TagName***.Date'	Date (m/d/y)	Tag's date
=LABLINK|TAGINFO! '***TagName***.Time'	Time (hh:mm:ss)	Tag's time
=LABLINK|TAGINFO! '***TagName***.Message'	Text	Tag's message

Note: Tag name is case sensitive.

After the procedures, real time tag data should appear in the cells.



Chapter 9 Network Connection

Introduction

Network connections enable **Lab-LINK** workstation s to share real time data across network. With this feature, it is possible to monitor and control your system at a remote location or even from a foreign country through the internet.

Features

- Use standard TCP/IP protocols and thus support intranet and internet.
- No file server required.
- Peer to peer connection with high efficiency.
- Workstations can either be server, client or both at the same time.
- Tags can be set as read only for clients to limit its access.
- Servers can support multiple concurrent clients.
- Will recover from network disconnection automatically. Communication status can be detected and sent to Communication Tags.

Architecture

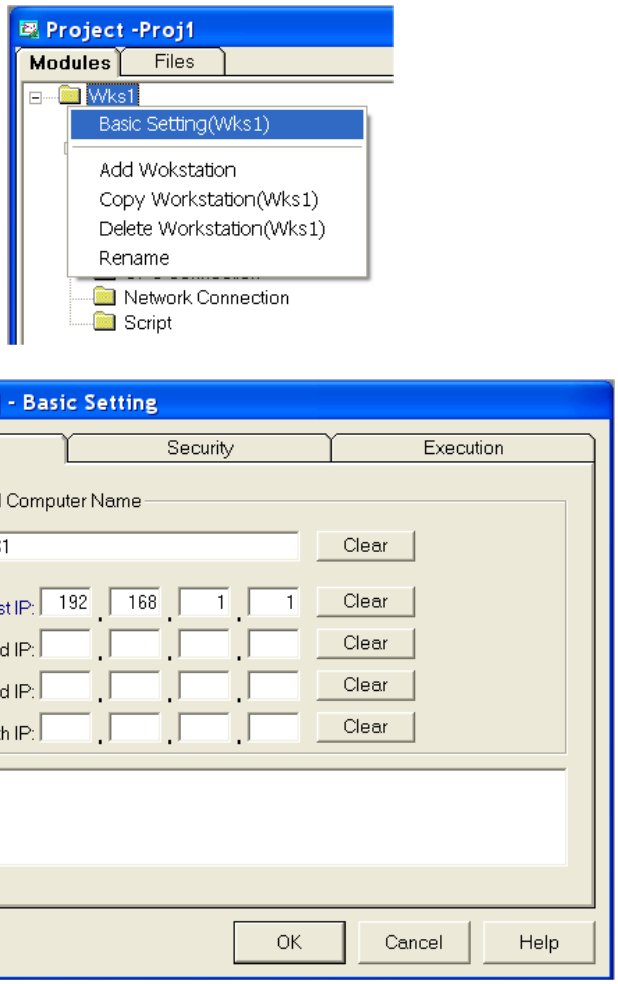
When multiple workstations are involved in a Lab-LINK project, workstations can play one of both rules:

- Server: Provider of tag data. They are usually connected to I/O devices to collect real time data or send control output. A server workstation can provide service to multiple client workstations and the same time by sending real time data to them across network.
- Client: Receiver of real time data. They are usually used for remote monitoring and control. A client workstation can connect to multiple server workstations at the same time to receive data from different sources.

Any workstation can be server and client at the same time to provide real time data to other workstations while receiving some other real time data from other workstations.

Basic Setting of Server Workstation

Some basic information related to its network setting must be defined for a server workstation. Right click on a workstation node in the **Project** window and select **Basic Setting** from its popup menu. The **Basic Setting** dialog will appear to allow the setting below:



Workstation basic setting

More than one IP address can be set to a workstation. Client can select an appropriate IP address fitting its network setting when creating a Network Connection with this server.

Computer Name

Specify the network computer name of the workstation.

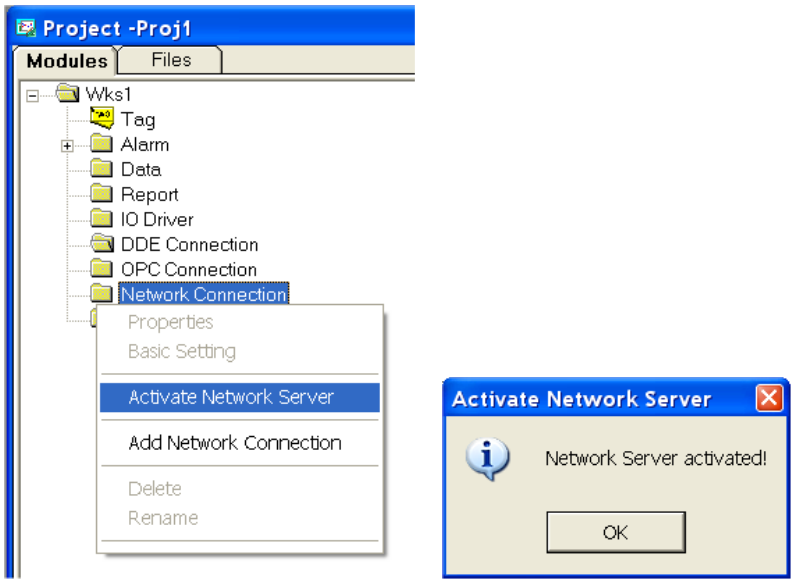
IP Address

Specify the IP address of the workstation. Up to four set of IP addresses can be assigned to a workstation.

Remark

Enter a short text to describe this **Network Connection**.

Activate Network Server

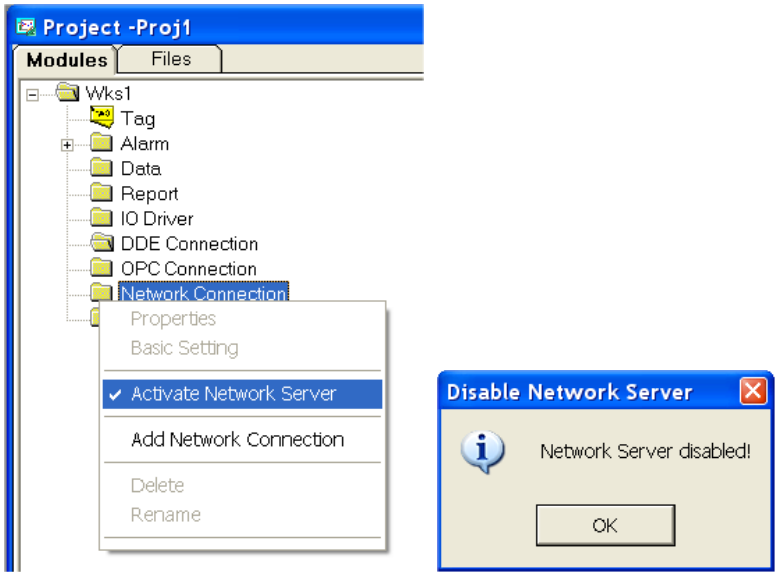


Activate Network server

A workstation must activate its Network Server to become a server workstation. Right click on the **Network Connection** node of the workstation in the **Project** window and select **Activate Network Server**. A message appears to indicate that the server is activated. Press **OK** button to close the message. A check mark will also appear before the **Activate Network Server** item in the popup menu.

To shutdown the network server, right click on the **Network Connection** node and select **Activate Network Server** again. A message box will appear to indicate that the network server has been disabled. When the server is disabled, the check mark before the **Activate Network Server** popup menu item will also disappear.

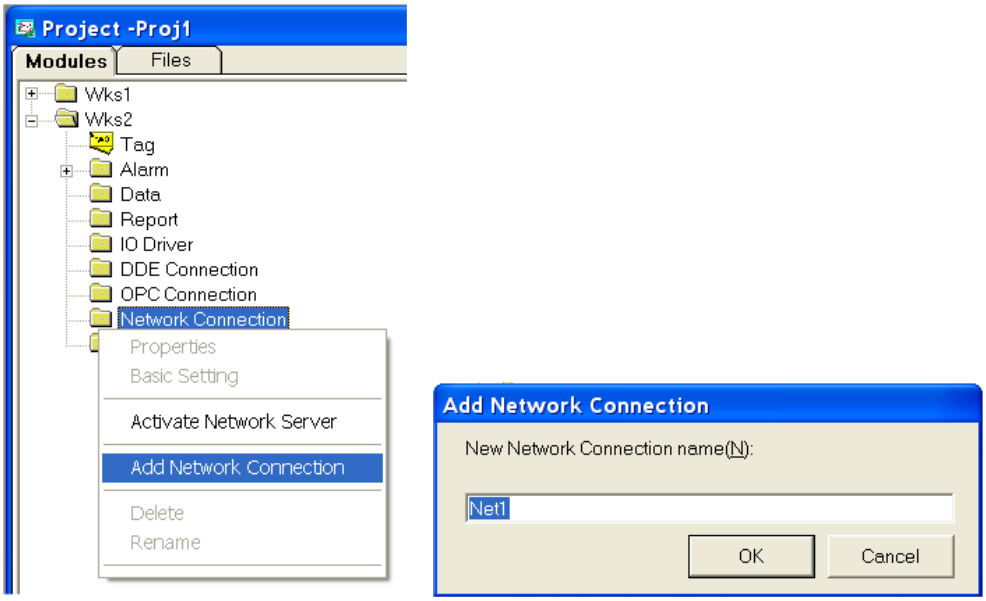
Activation or deactivation of the network server has effect only after the project is regenerated and executed again.



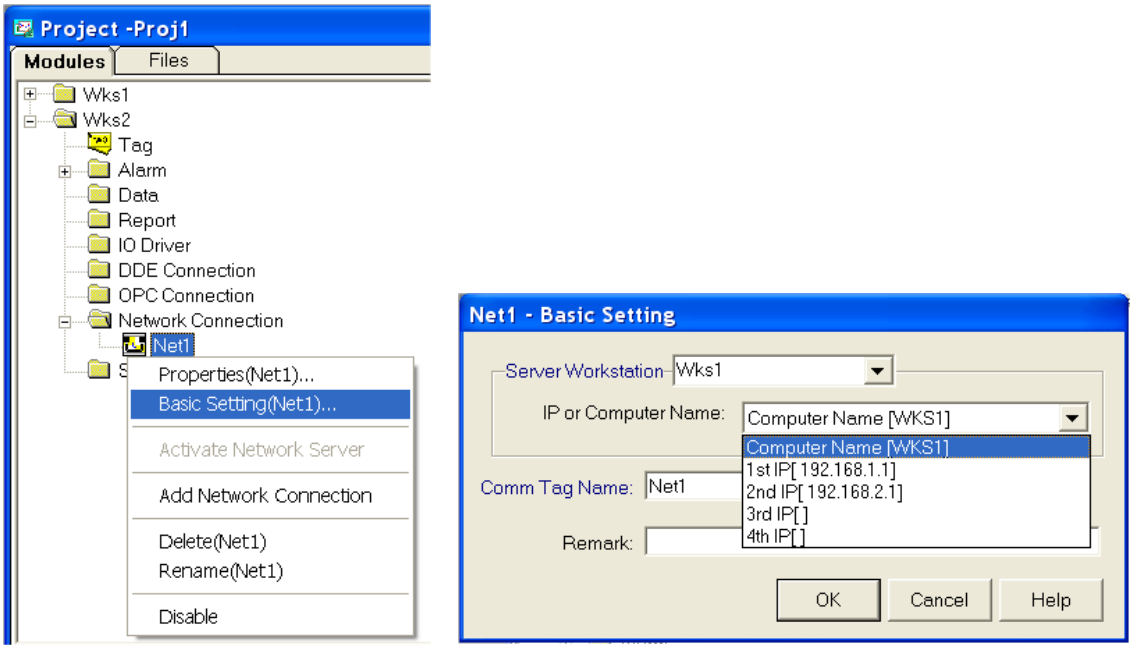
Disable the network server

Add a new Network Connection

Right click on the **Network Connection** node in the **Project** window and select **Add a Network Connection** from the popup menu. A dialog appears to request for a name. Enter a name and press **OK** to open **Basic Setting** dialog. Finish the setting in the dialog and press **OK** button, the new **Network Connection** is created and shown in the **Project** windows under the **Network Connection** node.



Add a new Network connection



Basic Setting of Network Conenction

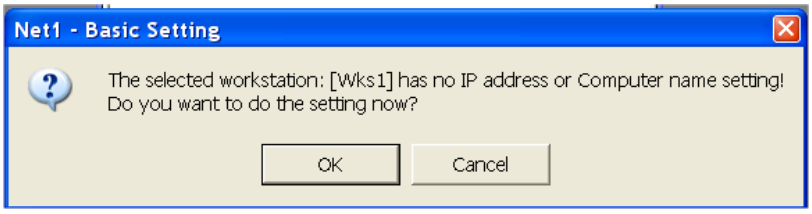
Basic Setting of Network Connection

Right click on a **Network Connection** in the **Project** window and select **Basic setting** from the popup menu to open the dialog. A dialog appears to request for a name. Enter a name and press **OK** to open **Basic Setting** dialog. Finish the setting in the dialog and press **OK** button, the new **Network Connection** is created and shown in the **Project** windows under the **Network Connection** node.

Server Workstation

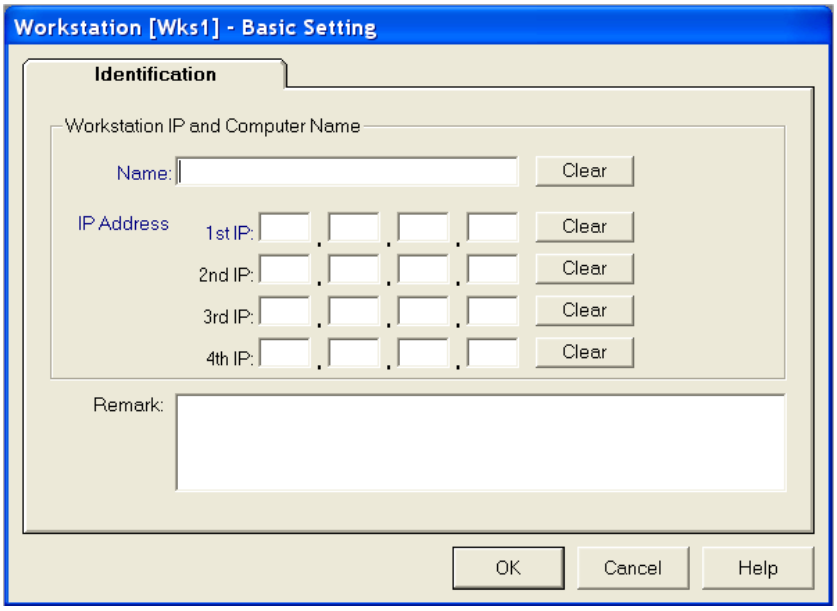
Select server workstation of the **Network Connection**.

If network information is not given in the basic setting of the selected server workstation, the message box shown below will appear.



The message reminds user that server network setting is required before the **Network**

Connection basic setting can be continued. Press **OK** button to open the **Basic Setting** dialog of the server workstation. Finish the setting by entering computer name or IP address and press **OK** button. This will bring you back to the **Basic Setting** dialog of the **Network Connection** for you to continue its setting.



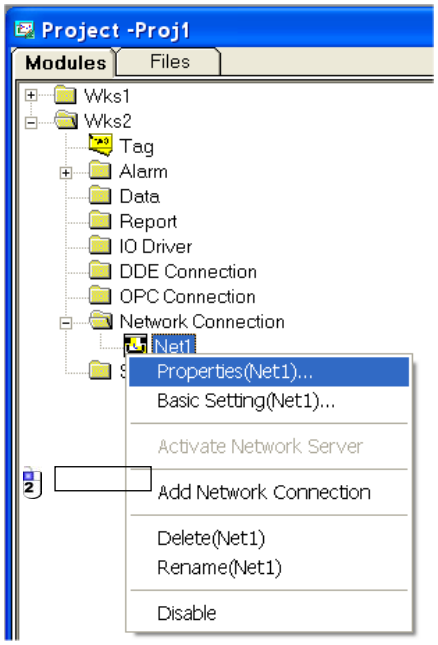
IP or Computer Name

After a server workstation is selected, its computer name and IP address will appear in this drop-down list. Select its name or one of its IP addresses that is appropriate for this Network Connection. Client workstation will use the selected computer name or IP address to locate the server at runtime. IP address is recommended especially when the server and the client workstation are not in the same local area network.

Comm Tag Name

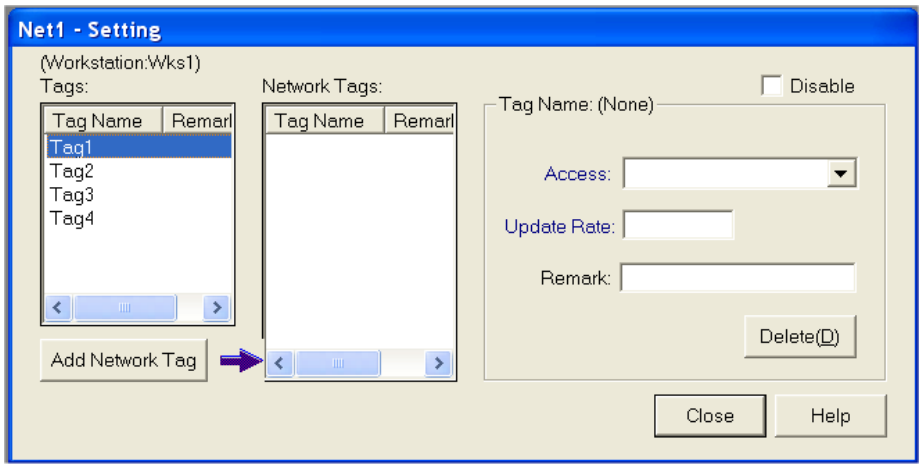
Enter a tag name to be used as the **Communication Tag**. At runtime, client workstation can detect the communication status of the network connection between itself and the server workstation. **Communication Tag** is used to indicate the connection status. If the communication breaks down, the value of **Communication Tag** will be set to “1”. The tag can be conveniently assigned as a digital alarm to alert user the abnormal condition.

Network Connection Setting



Open Network Connection properties setting

Right click on a **Network Connection** in the **Project** window and select **Properties** from the popup menu. A Network Connection Setting dialog will appear. On the left of the dialog is a **Tags** list showing all the tag in the **Server Workstation**. Next to the tags list is the **Network Tags** list showing all the tags that have been added to this connection. Select any tag from the **Network Tags** list, its Network setting is shown on the right half of the dialog for you to edit.

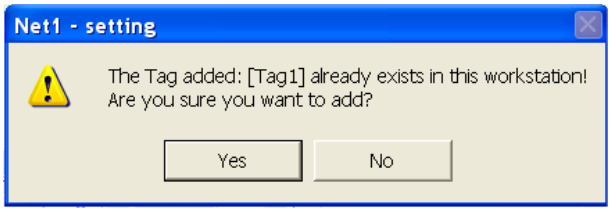


Network Connection setting

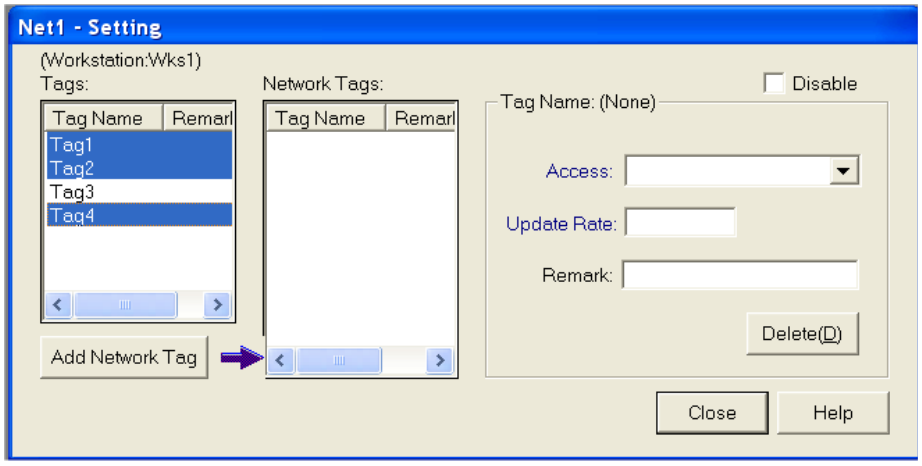
To add a new **Network Tag**, left click a tag name from the **Tags** list and press **Add Network Tag**

button. The selected tag from the server workstation is then added to the **Network Tags** list of the client workstation.

If the tag added does not exist in the client workstation, a message box will appear and ask user to confirm whether the tag will be created in the client workstation or not. Press **OK** button to accept the request and the tag will be added into the tag database of the client workstation. If **No** button is pressed, the tag will not be added into the Network Tags list and the **Network Connection**.



Multiple **Network Tags** can be added in one operation. Select multiple tags from the **Tags** list by clicking each tag while pressing the <Ctrl> key on your keyboard. Another way to select multiple tags is to select a tag first, and then select another tag while press <Shift> Key on the keyboard; all the tags between the two tags in the list will be selected. Selected tags are highlighted in the **Tags** list. Press **Add Network Tag** button after all needed tags are selected to add them into the connection.



To delete a network tag, select it from the **Network Tags** list and press **Delete** button.

To edit the properties of a network tag, select it from the **Network Tags** list and edit the fields shown on the right half of the dialog. The properties are discussed as follows:

Tag Name

Display the tag name of the tag selected from the **Network Tags** list.

Access

Specify the limitation of client workstation on the access of the network tag. There are two options:

1 **Read/Write**: Client workstation can read and write the content of the tag. Any change on the content of the tag on server workstation will be sent to the client workstation. If the content of the network tag is modified by the client workstation, the change will also be sent to the server workstation and the content of this tag on the server workstation will also be modified as well.

2 Read Only: Client can only read the content of the tag. Any change on the content of the tag on server workstation will be sent to the client workstation. However, the client workstation cannot modify the content of the tag on the server workstation.

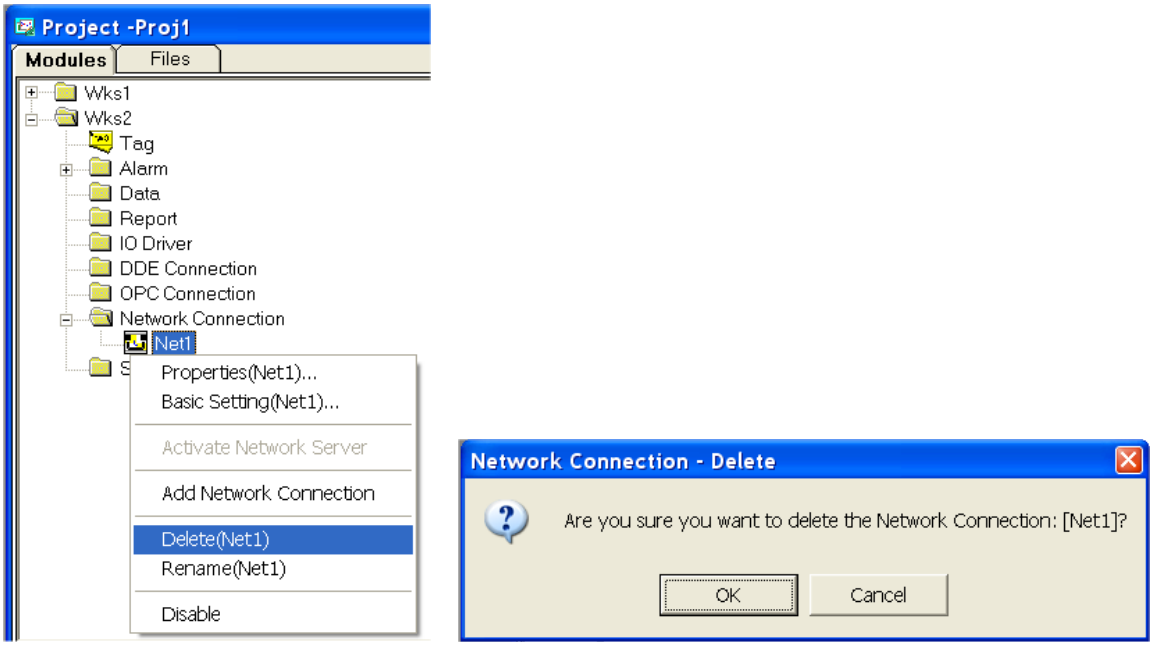
Update Rate

Specify how frequent the server workstation should update the content of the tag to the client workstation. The server scans the content of the tag internally. If this property is set to “1”, it means the server will update the tag to the client at every scan. If the property is set to “N”, the server will only update the tag to the client workstation only after “N” scan. This is setting is useful if the network will be rather busy and it is not necessary to update the tag too often.

Remark

Enter a short text string to describe the tag.

Delete a Network Connection



Right click on a **Network Connection** and select **Delete** from its popup menu to delete the connection. A message box will appear to request for confirmation. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation.

Detecting Disconnection

A Communication Tag is defined in **Network Connection Basic Setting** to detect the breakdown of the connection. The tag is set to "1" when disconnection is detected. Lab-LINK Network module can automatically restore the network connection when the network recovers.

Recovery of Network Connection

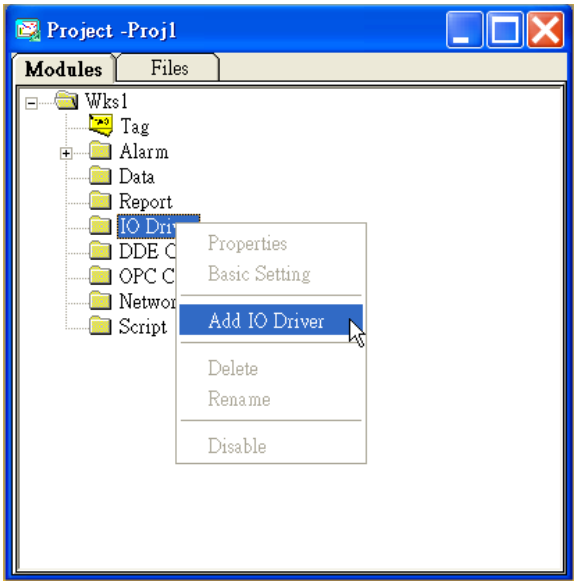
When a **Network Connection** breaks, the client workstation will keep trying rebuilt the connection with the server until the connection is restored. Since the reconnection of network may consume much CPU time, **Lab-LINK** Network module will slow down the reconnection process if it cannot be restored immediately to avoid affecting the normal function of other modules. However, this will also delay the time for the connection to restore when the network recovers.

Chapter 10 I/O Drivers

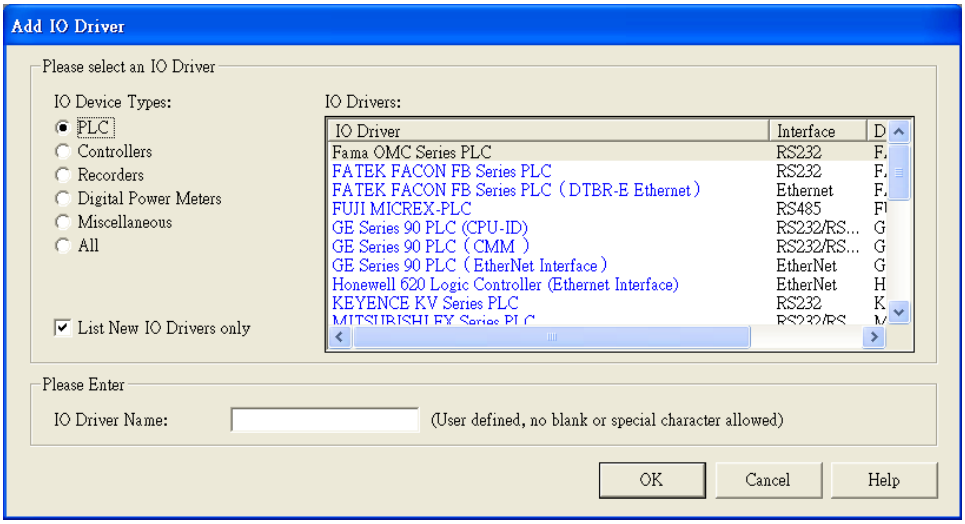
Introduction

I/O Drivers are used to communicate with I/O device. They can scan I/O devices for real time I/O data and write data back to I/O devices when data are changed by Lab-LINK. Lab-LINK provides tens of I/O Drivers for I/O devices from many different venders. This section will discuss how to configure the I/O Drivers in a Lab-LINK project.

Add an I/O Driver



Right click on **IO Driver** node in the **Project** window and select **Add IO Driver** from the popup menu. An **Add IO Driver** dialog appears.



Select an I/O Driver

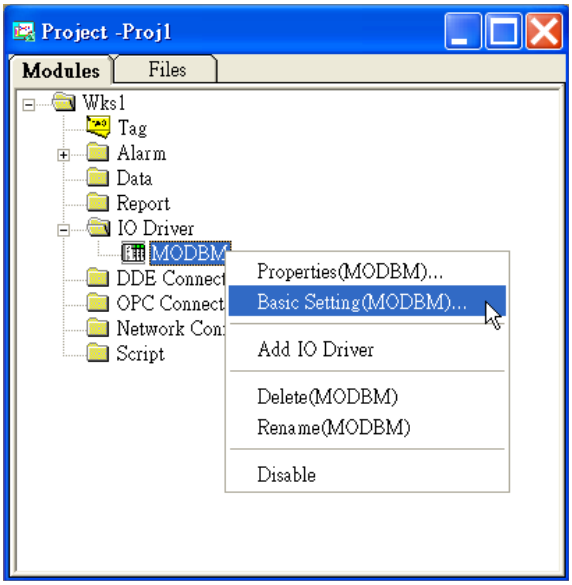
Since **Lab-LINK** 4.0 provide a new dialog to configure **I/O Driver**, **Lab-LINK** users who are used to the old style version 3.x I/O configuration dialog and wish to continue using it, unselect the check box **List New IO Drivers Only** to list the old drivers. Those I/O drivers not marked with version number 4.0 will use the old I/O configuration dialog.

Select an I/O device type from left of the dialog and the I/O Drivers of that type will be listed in the **I/O Drivers** list on the right. Selecting **All** will list all I/O drivers supported by **Lab-LINK** disregard its type.

Select the I/O driver you want to use from the **I/O Drivers** list and specify a name in the **I/O Driver Name** field. The limit on the length of the name is 8 characters. No space or special character allowed. Press **OK** button to open **Basic Setting** dialog of the I/O driver (see next section for detail). After the configuration of the basic setting, a new I/O driver is created and appears in the **Project** window under the **I/O Driver** node. Press **Cancel** button to cancel the addition of a new I/O driver.

Basic Setting of an I/O Driver

Right click on an I/O driver in the **Project** window and select **Basic Setting** from its popup menu to open **Basic Setting** dialog. This dialog is used to configure communication parameters used by the driver.

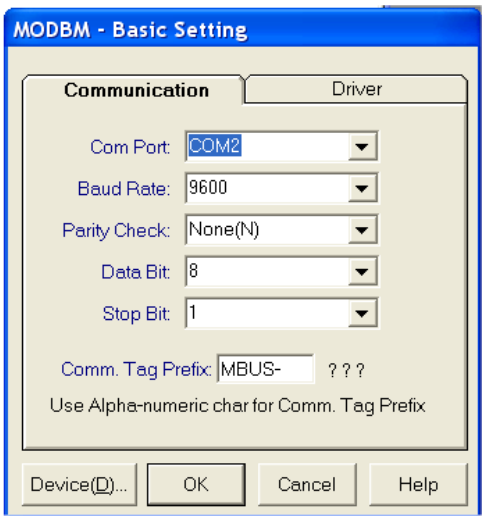


Open Basic Setting dialog of an I/O Driver

Basic Setting contains two pages: **Communication** and **Optional**. The former page defines the communication parameters used to connect to the I/O device and the latter page defines some extra optional parameters related to communication.

Basic Setting – Serial Interface

I/O Drivers with different interface may have different communication parameters. For drivers using serial interface, its basic setting dialog may appears like the figure below. The parameters include:



Basic Setting of I/O Driver using serial interface

Com Port

Specify the communication port used by the I/O driver. Be sure to select the com port that will be actually used to connect with the I/O device.

Baud Rate

Specify the communication speed (baud rate) used by the driver. The unit is bps. This should be exactly the same speed the I/O device uses.

Parity Check

Specify the parity check method used. Selections include: N(None), O(Odd), E(Even), M(Mark)or(Space). This setting should be exactly the same as the method used by the device.

Data Bit

Specify the number of data bit used by the driver. Selections include: 5, 6, 7 or 8. This setting should be exactly the same as the data bit used by the device.

Stop Bit

Specify the number of data bit used by the driver. Selections include: 1 or 2. This setting should be exactly the same as the stop bit used by the device.

Comm. Tag Prefix

Comm. Tag Prefix is used to name **Communication Tag**. **Communication Tag** is used to indicate the communication status between **Lab-LINK** PC and the I/O device. I/O driver will set the value of **Communication Tag** to "1" if the communication breakdown.

Comm. Tag Prefix has a length limit of 5 or 6 characters (depends on the I/O driver used).The actual communication tag name used will be the prefix with a 2 or 3 digit index number behind it. The index number is generated by the driver automatically and always starts with "1". For example, if PLC1, PLC2 and PLC3 are the devices defined in an I/O driver and the **Comm. Tag Prefix** is MBPLC. The actual communication Tag for the devices will be MBPLC001, MBPLC002 and MBPLC003 respectively.

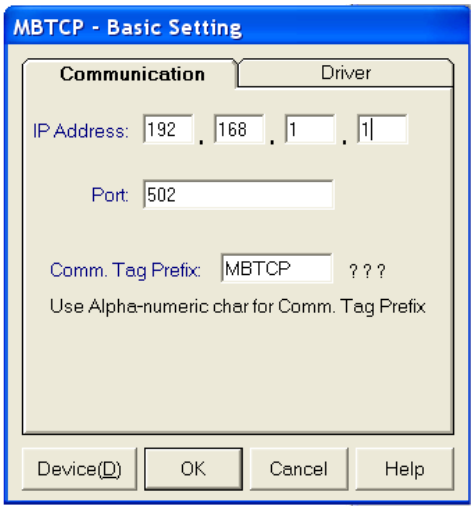
If the prefix entered has less characters then the number needed (5 or 6 depending on the driver used), system will make up the length with "X" behind.

After the communication setting, press **Device** button to configure parameters for each device in this diver (see next section). When the settings are done, press **OK** button to

close the **Basic Setting** dialog and return to the **Project** window.

Basic Setting – Ethernet Interface

For I/O Driver with Ethernet interface, communication parameters include:



Basic Setting dialog of I/O Driver with Ethernet interface

IP Address

Specify the IP address used by the I/O device.

Port

Specify the TCP or UDP port number used by the IO device.

Comm. Tag Prefix

Comm. Tag Prefix is used to name **Communication Tag**. **Communication Tag** is used to indicate the communication status between **Lab-LINK** PC and the I/O device. I/O driver will set the value of **Communication Tag** to “1” if the communication breakdown.

Comm. Tag Prefix has a length limit of 5 or 6 characters (depends on the I/O driver used).The actual communication tag name used will be the prefix with a 2 or 3 digit index number behind it. The index number is generated by the driver automatically and always starts with “1”. For example, if PLC1, PLC2 and PLC3 are the devices defined in an I/O driver and the **Comm. Tag Prefix** is MBPLC. The actual communication Tag for the devices will be MBPLC001, MBPLC002 and MBPLC003 respectively.

If the prefix entered has less characters then the number needed (5 or 6 depending on the driver used), system will make up the length with “X” behind.

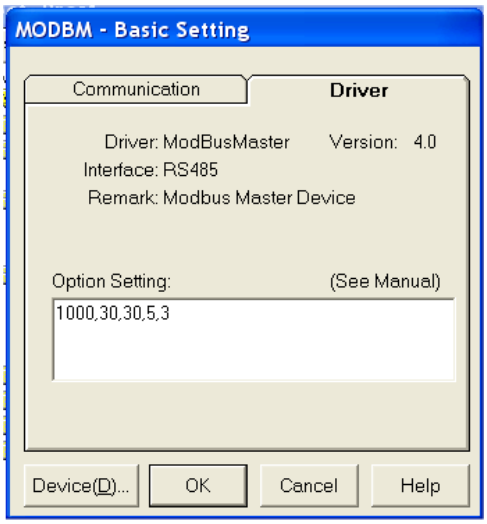
After the communication setting, press **Device** button to configure parameters for each device in this diver (see next section). When the settings are done, press **OK** button to close the **Basic Setting** dialog and return to the **Project** window.

Basic Setting - Optional

Optional page in **Basic Setting** dialog is used to define some extra communication setting of the I/O driver. Parameters may vary for different I/O drivers. Usually, there is no need to set these optional parameters since proper default values have already assigned. However, they can still be modified under special circumstances such as increasing the tolerance of communication interference by extending the timeout and retry settings of the driver.

Optional communication parameters consist of a serial of parameters separating by comma. Some common parameters used by most I/O drivers are:

<Time-out>,<Station Delay>,<Command Delay>, <Error Count>, <Retries>, <ClearValue>



- <Time-out>: The maximum time the driver should wait before response is received after a communication command is sent. If no response is received after this time limit, the command is considered failed. The next communication command will be sent. Unit of this parameter is ms.
- <Station Delay>: When the I/O driver is communicating with multiple I/O devices (ex. devices on a RS-485 network), the I/O driver will poll the devices in turns for data. This parameter specifies the time between the finish of a communication session with a device and the beginning of the

communication session with the next device. Unit of this parameter is ms.

- <Command Delay>: When the I/O driver is configured to scan multiple data from a device, it may need to send several communications read all the data. This parameter is used to define the time between the finish of receiving of response from the device and the beginning of the next command sent. Unit of this parameter is ms.
- <Error Count>: Most I/O driver use Communication Tag to indicate the communication status between it and the I/O device. Judgment of communication status is based on the number of consecutive communication command failure. This parameter specifies the maximum number of consecutive failed communication command sent to a specific device after which the value of the communication tag will be set to “1”.
- <Retries>: If the response received from an I/O device has incorrect format as expected by the driver, it will consider it as a communication error and retry the same command again. If a number of consecutive retries still result in incorrect response, the command will be consider as a failure and system will go on to send the next command. This parameter specifies the maximum number of communication command error after which the command is consider failed.
- <Clear Value>: This parameter determines how the data of a IO Tag is set when its communication status becomes offline. If the parameter is set to 0, the last data of the IO Tag before communication is offline will be retained. If the parameter is set to 1, the data of the IO Tag will be cleared (0 for numerical data and null string for message data) when communication is offline. The default setting of this parameter is 0.

  Note: For some IO drivers with extra parameters, the position of this parameter should be placed after the extra parameters.

All the optional parameters described above can be omitted. If a parameter is omitted, the system will use its default value. However, if any prior parameter is omitted, the “commas“ used as delimiters between parameters cannot be omitted. For example, if only the parameter <Command Delay> needs to be set to 100 with all oter parameters are omitted, the setting should be “, ,100”.

Besides the optional communication parameters discussed above, some I/O divers have extra optional parameters:

<Time-out>,<Station Delay>,<Command Delay>, <Error Count>, <Retries>, <ExtraParm1>, <Clear Value>, <ExtraParm2>

Number and meaning of these extra parameters differ among I/O drivers. Please see the figure below or other Lab-LINK I/O Driver documents for details:

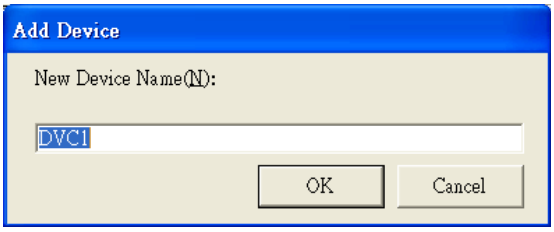
I/O Driver	Parameters		Description
Advantech Adam 4000/5000	<ExtraParm1>	<Use Checksum>	Specify whether checksum should be used in the communication protocol or not. Default value is 0 which means do not use checksum. Set this parameter to 1 if check sum is used.
ICP DAS I-7000	<ExtraParm1>	<Use Checksum>	Specify whether checksum should be used in the communication protocol or not. Default value is 0 which means do not use checksum. Set this parameter to 1 if check sum is used.
Modbus RTU	<ExtraParm1>	<Max. Block Size>	Specify the maximum block size that can be read/written in a Modbus command. Unit of this parameter is byte and the default value is 32
	<ExtraParm2>	<Force Multi-Write>	Always use multiple set fiction code when setting register or coil values
Modbus TCP	<ExtraParm1>	<Max. Block Size>	Specify the maximum block size that can be read/written in a Modbus command. Unit of this parameter is byte and the default value is 250
	<ExtraParm2>	<Force Multi-Write>	Always use multiple set fiction code when setting register or coil values
Yokogawa PLC	<ExtraParm1>	<Need CR>	Specify whether <CR> should be used as ending code in each communication command. Default value is 1 which means <CR> should be added. Set this parameter to 0 if <CR> is not used.

Basic setting - Device

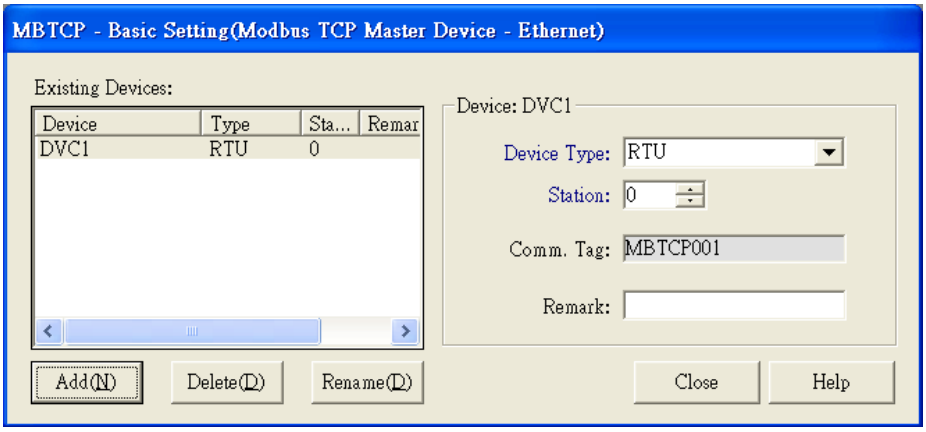
After the setting of communication parameter in basic setting of an I/O driver, press **Device** button to configure each device connected to this I/O driver. On the left of the Device setting dialog is the **Existing Devices** list that shows all the devices already added into the I/O driver. Select a device and its setting is shown on the right half of the dialog. After all devices are added and configured, press **Close** button to return to the previous basic setting dialog.

Add a New Device

Press **Add** button, enter a device name and press **OK** to add a new device. Set the following parameters for the newly added device:



Enter device name



Device setting

Device Name

Specify a name for the new device. The name will be used as the identification of the device through the setting of I/O driver.

Device Type

Select the type of the I/O device, usually the model number of the device. For most I/O driver, this selection is irrelevant since all types have the same communication protocol and the selection won't affect the communication result. If an exact model name of the device you use cannot be found in the list, just choose a similar one.

Note: Type selection in some I/O drivers does affect its communication. Please refer to documents of specific drivers for details.

Station

Specify station number of the device in its communication network. Most communication protocols define a station number to be used by devices to identify themselves when multiple devices are installed in the same communication network (ex. RS-485/422). Every device on the network must have unique station number to guarantee correct

communication.

Comm. Tag Name

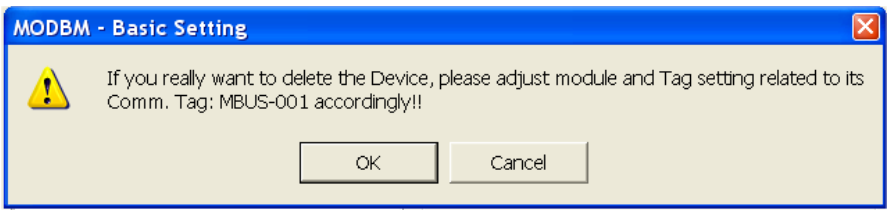
Display the **Communication Tag** name of the device. The name is generated by combining the **Comm. Tag Prefix** in **Basic setting** and an index number. See previous section for **Comm. Tag Prefix** discussion.

Remark

A short text string to describe the device.

Delete a Device

Select a device from the **Existing Devices** list and press **Delete** button to delete it. A message box will appear to request for confirmation. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation.

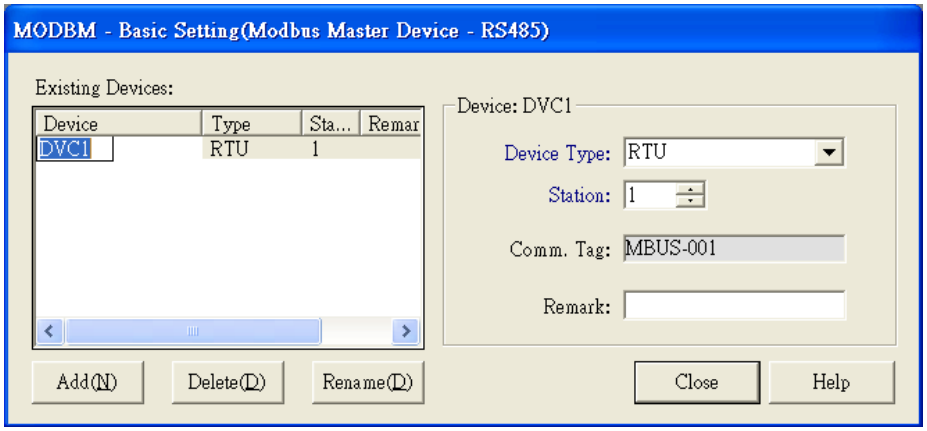


Confirm device deletion message box

When a device is deleted, all IO Tag settings belong to the device will also be deleted. **Comm. Tag** will not be automatically deleted. However, since **Comm. Tags** are generated by **Comm. Tag Prefix** and an index number, the index number for subsequent device in the **Existing Devices** list will be decrease by one and their **Comm. Tag** will be changed respectively. Please keep this change in mind and make necessary modification to related setting of these **Comm. Tags** if necessary. For example, if an IO Driver contains two IO Devices: DVC1 is the first and DVC2 is the second in the list. Their **Comm. Tags** are ComTag01 and ComTag02 respectively with ComTag as the **Comm. Tag Prefix**. When DVC1 is deleted, ComTag01 will become the **Comm. Tag** of DVC2 while ComTag02 will be useless. All settings related to ComTag01 should be changed and ComTag02 can be removed.

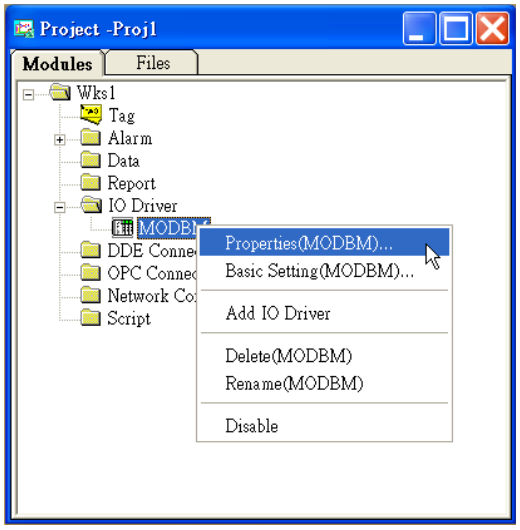
Rename a Device

Select a device name from the **Existing Devices** list and press **Rename** button. Edit its name and press <Enter> key on your keyboard to modify its name.



After its name is changed, all IO Tags belong to the device in the IO Driver setting will also be modified automatically to reflect this change.

IO Tag Setting



Open IO Driver Setting dialog

Right click on an I/O Driver in the **Project** window and select **Properties** from its popup menu to open its setting dialog.

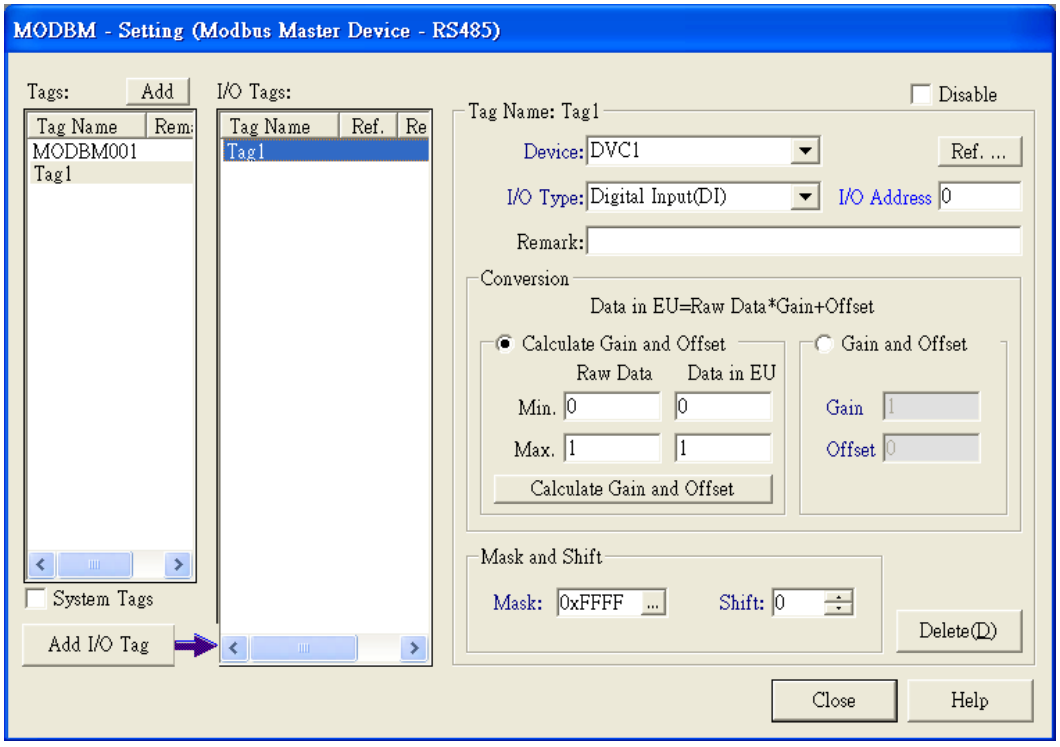
There are two configuration style of Lab-LINK I/O Driver setting. For I/O devices whose I/O memory are freely used by users and not limited to store specific information only (Ex. PLC, usage of I/O depends on its program), the setting dialog will ask developer to specify I/O type and address for each I/O Tag. For I/O devices whose specific I/O address contain specific information (Ex. PID controller, its specific I/O represent present value or set point), the setting dialog will present a list of possible parameters in the device for the developer to choose and map to I/O Tags. Besides, Lab-LINK 4 also provides a new configuration setting style for the I/O address

base devices. These configurations will be discussed in the sections follows.

I/O Tag Setting – Using I/O Address

Most I/O Drivers belong to this category. Each tag is mapped to one or more I/O addresses in the I/O device.

As shown in the figure below, left of the dialog is **Tags** list showing all the tags in the workstation. Next to the **Tags** list is **IO Tags** list showing all the IO tags added into this IO driver. Select a tag from the **IO Tags** lists and its setting appears on the right half of the dialog.

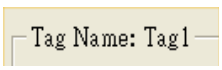


IO Tag Setting

To add a new I/O tag, select a tag name from the **Tags** list and press **Add IO Tag** button. The selected tag will appear in the **IO Tags** list and its setting can then be edited on the right half of the dialog.

To delete an I/O tag, select it from the **IO Tags** list and press **Delete** button.

I/O tag settings include:

Tag Name 

Display the name of the tag being edited.

Device 

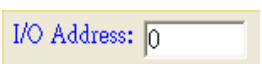
Select the device the tag belongs to. Click on the drop down list to display all the devices created in the basic setting. Click on a device name from the list to select it.

I/O Type 

Specify the I/O type the tag is. Use the drop down list to select the IO type. The content of the list varies for different I/O drivers. Some common types include:

- DI – Digital input
- DO – Digital output
- MI – Internal coil, read only
- MO – Internal coil, read/write
- AI – Analog input
- AO – Analog output
- RI – Register, read only
- RO – Register, read/write
- UAI – Unsigned analog input
- UAO – Unsigned analog output
- URI – Unsigned register, read only
- URO – Unsigned register, read/write

Note: Generally internal coil or register can be read and written. Read only selection for these I/O give use extra control on the access of these I/O. If a coil or a register is set to read only, Lab-LINK will never write any data back to the I/O during runtime.

IO Address 

This parameter is an integer. It specifies the physical I/O address on the I/O device that the IO tag will be mapped to. Range of I/O address depends on the I/O device.

In general, the I/O address is a decimal integer. However, some I/O devices use octal or hexadecimal addresses. Please add a prefix “0” before the address number to indicate it

is an octal address. (Ex. 017 is octal number 17 which is equal to 15 in decimal system) For hexadecimal address, please add a prefix “0x” or a suffix “h”. (Ex. 0x17, 0X17, 17h and 17H are all hexadecimal number 17 which is equal to 23 in decimal system)

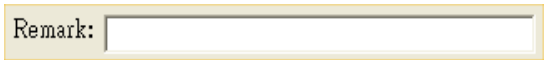
Gain, Offset, Mask and Shift

IO Drivers will perform several computation on the raw data acquired from the I/O device before assign the data to tags. The computations performed are Mask, Shift, Gain and Offset, in the exact order. If any of the setting is omitted, the corresponding computation will also be spared. These parameters will be discussed in later section.

Disable

Selection of this parameter will disable the I/O tag, that is, I/O driver will neither scan for its value nor write data to it.

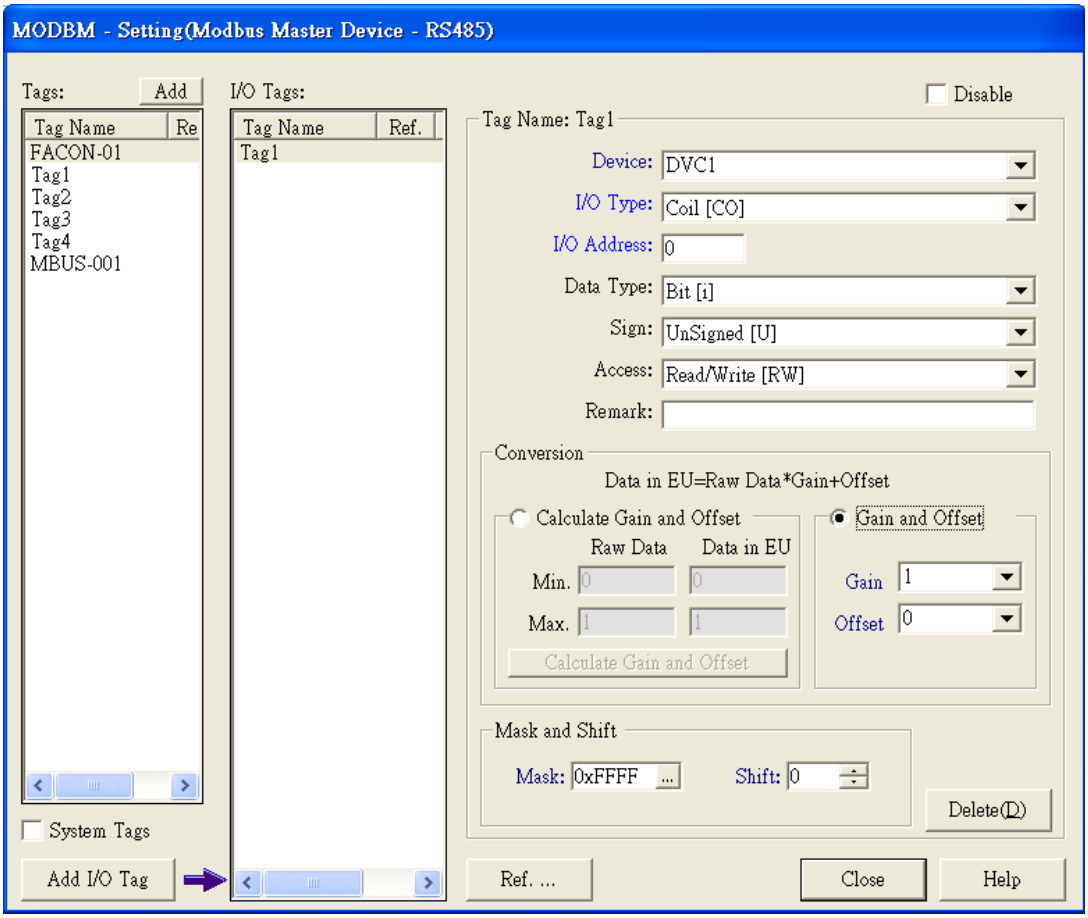
Remark



A short text string to describe the I/O tag.

I/O Tag Setting ─ Using I/O Address (Lab-LINK 4.0)

Lab-LINK 4.0 provides a new I/O tag configure method. More parameters are added to enhance the flexibility of I/O drivers. As shown in the figure below. Left of the dialog are the same **Tags** and **IO Tags** list, but the right half has more field for each I/O tag to set.

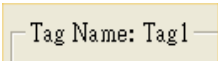


IO Tag Setting

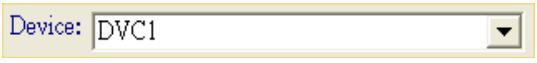
Select a tag name from the **Tags** list and press **Add IO Tag** button to add a new IO tag. The selected tag will appear in the **IO Tags** list and its setting can be edited in the filed on the right.

To delete an I/O tag, select it from the **IO Tags** list and press **Delete** button.

IO Tag parameters are discussed as follows:

Tag Name 

Display the name of the tag being edited.

Device 

Select the I/O device the tag belongs to. Use the drop down list to select an I/O device by clicking its name from the list.

IO Type 

Select the I/O type of the I/O tag. Selectable types depend on the I/O driver used. Please use the drop down combo box to select the I/O type the tag actually references.

IO Address 

Specify an integer that is the physical I/O address on the I/O device the tag references. Range of the address varies with drivers.

In general, a decimal integer is entered for this parameter. However some I/O devices may need an octal or hexadecimal address. To enter an octal number, please add a leading 0 before the address. For example, 017 indicates the octal number 17 that is equal to 15 in decimal number system. To enter a hexadecimal number, please add leading 0x or 0X before the address or a trailing h or H after the address. For example, 0x17, 0X18, 17h, and 17H all indicate the hexadecimal number 17 that equals 23 in decimal number system.

Data Type 

This parameter defines how I/O driver will convert the I/O value into tag data.

In general, there are two major types of data: digital and analog. Digital data are of bit type and analog data are of word type. Bit data have values of either 0 or 1, but word data have more variation. A word is usually composed of 16 bits and will be converted to a signed or unsigned integer. In some application, a tag may be mapped to two or more consecutive words and I/O data conversion may have different needs: converted data to an integer or a floating number, using binary or BCD coding for conversion, determining high byte and low byte order, etc. To provide more flexibility on I/O data processing, Lab-LINK 4.0 let users select **Data Type** to determine how the I/O driver will convert I/O value to tag data.

Use the drop down list to select the data type based on your application. Selectable **Data Types** include:

- **Bit[i]**: A single bit data. Its value is either 0 or 1.
- **Word[w]**: A single word data. Its value is converted to an 2 byte short integer

using binary coding(Range: 0~65535 or -32767~32766, depending on the **Sign** parameter discussed later)。

- **2 Words[d]**: Two words of consecutive address starting with the specified I/O address. Convert its value into a 4 byte long integer using binary coding. (Range: 0~4294967295 or -2147483648~2147483647)
- **3 Words[t]**: Three words of consecutive address starting with the specified I/O address. Convert its value into an integer using binary coding (the integer is actually stored as a floating number due to its length).
- **4 Words[q]**: Four words of consecutive address starting with the specified I/O address. Convert its value into an integer using binary coding (the integer is actually stored as a floating number due to its length).
- **2 Digits BCD[p]**: Convert a single word data into a two digit integer using BCD coding. Only the lower byte will be used.
- **4 Digits BCD[m]**: Convert a single word data into a 4 digit integer using BCD coding.
- **6 Digits BCD[s]**: Taking two words of consecutive addresses starting with the specified address and convert its data into a 6 digit integer using BCD coding. For the word with higher address, only the lower byte will be used.
- **8 Digits BCD[o]**: Taking two words of consecutive addresses starting with the specified address and convert its data into a 8 digit integer using BCD coding.
- **12 Digits BCD[j]**: Taking three words of consecutive addresses starting with the specified address and convert its data into a 12 digit integer using BCD coding. For the word with highest address, only the lower byte will be used.
- **16 Digits BCD[h]**: Taking four words of consecutive addresses starting with the specified address and convert its data into a 16 digit integer using BCD coding.
- **Float[f]**: Taking two words of consecutive addresses starting with the specified address and convert its data into a single precision floating number.

- **Double[r]**: Taking four words of consecutive addresses starting with the specified address and convert its data into a double precision floating number.
- **Byte[b]**: Convert the lower byte of the specified word into an integer using binary coding.
- **3 Bytes[c]**: Taking three bytes of data in the two consecutive words starting with the specified address and convert its value into an integer using binary coding. For the word with the higher address, only the lower byte is use.
- **3 Bytes Real[e]**: Taking three bytes of data in the two consecutive words starting with the specified address and convert its value into a floating number using binary coding. For the word with the higher address, only the lower byte is use.
- **Swapped 2 Words[l]**: Two words of consecutive address starting with the specified I/O address. Convert its value into a 4 byte long integer using binary coding (Range: 0~4294967295 or -2147483648~2147483647), but with lower and higher word swapped.
- **Swapped 3 Words[u]**: Three words of consecutive address starting with the specified I/O address. Convert its value into an integer using binary coding (the integer is actually stored as a floating number due to its length), but with the high/low words swapped.
- **Swapped 4 Words[x]**: Four words of consecutive address starting with the specified I/O address. Convert its value into an integer using binary coding (the integer is actually stored as a floating number due to its length), but with the high/low words swapped.
- **Swapped Float[a]**: Taking two words of consecutive addresses starting with the specified address and convert its data into a single precision floating number, but with the high/low words swapped.
- **Swapped Double[g]**: Taking four words of consecutive addresses starting with the specified address and convert its data into a double precision floating number, but with the high/low words swapped.
- **Swapped 8 Digits BCD[k]**: Taking two words of consecutive addresses

starting with the specified address and convert its data into a 8 digit integer using BCD coding, but with the high/low words swapped.

- **Swapped 12 Digits BCD[v]**: Taking three words of consecutive addresses starting with the specified address and convert its data into a 12 digit integer using BCD coding, but with the high/low words swapped.
- **Swapped 16 Digits BCD[n]**: Taking four words of consecutive addresses starting with the specified address and convert its data into a 16 digit integer using BCD coding, but with the high/low words swapped.
- **2 bit[J]**: Take the lowest two bits of the specified word and convert its value into an integer using binary coding.
- **3 bit[K]**: Take the lowest three bits of the specified word and convert its value into an integer using binary coding.
- **4 bit Nibble[y]**: Take the lowest four bits of the specified word and convert its value into an integer using binary coding.
- **2 ASCII[A]**: Convert the word into a two character string using ASCII coding. The data will be sent to the Message field of the tag.
- **4 ASCII[B]**: Take 2 words of consecutive address starting with the specified address and convert its value into a 4 character string using ASCII coding. The data will be sent to the Message field of the tag.
- **6 ASCII[C]**: Take 3 words of consecutive address starting with the specified address and convert its value into a 6 character string using ASCII coding. The data will be sent to the Message field of the tag.
- **8 ASCII[D]**: Take 4 words of consecutive address starting with the specified address and convert its value into a 8 character string using ASCII coding. The data will be sent to the Message field of the tag.
- **10 ASCII[E]**: Take 5 words of consecutive address starting with the specified address and convert its value into a 10 character string using ASCII coding. The data will be sent to the Message field of the tag.
- **12 ASCII[F]**: Take 6 words of consecutive address starting with the specified address and convert its value into a 12 character string using ASCII coding. The data will be sent to the Message field of the tag.

- **14 ASCII[G]**: Take 7 words of consecutive address starting with the specified address and convert its value into a 14 character string using ASCII coding. The data will be sent to the Message field of the tag.
- **16 ASCII[H]**: Take 8 words of consecutive address starting with the specified address and convert its value into a 16 character string using ASCII coding. The data will be sent to the Message field of the tag.

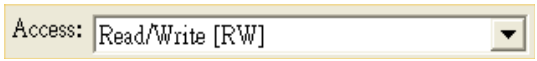
Sign 

This parameter is used only when I/O values are converted to integer related data types. It will determine whether the converted integer is signed or unsigned. It is ignored if non integer data type is selected.

Please use the drop down list to select an appropriate item:

Unsigned[U]: Convert the data into an unsigned integer.

Signed[S]: Convert the data into an signed integer.

Access 

This parameter is used to limit access to the tag data during runtime.

In general, I/O driver is capable of two operations to an I/O: Read and Write. When running, I/O driver will keep on reading I/O to get real time data. When tag values is changed in Lab-LINK (Ex. By user operation), I/O driver will write the changed data back to its corresponding I/O address in the I/O device.

In some application, it is possible that the Read/Write access to the I/O need to be limited. Use the drop down list to select Access limit applied to the I/O tag:

Read/Write[RW]: The I/O address can be read and written.

Read only[RO]: The I/O address will only be read. No writing is allowed.

Write only[WO]: I/O Driver will only write data to the I/O address when tag value is changed. No reading will be performed.

Force only[FO]: The I/O driver will read and write the I/O device. However, the read data won't be send to tag but only used to compare with tag data. If the I/O data is different from the tag data, the Driver will keep writing tag data back to the I/O address until their values are identical.

Read once/Write[R1W]: The I/O is only read once when the driver starts. The I/O will

only be written when tag data changed in Lab-LINK afterward.

Gain, Offset, Mask and Shift

Mask, shift, gain and offset operation will be performed in the stated order upon the raw data read from the I/O device before doing data type conversion. These parameters will be discussed in detail later.

Disable

Click on the check box to disable the I/O tag. When checked, the I/O tag won't be read and written by the I/O driver at runtime.

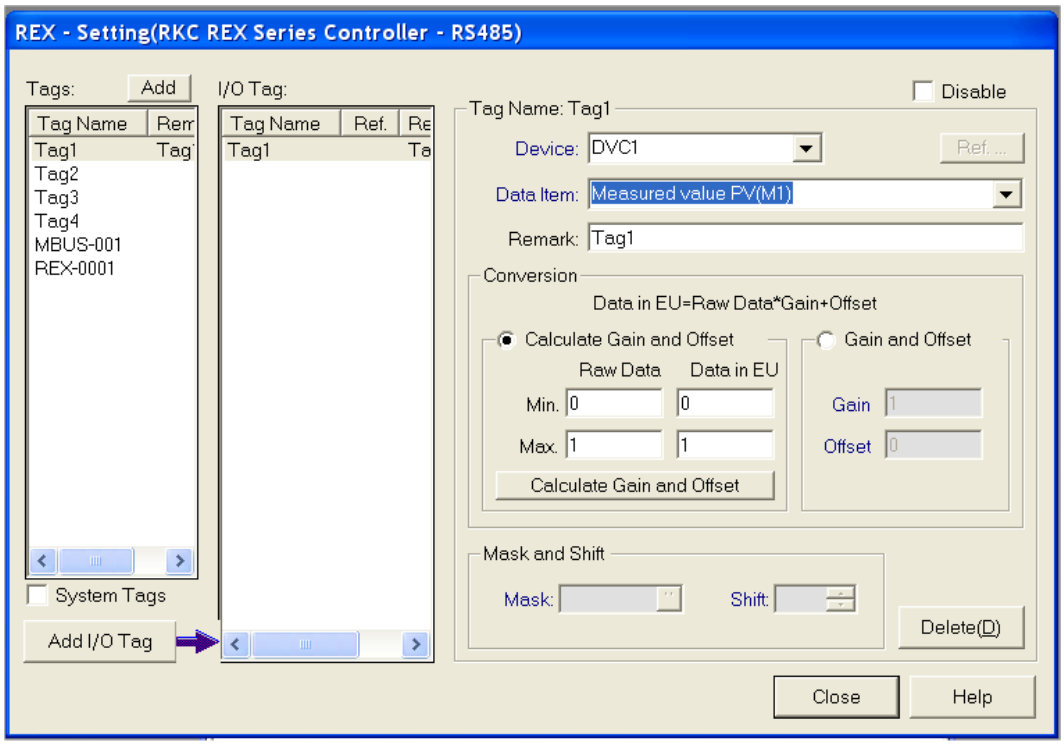
Remark

Enter a short text to describe the I/O Tag.

I/O Tag Setting ─ Using Data Item Names

Some I/O devices do not use addresses to specify data. Some I/O devices does have address but each address representing specific data. This is most commonly seen in PID controllers. To simplify the I/O driver configuration for these devices, Lab-LINK provides a I/O setting dialog for this kind of drivers. Instead of specifying address, I/O tags are mapped to I/O point by selecting a data item name.

Similar to previous I/O setting dialog, left of the dialog are **Tags** list and **IO Tags** list and right half of the dialog is the setting for the selected IO Tag.

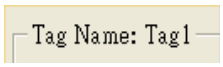


IO Tag Setting

To add a new I/O tag, select a tag name from the **Tags** list and press **Add IO Tag** button. The selected tag will appear in the **IO Tags** list and its setting can then be edited on the right half of the dialog.

To delete an I/O tag, select it from the **IO Tags** list and press **Delete** button.

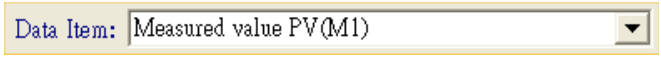
I/O tag settings include:

Tag Name 

Display the name of the tag being edited.

Device 

Select the I/O device the tag belongs to. Use the drop down list to select an I/O device by clicking its name from the list.

Data Item 

Specify the data item the IO Tag references. Use the drop down list to select an item.

Gain, Offset, Mask and Shift

Mask, shift, gain and offset operation will be performed in the stated order upon the raw data read from the I/O device before doing data type conversion. These parameters will be discussed in detail later.

Disable 

Click on the check box to disable the I/O tag. When checked, the I/O tag won't be read and written by the I/O driver at runtime.

Remark 

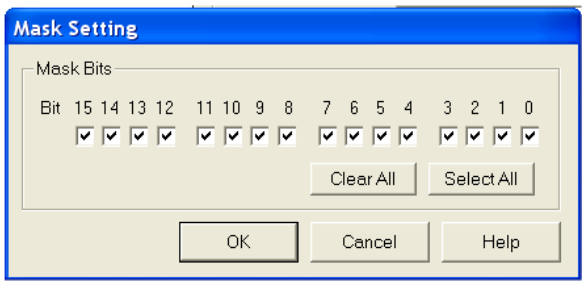
Enter a short text to describe the I/O Tag.

Mask and Shift

When raw data are acquired from the IO device, Mask and Shift operation will first be operated upon them. Mask and shift are usually applied to word data. A word usually consists of 16 bits. Mask is used to remove unused bits and shift is used to move the selected bit to appropriate position.

Mask and shift setting

Press [...] button to show mask setting dialog. To set the **Mask**, select the bits you want to preserve by checking on the check box below the bits while uncheck on those you want to remove. All unchecked bits will be set to 0 after the mask operation. **Shift** is set by entering a number in the shift field or using the spin button next to it to adjust its value. This number will shift the bits rightward in the word.



Mask setting

If no Mast and Shift operation is required, please leave the field to its default value of 0xFFFFand 0.

The example below is used to illustrate the application of **Mask** and **Shift** operation:

Ex: Acquire bit 8 ~ bit 10 in a word data and convert it into an integer with range of 0 to 7.

Mask Setting: 0x0700

Shift Setting: 8

Description: Mask operation is applied first. As shown in the figure below, by setting Mask to 0x0700 (that is 0000011100000000 using binary number notation), all other bits except bit 8, bit 9 and bit10 are all set to 0 (binary notation: 00000xxx00000000, where xxx represent bit 8, bit 9 and bit10).

After the mask operation, shift operation is performed by the IO driver. Since shift setting is 8, all bits will be moved rightward for 8 positions. Those bits moved beyond bit 0 will be discarded. After the shift operation, the masked data become xxx in binary number notation.

Raw data

bit 15 bit 0

x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Mask

bit 15 bit 0

0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Mask data

bit 15 bit 0

0	0	0	0	0	x	x	x	0	0	0	0	0	0	0	0

Shifted data

bit 15 bit 0

0	0	0	0	0	x	x	x

→ Shift 8 positions

Due to its nature, **Mask** should not be performed on bit data and should be set to the default 0xFFFF for such cases. **Shift** can be applied to bit data but with a different effect. As shown in the figure below, when **Shift** is set to 8 for a bit data, it will move the bit leftward and insert 0 for the newly created bits. The shifted data will then be converted according to **Data Type** setting.

Before Shift

bit 15 bit 0

x

After shift

bit 8 bit 0

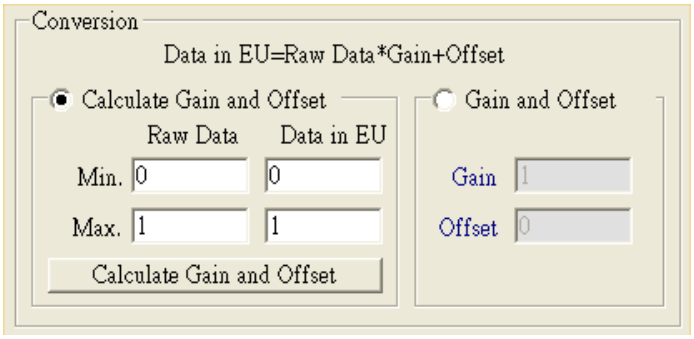
0	0	0	0	0	x	x	x

Gain and Offset

Gain and offset are usually used in analog data conversion. For example, they can be used to convert the raw data to appropriate engineering unit. In general, gain and offset calculation applies a linear conversion to the raw data using the formula below:

Data in EU=Raw Data*Gain+Offset

Raw data are the data read from the I/O device by the IO Driver and the Mask, Shift and Data Type conversion have been performed. Data in EU are the tag data in correct engineering unit that will be display and stored in Lab-LINK.

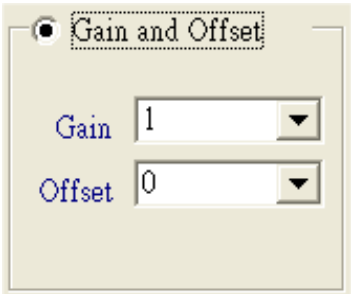


Gain and offset setting

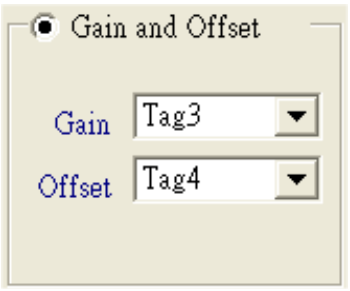
There two method to define gain and offset as described below:

Specify Gain and Offset

Click to select **Gain and Offset** to specify these two parameters directly. Enter **Gain** and **Offset** value in the corresponding fields and IO Driver will use them to perform Gain and Offset operation at runtime.



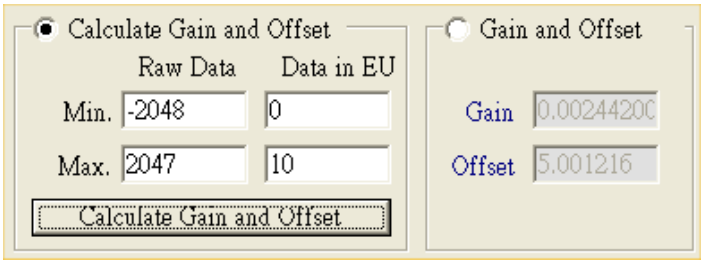
For **Lab-LINK** 4.0 IO Drivers whose IO Tags use I/O address setting, Tag names can also be used in **Gain** and **Offset** settings. Users can enter an established Tag name in the fields or use the drop down list to select a Tag name.



If Tag names are used as **Gain** and **Offset**, **Lab-LINK** users will be able to change **Gain** and **Offset** values at runtime. However, the change will take effect only after the next IO scan.

Calculate Gain and Offset

Click to select **Calculate Gain and Offset** and enter **Min.** and **Max.** values of **Raw Data** and **Data in EU**. Press **Calculate Gain and Offset** button and the system will calculate the actual Gain and Offset value according to the Raw and EU data range entered automatically. The calculated **Gain** and **Offset** values will appear in the fields on the right. The example below is used to illustrate gain and offset application.



Ex：An analog input in an IO device is used to measure a pressure value. The measuring range of the pressure sensor is 0~10 Kg/cm^2. The sensor is connected to a transmitter which converts the pressure into 4-20mA signal for the use of the I/O device. The IO device will then measurement the signal, do the AD conversion and store it as an integer with range between -2048 and 2047 in its register.

Raw Data: Min. -2048, Max. 2047

Data in EU: Min. 0, Max. 10

Description: Raw data are the data IO Driver acquire from the I/O device. In this case, the data have a range between -2048 and 2047. Data in EU is the tag data displayed and stored by **Lab-LINK**, that is, the pressure value in pressure unit Kg/cm^2. Therefore, the

data in EU has the range between 0 and 10. Entering these limits in the I/O setting dialog and use the automatic calculation function, the system will calculate the actual **Gain** and **Offset** used by I/O driver as 0.002442 and 5.001216 respectively.

At runtime, when I/O driver read raw data of -2048、0 及 2047 from the IO device, the tag will show data in EU as

-2048×0.002442+5.001216=0 Kg/cm^2

0×0.002442+5.001216=5.001216 Kg/cm^2

2047×0.002442+5.001216=10 Kg/cm^2

Reference

Reference provides the possibility to combine data from multiple IO addresses and perform predefined linear calculation before sending the data to tag.

Note: **Reference** only provide one way conversion. In other words, IO Drivers can read and convert raw data from IO device correctly according to **Reference** setting and send it to tags. However, it cannot write the changed tag data back to IO device correctly. Reference is not available for IO drivers using data item setting.

To set Reference, press **Ref. …** button in IO setting dialog to show Source Reference dialog. **Reference Variables** are used to represent data from different addresses. Up to 10 **Reference Variables** can be added ─ **:R0**、**:R1**、……、**:R9**, every variable is assigned to an IO address like a tag. An example is used to illustrate the usage of **Reference**.

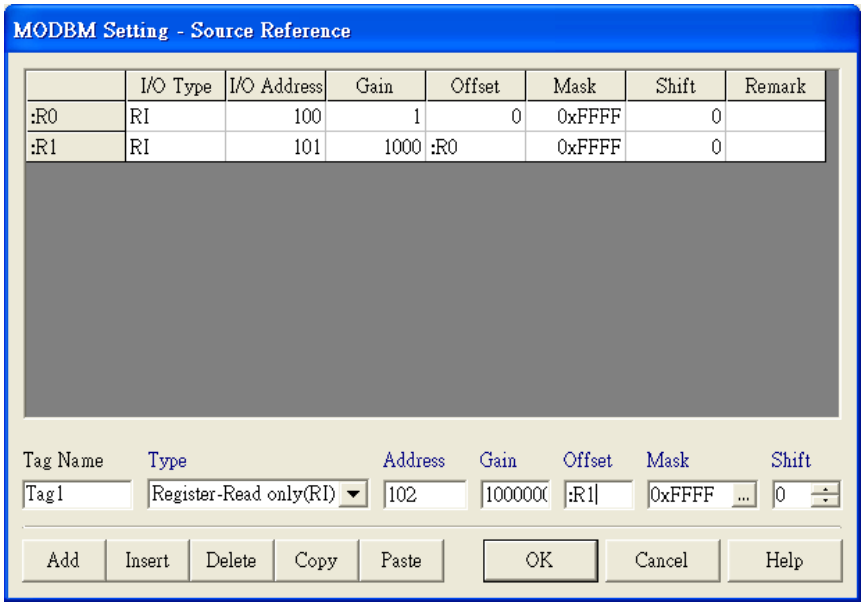
For **Lab-LINK** 4.0 IO Drivers with IO Tags using I/O address setting, Tag names can also be used in **Gain** and **Offset** settings of **Reference Variables**.

Ex.: NewTag1 is an IO data that is stored in three register with addresses 100、 101 and 102. The equation to calculate its value is

$$NewTag1=R(102)\times1{,}000{,}000+R(101)\times1{,}000+R(100)$$

Where R(100) represent the data in register address 100.

Setting:



(1) Press **Ref. …** button to enter source reference dialog of NewTag1.

(2) Press Add button to add a new Reference Variable :R0. Define its parameters as shown below:

	IO Type	IO Address	Gain	Offset	Mask	Shift
:R0	RI	100	1	0	0xFFFF	0

(3) Press Add button to add a new Reference Variable :R1. Define its parameters as shown below:

	IO Type	IO Address	Gain	Offset	Mask	Shift
:R1	RI	101	1000	:R0	0xFFFF	0

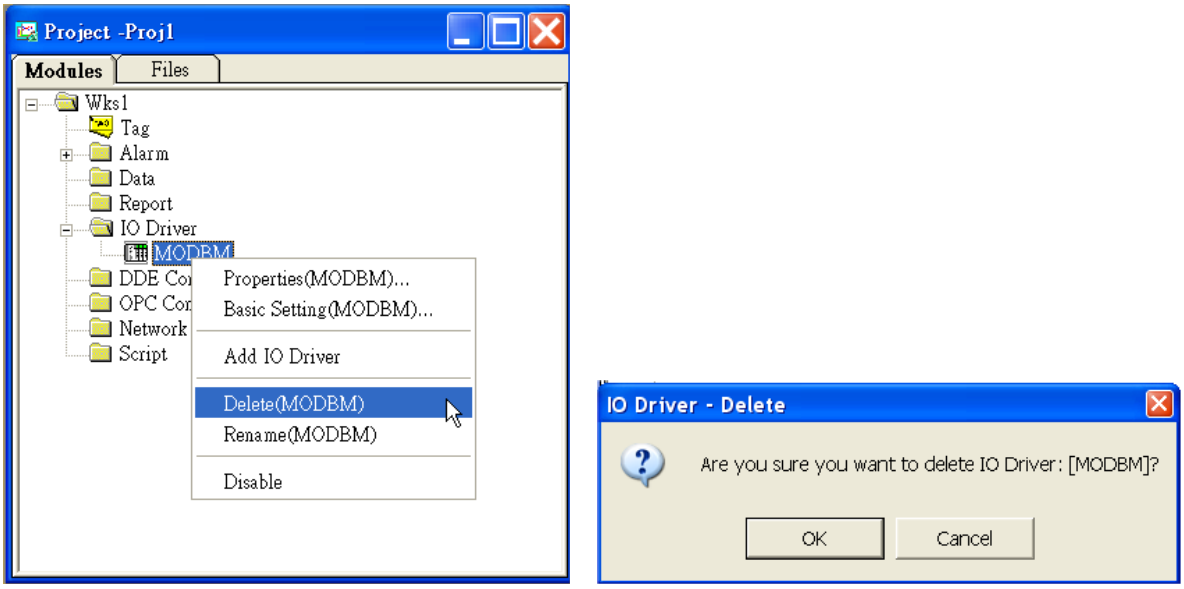
(4) Enter the following setting in the tag setting fields at the bottom of the dialog

TAG Name	Type	Address	Gain	Offset	Mask	Shift
NewTag1	RI	102	1000000	:R1	0xFFFF	0

Description: The settings above first store the value of R(100) in variable :R0. It then times the value R(101) by 1000, add the value of variable of :R0 and store the result to variable :R1. Lastly, it times the value of R(102) by 1000000, add it with variable :R1 and send the result to tag NewTag1. Therefore, the value of NewTag1 is calculated with the equation below as expected.

$$\text{NewTag1} = \underbrace{R(102) \times 1{,}000{,}000 + R(101) \times 1{,}000 + \overbrace{R(100)}^{:R0}}_{:R1}$$

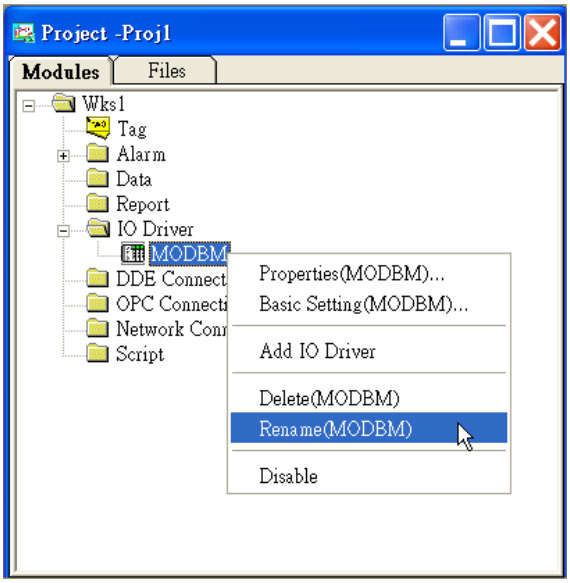
Delete IO Driver



Delete an IO Driver

Right click on the IO driver to be deleted and select **Delete** from its popup menu. A message box appears to request for confirmation of deletion. Press **OK** button to delete it or press **cancel** button to cancel the operation.

Rename IO Driver

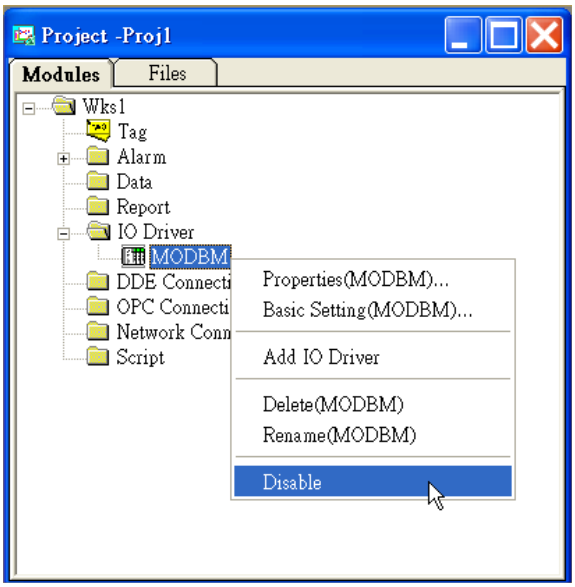


Rename an IO Driver

Right click on the IO driver to be renamed and select **Rename** from its popup menu. Its name will

be highlighted and allow user to edit. Enter a new name and press <Enter> key on the keyboard to change its name.

Disable



Disable an IO Driver

Right click on the IO driver to be disabled and select **Disabled** from its popup menu. Its name will be displayed in gray color to indicate that it is disabled. When the project is regenerated and rerun, the disabled IO driver will not be executed and no communication with devices using this driver will occur.

To enable the IO driver, right click on the IO driver and select **Enable**. After the project is regenerated and rerun, the IO driver will resume running.

Detection of Communication Problem

In general, all Lab-LINK IO drivers are capable of detecting the communication breakdown between the PC and the IO devices. There are two level of communication problem: communication breakdown of the IO device or a single IO point. The former is indicated by the value of its Communication Tag and the latter is shown by **State** field of the IO tag.

Communication Breakdown of an IO Device

As seen in IO device setting described in the previous sections, a **Communication Tag** is assigned to each IO device in an IO driver to indicate its communication status. When the communication between the driver and the IO device breakdown, the value of the **Communication Tag** will be set to 1. When the communication resume, its value will be set to 1.

Please note that IO Driver will not set **Communication Tag** to 1 immediately when a single communication command it sends fails. Since it is possible that communication may have to tolerate some kind of interference, so communication commands may fail from time to time while the communication can still be maintained at an acceptable level. Therefore, IO Driver will set Communication Tag to 1 only after a preset number of consecutive communication command failures. This is determined by some optional communication parameter discussed in previous sections. Any successful communication command will reset the Communication Tag to 0.

Communication Breakdown of an IO Tag

As discussed in Tag Chapter of this manual, every tag has a State field to indicate its stats. For IO Tag, its **State** represent sits communication status. There are two kinds of states:

Input States: For those IO Tags with **Access** setting allowing reading of its value from the IO device, IO Driver will keep scanning the device for their real time values. If a reading command related to an IO tag fail, its **State** will be set to **Offline**. The next time the IO tag is successfully read, its **Input State** will be set to **Online**.

Output State: For those IO Tags with **Access** setting allowing writing of its value to the IO device, IO Driver will write value to the device when the tag data change in **Lab-LINK**. When the writing command fails, IO Driver will retry again. If it still fails to write data to the device after three consecutive trials, it will set the Output State of the tag to Output Failed. The State will be clear when any latter writing succeeds.

Suspend Communication

Communication with an IO device can be suspended by setting its **Communication Tag** to -1 or -2. IO Driver will stop scanning the device for data when its communication is suspended. To resume communication, set the value of the **Communication Tag** back to 0. The difference between setting the **Communication Tag** to -1 and -2 are described as follows:

Tag Value	-1	-2
Action when communication suspended	IO Tag values remain unchanged	Based on the optional communication parameter <ClearValue> to determine whether reset all IO Tag to 0
Action when communication resumed	No extra action	For IO Tags with **Access** setting “Read once/Write [R1W]”, their values will be read from the IO device again.

Note: Both reading and writing of all IO on a suspended device are stopped. Any change of the IO tag belonging to that IO device will not trigger the writing of data back to the device. Output State of the tag will not reflect that data are not written back either.

Chapter 11 OPC Connection

Introduction

OPC is a standard based on Microsoft COM/DCOM technology and defined by OPC foundation to solve the problem of data communication between applications and IO devices from different venders.

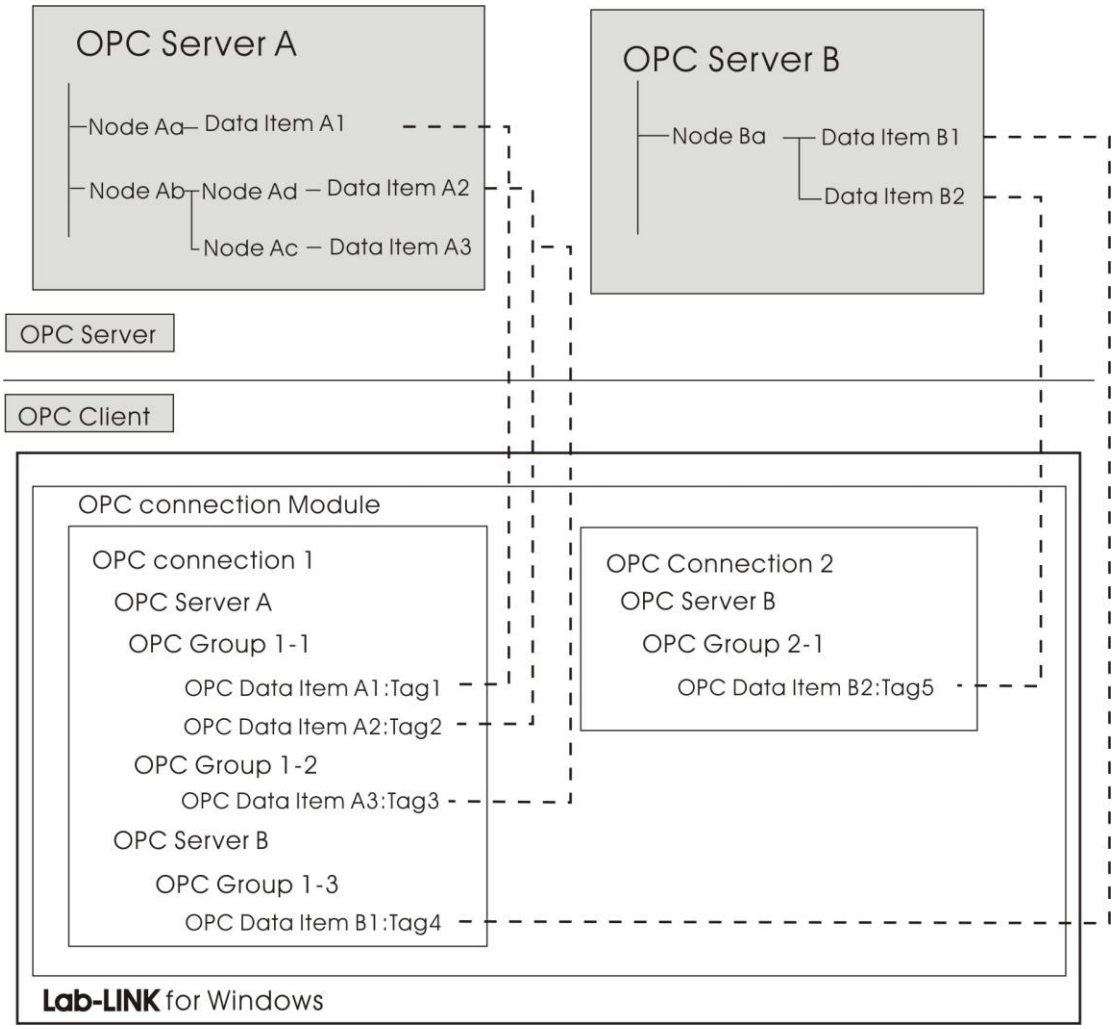
Traditionally, application developers have to write their own IO drivers to communicate with IO devices. This may becomes a burden for developers and owners as well. With the standard, IO Drivers complying with OPC (called OPC Servers) can be used by any OPC compliant applications (called OPC Client) to communicate with IO devices the driver supports.

Lab-LINK for Windows' OPC Connection module is an OPC client complying with OPC DA standard. You can use it to connect to any third party OPC servers to extend the connectivity of Lab-LINK for IO devices.

Features

- ❒ Comply with OPC Data Access Specification 2.05.
- ❒ Provide OPC Server browsing function and can search for installed OPC Server.
- ❒ Users can define Update rate and Dead band for each OPC Group.
- ❒ A Communication Tag is assigned to each OPC Group to detect its communication status
- ❒ Can browse OPC Server for established OPC Item.
- ❒ Provide OPC Item identification validation function (subject to OPC Server support).
- ❒ Can request for data type conversion of OPC Items. (Subject to OPC Server support).
- ❒ Can create Lab-LINK tag automatically for each OPC Item selected.
- ❒ Support connections with multiple OPC servers.

OPC Architecture



OPC Architecture

Roles of application and IO driver under OPC architecture are:

- ❒ OPC Server: The IO driver that provide IO data. It is responsible for communication with IO device and provides access of real time data to applications.
- ❒ OPC Client: Lab-LINK OPC Connection module. It can created connection between Lab-LINK and OPC server to let Lab-LINK access real time data on the IO device through OPC Server.

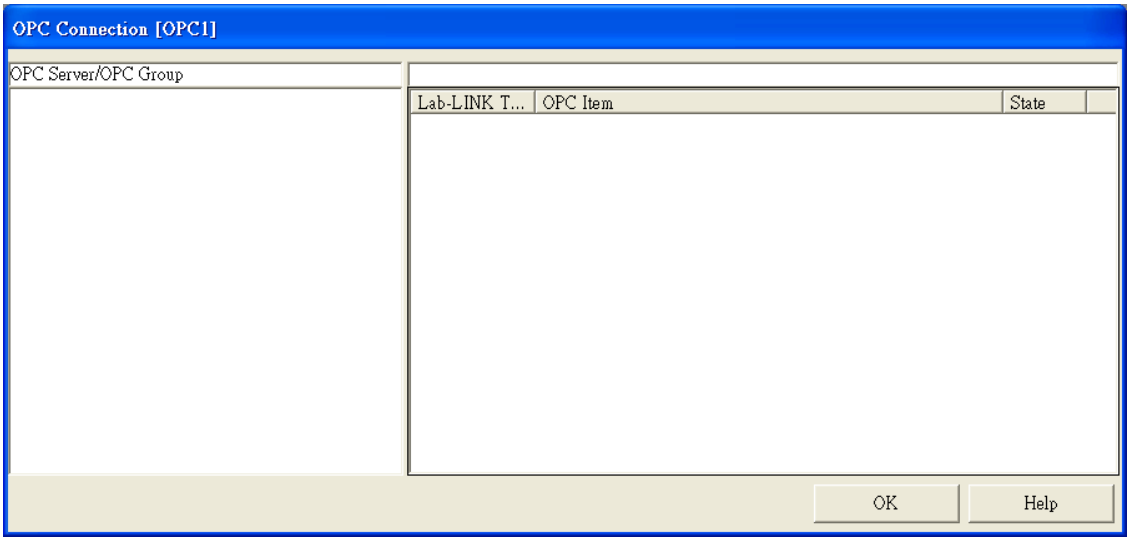
Add an OPC Connection

Right click on the **OPC Connection** node in the **Project** window and select **Add OPC Client** from the popup menu. A dialog appears to request for a name. Note that there are limits on the naming of OPC connection:

- The name can only contain numeric characters and cannot contain the following special characters:
  ! . [ ] ` \ / : * ? " < > | # $ % & ' ( ) + , ; = @ ^ { } ~
- The limit on the length of the name is 80 characters
- The name cannot be the same as any other Lab-LINK modules.

Add an OPC connection

Enter a name for the OPC connection and press **OK** button to create a new connection. An **OPC Connection** window as shown in the figure below will appear. Left part of the window is used to display added **OPC Server** and **OPC Group** while the right part shows **OPC Items** created in selected **OPC Server/OPC Group**.



OPC Connection Window

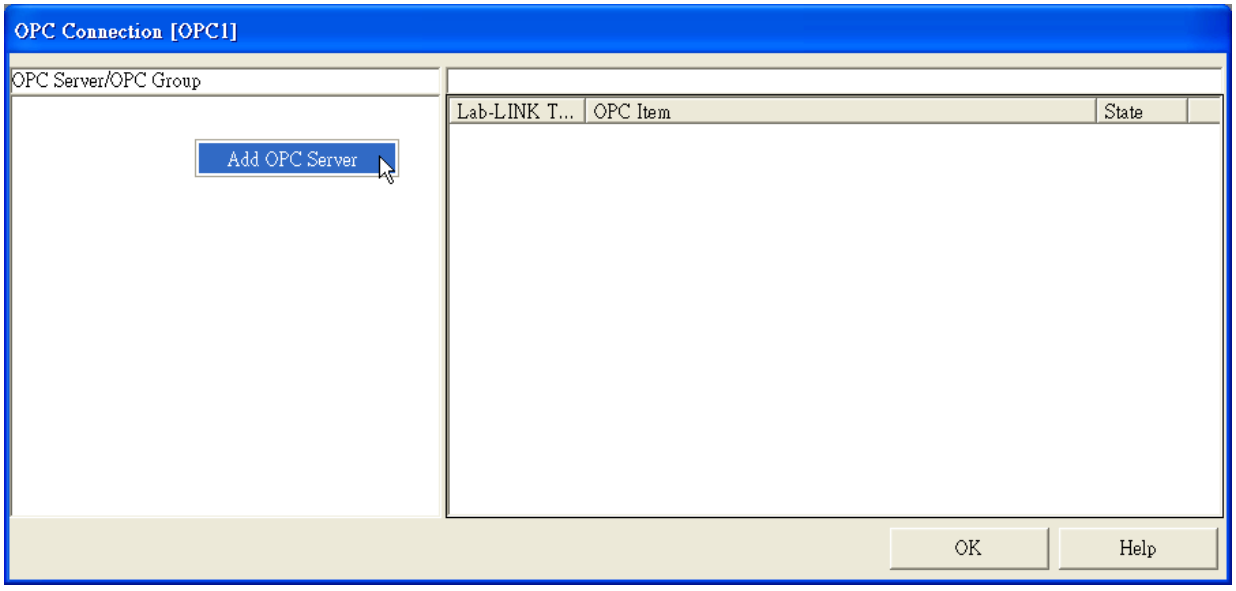
Setting of OPC Connection includes:

- Add **OPC Server**: Specify the name of OPC server to connect to.
- Add **OPC Group**: Create OPC Group under the OPC Server. An OPC Group is a set of data items belonging to the OPC server. These data items will be updated together. More than one OPC Groups can be added to an OPC Server.
- Add **OPC Items**: Add data item of the OPC Server into the OPC Group and map each item to a Lab-LINK tag. Note that it is possible to add the same OPC Item to different OPC Group. However, only one item can be mapped any Lab-LINK tag.

Setting details will be discussed in later.

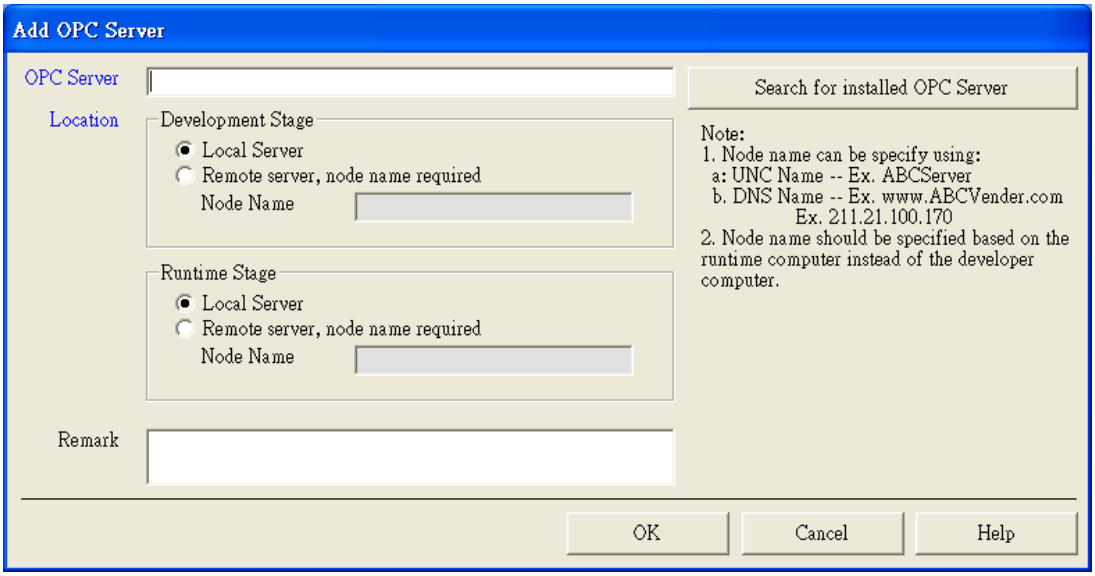
After the setting of **OPC Connections**, press **OK** button at the bottom of the window to close it. To modify the **OPC Connection** module, right click on its name in the **Project** window and select **Properties** from its popup menu.

Add OPC Server



Add an OPC Server

When the OPC Connection window is opened, right click on the left part and select Add OPC Server from the popup menu. **Add OPC Server** dialog will appear.

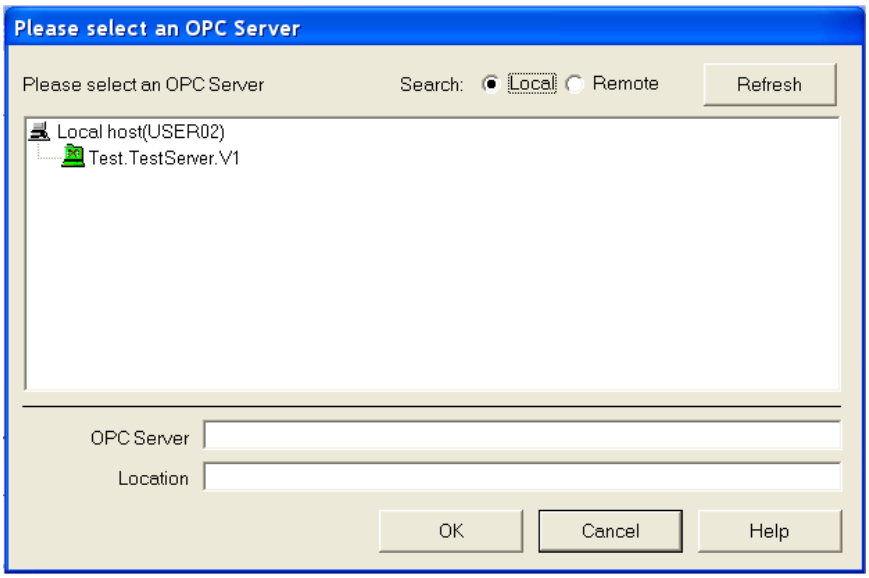


Add OPC Server dialog

You can either enter the name of the server in the OPC Server field directly, or try to find a server by pressing the **Search for installed OPC Server** button. **Location** selection is used to specify where the OPC server will be during development and runtime stage of the Lab-LINK project.

- Development Stage: Specify the location of the OPC server at development time. Since the system needs to locate and start the OPC server to browse it for established data items, correct location must be specified for further configuration of the **OPC Connection**. If the OPC server is on the same computer where **Lab-LINK** is, please select **Local Server**. Otherwise, please select **Remote Server**. If **Remote Server** is selected, a **Node Name** (the name of the computer the OPC server resides). The remote computer must be accessible on the network at this time and with proper DCOM configuration for the **OPC Connection** to be further configured.
- Runtime Stage: Specify the location of the OPC server when the **Lab-LINK** project is run. This setting is not required now but will be needed when **Lab-LINK** project is run. Select **Local Server** if it will on the same computer where **Lab-LINK** will be run. Select **Remote Server** if it is on another computer on the network. A **Node Name** must be specified for **Remote Server**. Please make sure the remote computer can be accessed by the Lab-LINK computer and with proper DCOM setting for OPC to work.

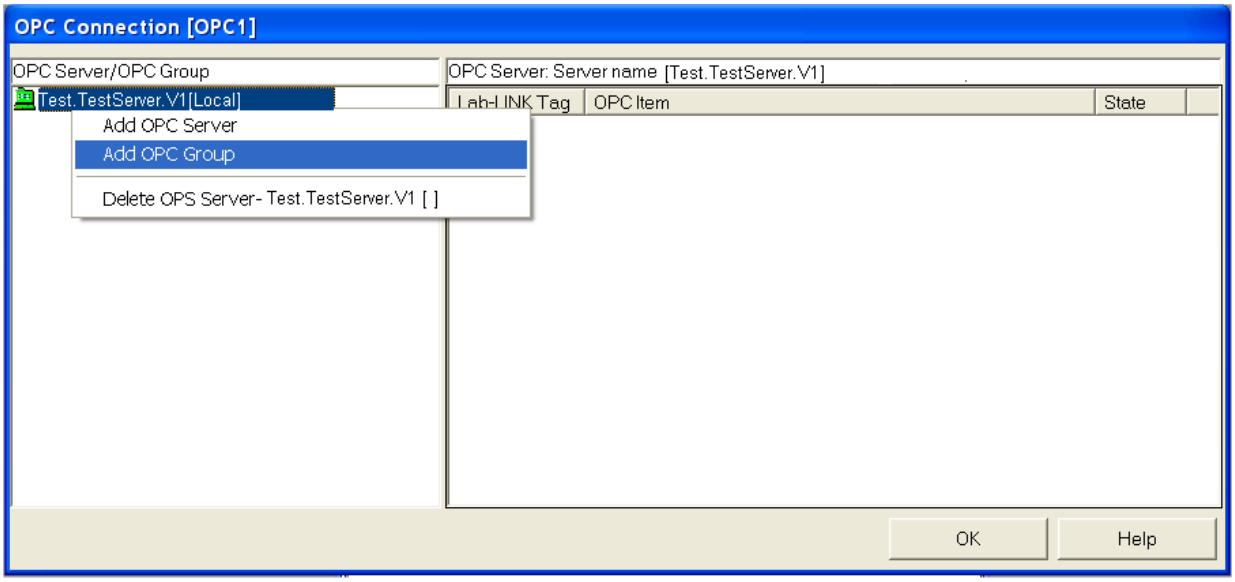
A short text can be entered in the **Remark** field at the bottom of the dialog to provide description of the connection.



Installed OPC servers found

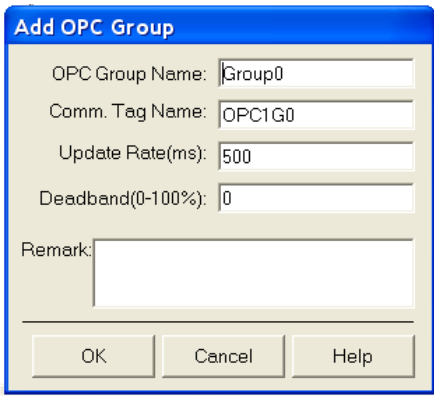
Press the **Search for installed OPC Server** button and the system will try to search for installed OPC servers on the specified location. All the installed OPC servers found by the system will be listed on the dialog shown above. Select the OPC Server to be connected by clicking it. Press **OK** button to close the dialog.

Add OPC Group



Add an OPC Group

Right click on the **OPC Server** name and select **Add OPC Group** from the popup menu to add a new **OPC Group**. A dialog will appear to provide the following settings for the group:

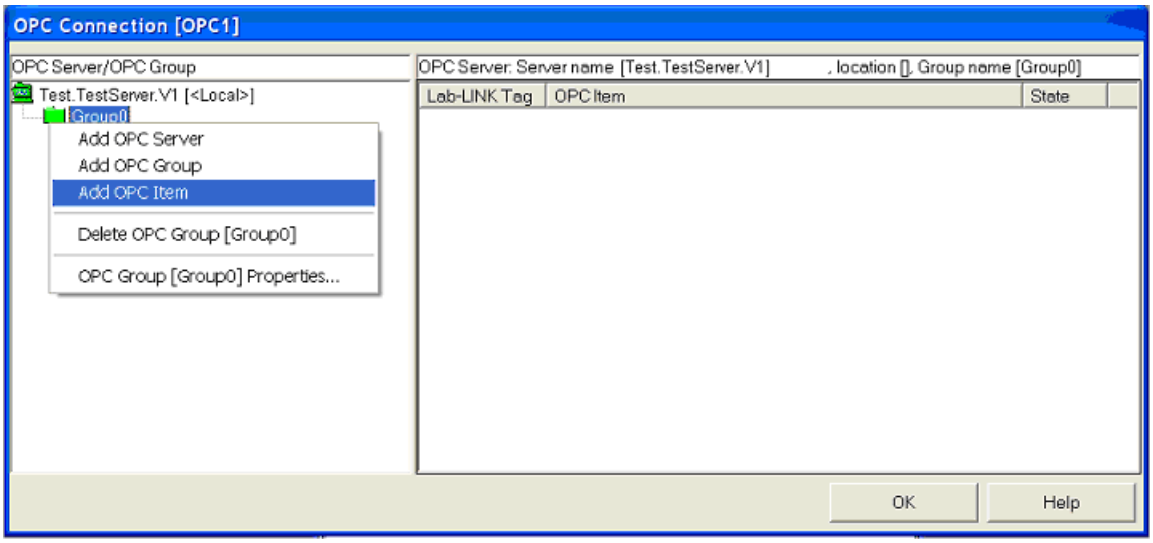


OPC Group Setting

- **OPC Group Name**: Specify a name for the **OPC Group**.
- **Comm. Tag Name**: Specify the **Communication Tag** name of the **OPC Group**. The tag is used to indicate the communication status of the data items in the group. Similar to the **Communication Tag** in IO Drivers, the value of the tag will be set to 1 if any communication occurs.
- **Update Rate**: Specify how frequent the data items in the group should be updated. Its unit is ms. OPC Server will update the data items in the group at the rate specified.
- **Dead band**: Specify the dead band size. Its unit is % which represents the percentage of change with respect to the full range of data. When the change of data is smaller than the specified dead band, OPC server will not send data to OPC client even the time specified in **Update Rate** is reached. Range of data is determined by OPC server. This setting is ignored if **Dead band** is set to 0 and thus data will always be sent to OPC client at specified Update Rate.
- **Remark**: A short text string to describe the OPC Group.

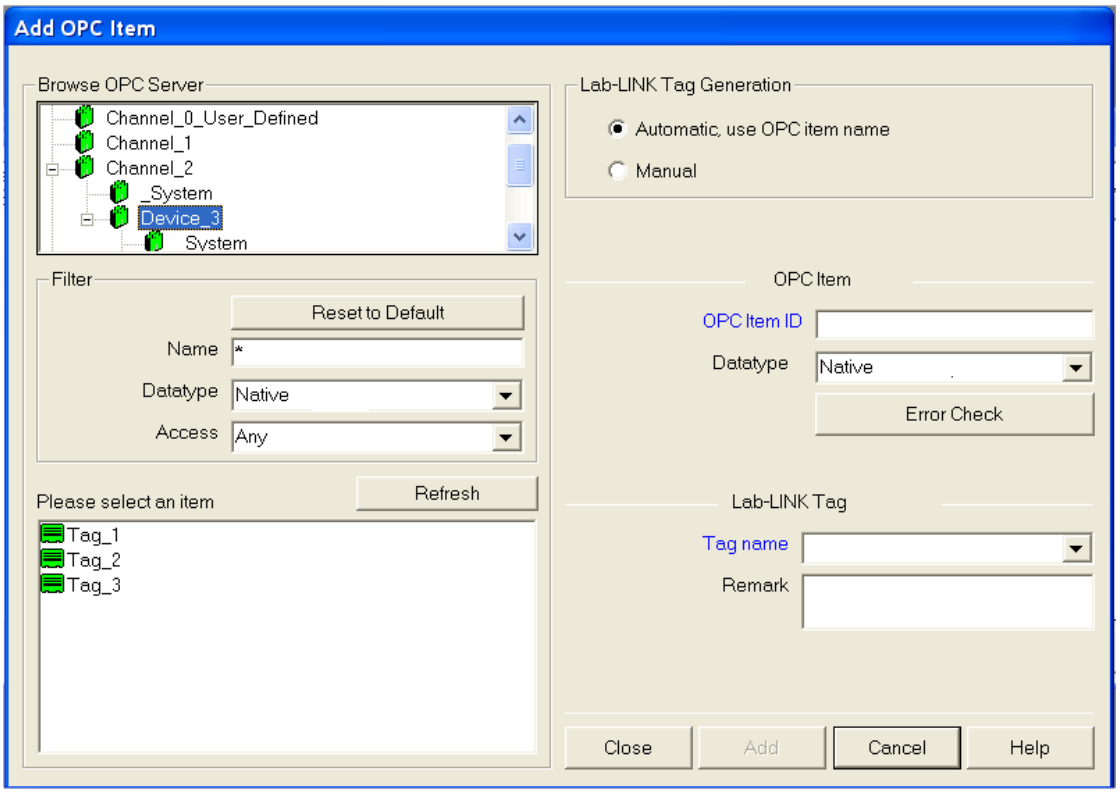
When the setting of **OPC Group** is finished, press **OK** button to return to **OPC Connection** window. If **Cancel** button is pressed, all setting change will be discarded.

Add OPC Item



Add an OPC Item

OPC Items can be added after **OPC Group** is created. Right click on the **OPC Group** in the **OPC Connection** window and select **Add OPC Item** from the popup menu. **Add OPC Item** dialog will appear to allow the adding of new **OPC Items**.



OPC Item browsing and setting

Left of the dialog is used to browse the content of the **OPC Server** to find the **OPC Item** needed. Right half of the dialog is used to set the details of a selected **OPC Item**. The fields in the dialog are discussed as follows:

- **Browse OPC Server**: The tree structure of the **OPC Server** (called Name Space) is shown in this column. Click on + before nodes to expand and show the data items under them. Click on an item name to select the OPC Item.
  Note: Only those items already configured in the OPC Server can be browse and you may need to configure the OPC server before doing this setting. Not all OPC server support browsing.
- **Filter**: When a node is selected from the Name Space, its items will be shown in the **Please select an item** column. These Filter fields are used to setup criteria used to filter the data item to be displayed. Only items match the specified conditions will be shown. Filter criteria include:
  - **Name**: Enter a string representing part of the item names. "*" can be included in the string as wild card character. Only OPC Items whose name match the specified pattern will be shown. For example, "Tag*N" can be used for those item names whose first three characters are "Tag" and the last character is "N" while there can be one or more characters in between.
  - **Data type**: Show items of the specified data type.
  - **Access**: Show items that allow the specified access right

  Press **Reset to Default** to clear all filter criteria.
- **Please select an item**: All OPC item of the selected node in the Name Space tree and match the filter criteria is display in this column. If **Filter** setting has been changed, please press **Refresh** button to refresh the listing in this column and reflect the change. Select an item from the column to edit its setting. The OPC Item ID of the selected item will appear in the field on the right.
- OPC Item: Specified the OPC Item to be added into the OPC Connection and setup its properties. OPC Item setting include:
  - OPC Item ID: Specify the OPC Item ID to be added. Select an item from the **Please select an item** column will copy its ID here. You can also enter the ID manually.
  - **Data type**: Specified which data type the OPC server should convert the item to before

sending it to Lab-LINK.

Note: Not all OPC servers support data type conversion. If not supported, Native should be used.

- **Error Check**: Press this button to request validation of the OPC Item ID definition by the OPC Server.

  Note: Not all OPC servers support data type conversion.

- **Lab-LINK Tag Generation**: Specify how to generate the **Lab-LINK** tag name which mapped to the selected OPC Item. There are two options:
  - **Automatic, use OP item name**: Click on the option to let system generate tag name automatically by using the last part of the OPC Item ID as the tag name.

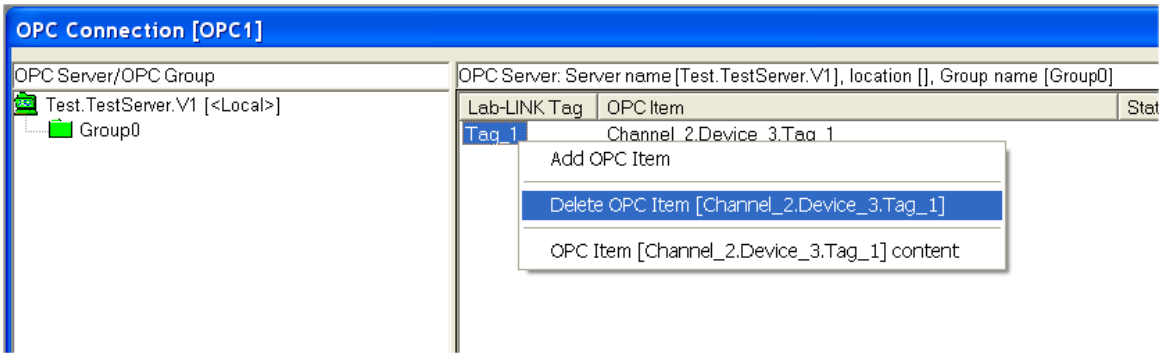
    Note: This option may not be available if the last par of ID exceeds the length limit of **Lab-LINK** tag name.
  - **Manual**: Click the option and specify the **Lab-LINK** tag name manually.
- **Lab-LINK Tag**: Specify the **Lab-LINK** tag name connected to the OPC Item. The name will be generated automatically if **Automatic** is selected.
- Remark: A short text string to describe the OPC item.

After setting of the new OPC item is finished, press **Add** button to add it to the connection. If the specified Lab-LINK tag mapped to the item doesn't exist in current project, a message box will appear to request confirmation on the creation of the new tag. Press **OK** button to confirm the adding or press **Cancel** button to cancel the operation.

After all the items needed are added, press **Close** button to close the dialog and return to **OPC Connection** window.

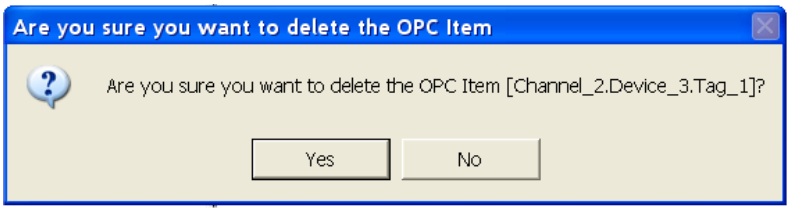
Note: The same tag cannot be mapped to more than on OPC Item.

Delete OPC Item



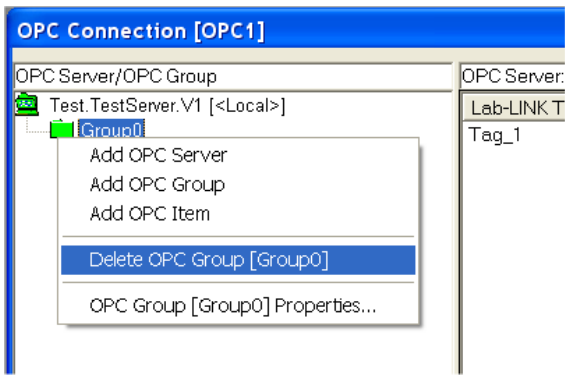
Delete an OPC Item

To delete an OPC item, first open the **OPC Connection** window. Click on the **OPC Group** it belongs to show all of its OPC items on the right. Right click on the item to be deleted and select **Delete OPC Item**. A message box appears to request for confirmation. Press **Yes** to confirm the deletion or press **No** to cancel the operation.



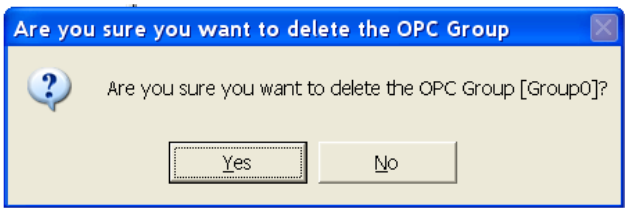
Note: when an OPC item is deleted, the **Lab-LINK** tag mapped to it will remain intact in the project.

Delete OPC Group



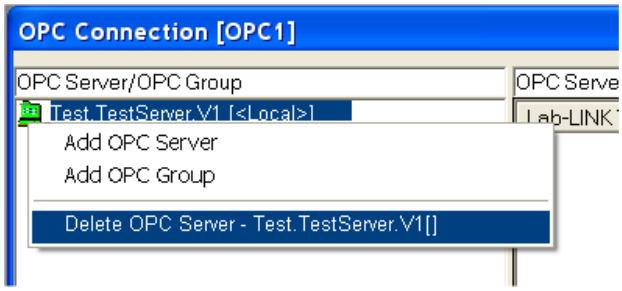
Delete an OPC Group

To delete an **OPC Group**, first open the **OPC Connection** window. Right click on the **OPC Group** to be deleted and select **Delete OPC Group**. A message box appears to request for confirmation. Press **Yes** to confirm the deletion or press **No** to cancel the operation.



Note: When an **OPC Group** is deleted, all **OPC Items** belong to it will also be deleted. However, the **Lab-LINK** tags mapped to these items will remain intact in the project.

Delete OPC Server

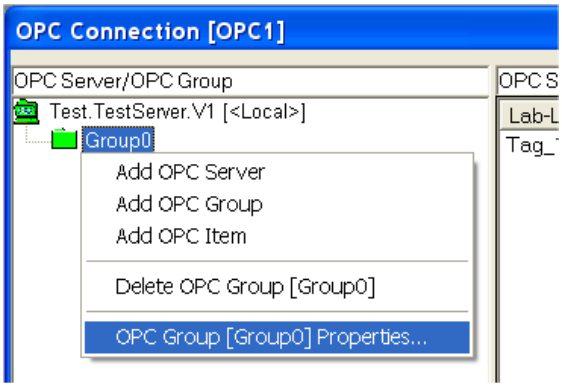


Delete an OPC Server

To delete an **OPC Server**, first open the **OPC Connection** window. Right click on the **OPC Server** to be deleted and select **Delete OPC Server**. A message box appears to request for confirmation. Press **Yes** to confirm the deletion or press **No** to cancel the operation.

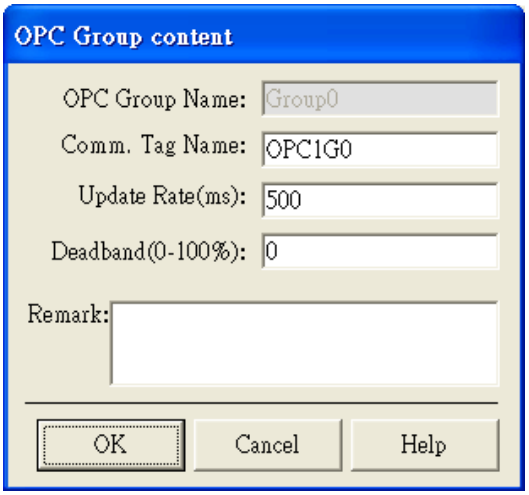
Note: When an **OPC Server** is deleted, all the **OPC Group** and **OPC Items** belong to it will also be deleted. However, the **Lab-LINK** tags mapped to these items will remain intact in the project.

Modify OPC Group Setting

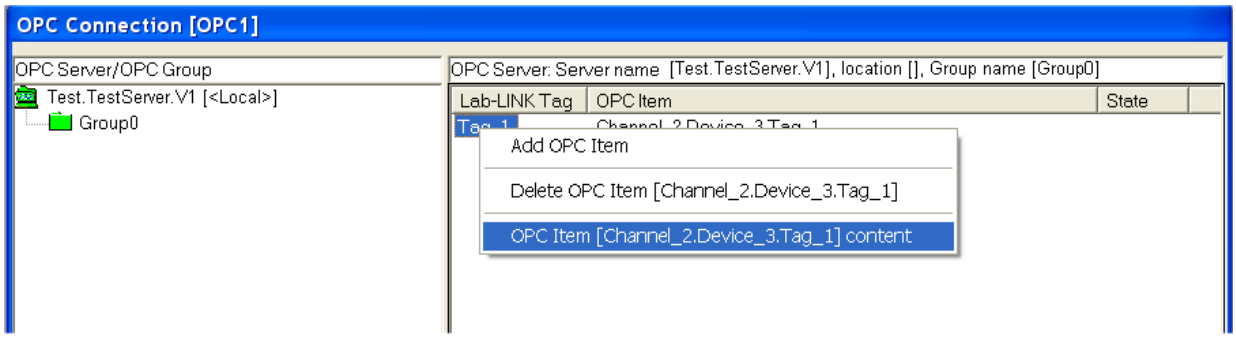


Modify OPC Group Setting

To delete an **OPC Group**, first open the **OPC Connection** window. Right click on the **OPC Group** to be modified and select **OPC Group Properties**. **OPC Group Content** dialog will appear to allow editing of the properties of this OPC group. After all modifications are made, press **OK** button to accept the change or press **Cancel** button to discard the change.

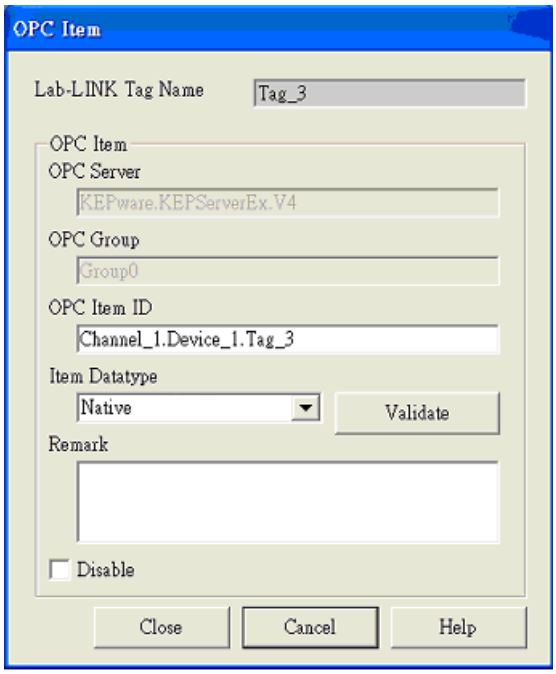


Modify OPC Item Setting



Modify the setting of an OPC item

To modify an OPC item, first open the **OPC Connection** window. Click on the **OPC Group** it belongs to show all of its OPC items on the right. Right click on the item to be edited and select **OPC Item Content**. **OPC Item** dialog will appear to allow editing of the properties of this OPC item. You can also double click on the item to open the dialog.



Properties that can be edited in **OPC Item** dialog include:

- **OPC Item ID**: Specify the correct path of the OPC item (that is its ID) in the OPC server's name space.
- **Item Data type**: Request which data type should the OPC server converts the item before sending it to Lab-LINK.

- **Validate**: Press this button to request the OPC server to validate setting of the OPC item.
- **Remark**: A short text string that describe the item.

After all modifications are made, press **Close** button to accept the change or press **Cancel** button to discard the change.

Chapter 12 Script

SmartScript is the script language provided by **Lab-Link** for Windows. It provides a simple and quick way to incorporate user logic into a Lab-LINK project to extend and enhance its function.

Scripts added into a Lab-LINK project as modules will run together with the project. This chapter will discuss how to add, delete, reference a script in a Lab-LINK project. For ***SmartScript*** editor usage and detail syntax of SmartScript, please see **Smart Script Reference Manual**.

Script Files and Modules

Since ***SmartScript*** module is an interpreter, the logic users programmed is stored as a text file at develop stage and will be interpreted and executed at runtime by the SmartScript module.

Script sources written by users at develop stage are stored as text files (called **Script Files**) with extension file name of .CSL. Users can add, delete or edit them using the file management function in **File** page in the **Project** window. **Scripts Files** are stored in the CSL subfolder in the project folder, but not necessarily run when the project is starts.

A **Script Module** always references a **Script File** and is part of Lab-LINK project setting. It will be run when the project is started. User can use module configuration functions found in **Module** page of the **Project** window to add, delete and modify a script module.

As discussed above, a **Script Module** can be considered as a shortcut of a **Script File**. When a **Lab-LINK** project is started, the **Script File** referenced by the **Script Module** will be loaded and executed. **Script Files** not referenced by **Script Module** won't be run automatically when the project starts, but can still be run like an application using **Executer** object of ***SmartPanel***.

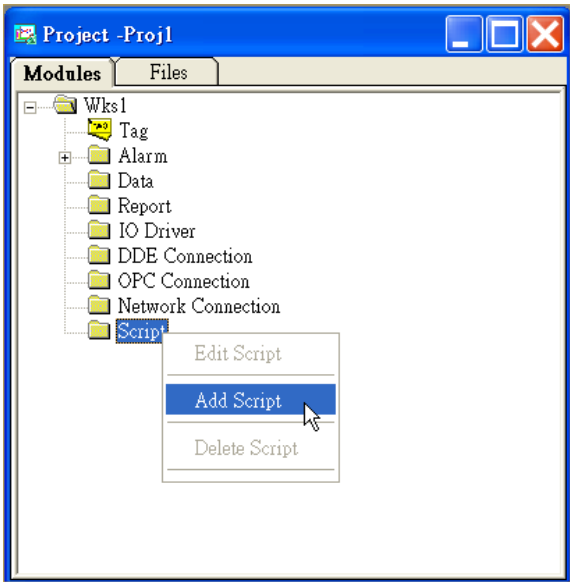
The table below further details the relationships between **Script Files** and **Script Modules**:

	Script Module	Script File(CSL)
Run	Automatically run when Lab-LINK	Run by Script Module when Lab-LINK project starts or by Executer object when

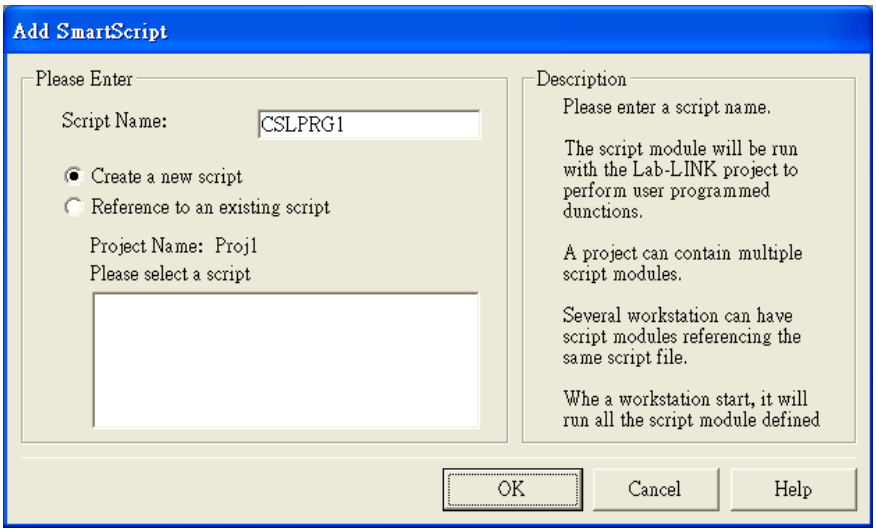
	project starts.	it is triggered
Reference	Must reference a Script File	Can be referenced by a Script Module.
Location	Part of Lab-LINK project setting	Stored as a file in CSL subfolder of a project.
Role	Similar to the shortcut of an application.	Source file of an application.
Edit	When users edit a Script Module, it is actually the Script File it references being edited.	Can be edited using ***SmartScript*** editor

Add Script Module

Right click on the **Script** node in the **Module** page of **Project** window and select **Add Script** to add a new **Script Module**.

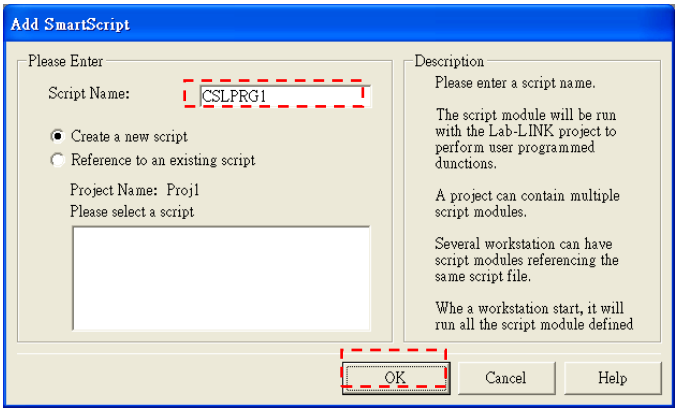


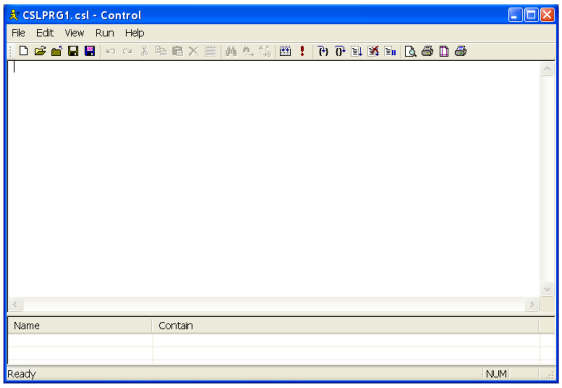
An **Add SmartScript** dialog will appear to allow the selection of **Script File** source. There are two selections available: **Create a new script** and **Reference to an existing script**.



Create a new script

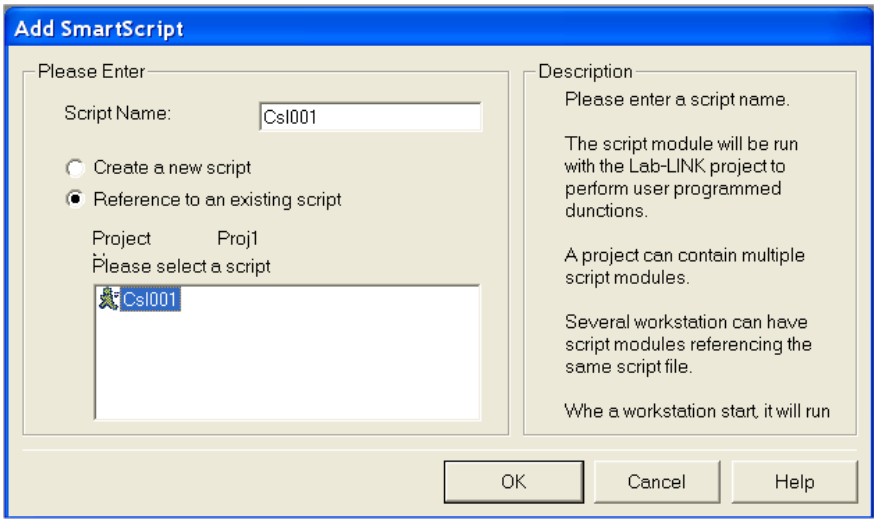
If **Create a new script** is selected and a name is entered in the **Script Name** field, the system will create a new blank script file in the CSL subfolder of the project and run **SmrtScript Editor** to load the empty for user to edit.





Reference to an existing script

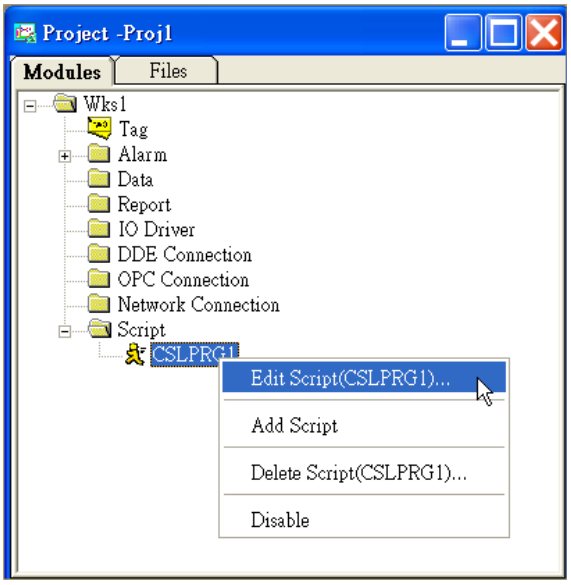
If **Reference to an existing script** is selected, the new script module will reference to an existed script file. No new script file will be created in this case. The referenced script should already exist in the CSL subfolder of the project. It can be created by a script module or as a file in the **File** page of **Project** window.



When two script module reference to the same script file, any change to the script source of a module will affect the other module. This has the advantage that only a source script needs to be maintained.

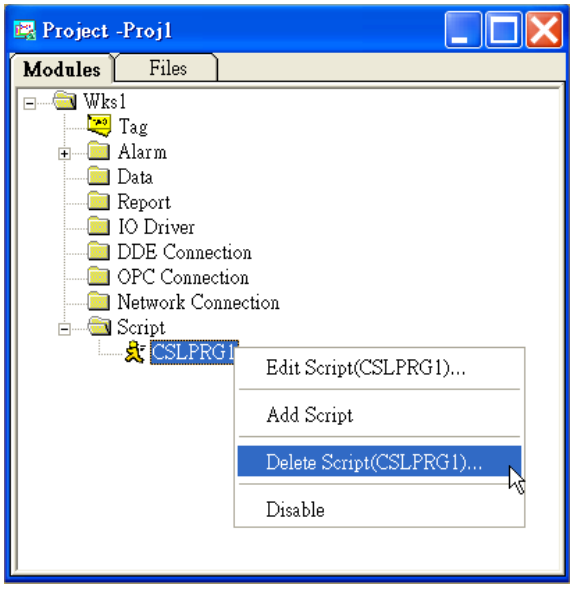
Edit Script

Double click on a script module or right click on it and select **Edit Script** from its popup menu to open the script file it reference for editing. ***Smart Script* Editor** will be run and the script file will be loaded. After all editing is done; exit ***SmartScript* Editor** to return to PAM.

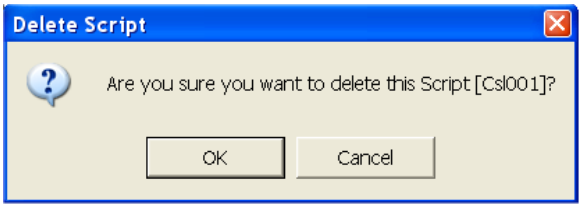


Delete Script Module

Right click on a script module and select Delete Script from its popup menu to delete the module.



A message box will appear to request for confirmation. Press **OK** button to confirm the deletion or press **Cancel** button to cancel the operation.



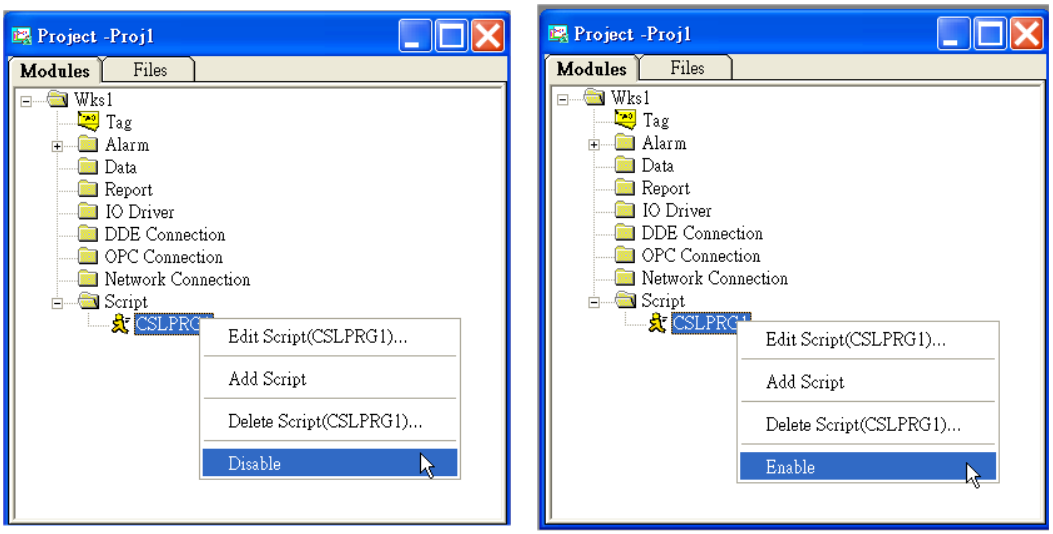
When a script module is deleted, if there is other workstations still reference to the script file, the script file will not be deleted but system will only remove the link of the module to the file. If there is no other workstation references to the script file, a message box will appear to request whether the script file should be deleted together with the module or not.

Disable Script

Right click on a script module and select **Disable Script** from its popup menu to disable the script. After regeneration and re-execution of the project, the disabled script module won't be loaded and run. The module will appear in gray color in the **Module** tree in the **Project** window

when disabled.

To resume the use of a disabled script module, right click on the script module and select **Enable Script** from its popup menu. Regenerate the project and the script module will be run when the project starts.



Chapter 13 Security

Introduction

Lab-LINK provides a security mechanism to manage the user security at **Lab-LINK** runtime. Through the use of password and privilege, it is possible to control that only users with proper authorization can conduct certain operation.

Lab-LINK uses a simple but effective method for security management. Each user is assigned with a privilege, and most control object in ***SmartPanel*** can also be assigned a minimum privilege that allow the operation of the objects. At runtime, when a user tries to operate a control object in a panel, the system will compare the privilege of the current login user with the setting of the control object. The privilege of the user must be greater than or equal to the preset minimum privilege of the object to conduct the operation successfully. With this security authentication mechanism, the developer of Lab-LINK project can effectively control who can conduct certain operations and who cannot.

Security Editor is the tool used to manage the runtime users of Lab-LINK. It can be used to create account for each user, edit their user name, and assign their password and privilege.

Login and Logout

There is no mandatory login process when a **Lab-LINK** project starts. User authentication requirement can be easily configured into control objects in panels.

There are two settings in control object properties that are related to user authentication: **Privilege** in basic setting and **Password** in Style setting. **Privilege** specifies the minimum privilege the user need to have to operate the object. **Password** mandated that a password authentication is required each time the object is operated.

At Lab-LINK runtime, when a control object with non-zero privilege set is operated, the system will request password authentication if no previous authentication has been done or the current login user has smaller privilege than the setting. , it is considered that no user has login. If the current

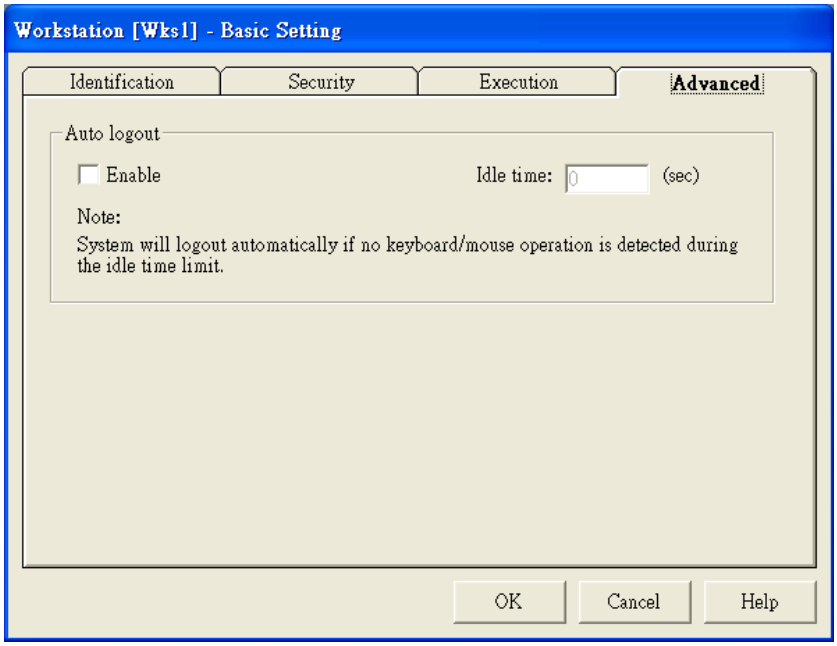
login user has greater or equal privilege as the setting, the operation will succeed. On the other hand, if **Password** style is set for the object, the system will always ask for password authentication no matter current user has enough privilege.

When password authentication is required at runtime, the message box shown below will appear to request for password entry. User should enter his or her password and press the **OK** button or the <Enter> key on the keyboard. Any password authentication process is considered as **Login** of the user. If there is no keyboard installed on the computer, users can click on the ... button next to the password field to enable a screen keyboard for entering password.

The system will retain the user's identification after the authentication and use it for future user privilege checking until the user logout or a new user login. There are two way to logout current user. The first method is to press **OK** button without entering any password in the password authentication dialog. The other method is to use a System Tag **$LOGOUT**. Whenever the value of **$LOGOUT** is set to 1, the current user will be logout. This can be easily accomplished using a **Button** object with **Reset Button** style set or a **Set Button** object.

Automatic Logout

Besides using objects setting to allow user logout operation, an idle time limit can be defined to implement automatic logout. This is to prevent unauthorized operation when a user leave the SCADA computer but forget to logout. In workstation basic setting dialog, select **Advanced** tab to show the automatic logout setting. By checking on the Enable check box and entering a number in the **Idle time** field, the automatic logout time limit is set. If the SCADA computer has been idle, that is without mouse or keyboard operation for the specified time, the user will be logout automatically.



System Tag related to Security

There are two system tags related to security management:

- $USER: Its value indicate the privilege and its message is the user name of the current login user.
- $LOGOUT: When its value is set to 1, the current user will be logout by the system .

User Setting

User setting includes the following information:

- Name: The name of user. Its length limit is 32 characters.
- Password: The password of the user. Its length limit is 32 characters and is not case sensitive by default.
- Privilege: The privilege of the user. It is a number between 1 and 255.

There are three default users when Lab-LINK is installed:

Name	Password	Privilege
Supervisor	Supervisor	255
Manager	Manager	200
Guest	Guest	1

Lab-LINK allows project developer to have full control of the limitation on user operation. Through proper configuration of control objects, the developer can determine the operation behavior of each user. There is no preset privilege for any runtime operation with only two exceptions: The execution of **Security Editor** and **Tag View**. Since **Security Editor** is the user managing tool and **Tag View** is the tool used for project testing and debugging, password authentication is required and a minimum of 200 in privilege is needed when the two tool program is executed.

Note: The system only allows a single user to have the top privilege of 255. This user can view and modify any user's identification data and thus can be considered as the system manager of Lab-LINK runtime.

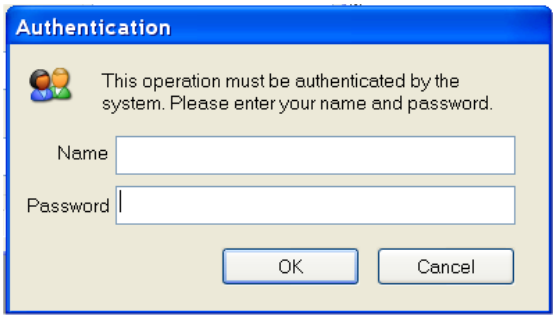
Run Security Editor

Security Editor is the tool program to manage users. It can be used to add, delete, or modify user information.

There are three ways to execute Security Editor:

- ❒ In PAM, select **Security Editor** from the **Tool** menu or press the **Security** button on tool bar.
- ❒ In Windows, select "Start\All Program\Lab-LINK 4 for Windows\Security Editor" shortcut.
- ❒ Create a shortcut or use an **Executioner** object in ***SmartPanel*** to run the tool. Its path is in the **Lab-LINK** system folder (c:\lablink\system4 by default) and the name of its program file is Scredit.exe.

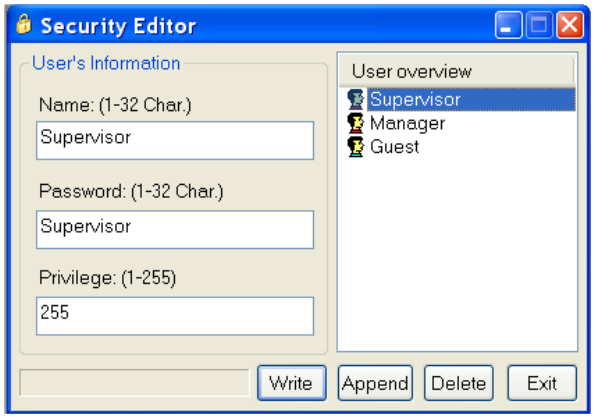
When **Security Editor** is executed, a password authentication dialog will appear to request for a password. A password with privilege greater than or equal to 200 is needed.



Password authentication

Display User Setting

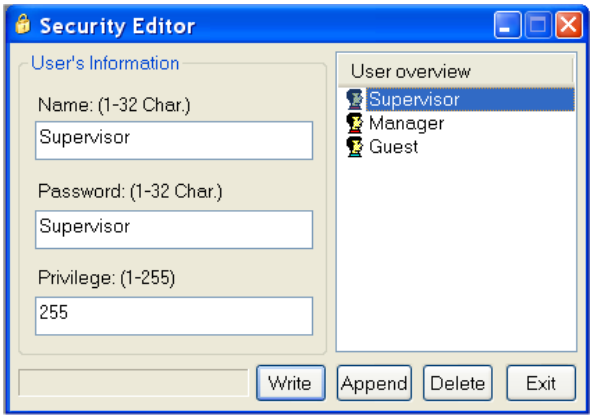
When **Security Editor** is executed, a window as shown below appears. To display the information of a user, click on its name from the **User Overview** list. The information of the selected user will appear in the fields on the left. Note that only the data of users with privilege smaller than current login user can be seen. The data of user with higher privilege will be hidden.



Display user setting

Edit User Data

To modify a user's setting, first select the user from the **User Overview** list to display its setting. You can than edit its setting in the respective fields. After finishing the editing, press **Write** button to accept the change.

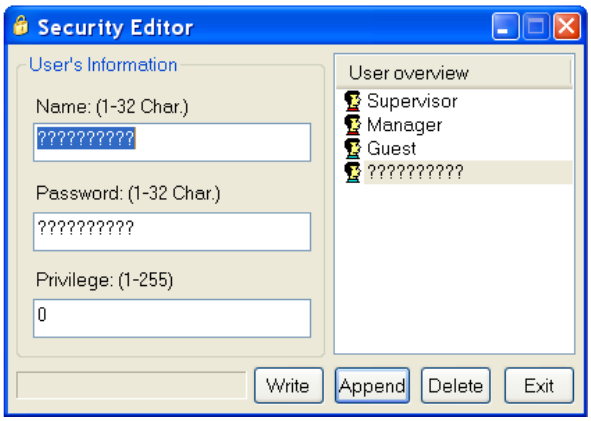


Edit user setting

The modified user setting will take effect immediately for the current running project. However, if the user setting is not saved to file when exiting **Security Editor**, the modified setting will not be saved. When the **Lab-LINK** project is exited and run again, since the original user setting file will loaded, all modification will be lost. To prevent this problem, be sure to save the user setting before exiting **Security Editor**.

Add User

To add a new user, press **Append** button in the **Security Editor**. A new user will appear in the Users list. Enter proper setting for the user and press Write button to add the new user.

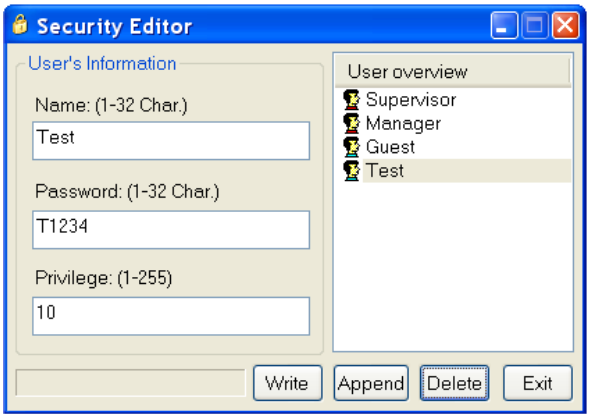


Add a new user

The newly added user setting will take effect immediately for the current running project. However, if the user setting is not saved to file when exiting **Security Editor**, the modified setting will not be saved. When the **Lab-LINK** project is exited and run again, since the original user setting file will loaded, the new user won't exist. To prevent this problem, be sure to save the user setting before exiting **Security Editor**.

Delete User

If a user is no longer using Lab-LINK, its setting can be deleted. Select the user from the Users list in the Security Editor and press Delete button to delete the user.

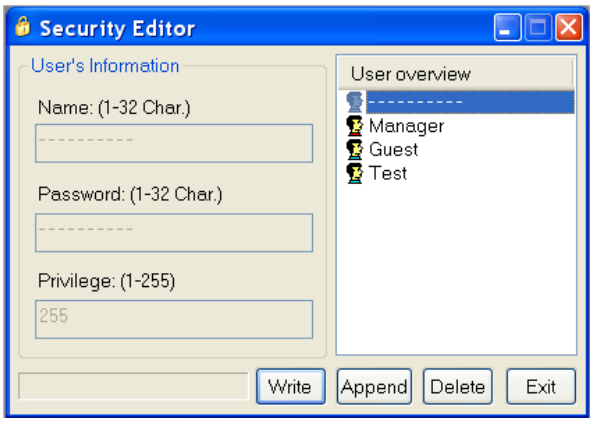


Delete a user

The deleted user setting will take effect immediately for the current running project. However, if the user setting is not saved to file when exiting **Security Editor**, the modified setting will not be saved. When the **Lab-LINK** project is exited and run again, since the original user setting file will loaded, the deleted user will still exist. To prevent this problem, be sure to save the user setting before exiting **Security Editor**.

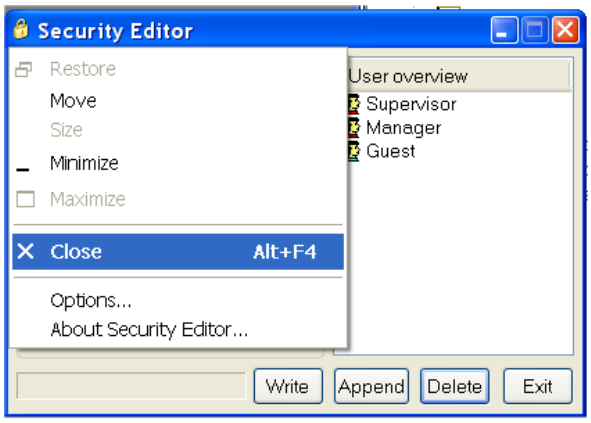
Limitation on the Use of Security Editor

Use of **Security Editor** may be limited if the current user doesn't have the top privilege of 255. **Security Editor** user can only view, add, delete and modify users with privilege smaller than his. For example, if current login user has the privilege of 200, the password and name setting of those users whose privilege are 200 or higher will be displayed as "----------". It is also impossible to create a user with higher or equal privilege as current user.

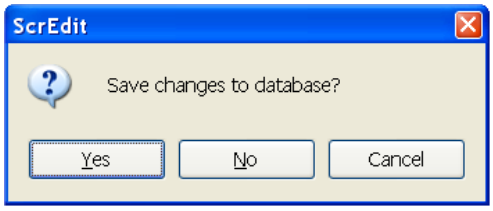


Limit on the use of Security Editor

Exit Security Editor and Save Setting



After finishing all user settings, press the **Close** button or click on Security Editor's control button (the  icon on the top left corner of the window) and select **Close** to exit the tool. If any of the user setting has been changed, a message box will appear to request for confirmation on saving the change to the **Security Setting File**. Press **Yes** button to save the change or press **NO** to discard the change and exit the tool program.



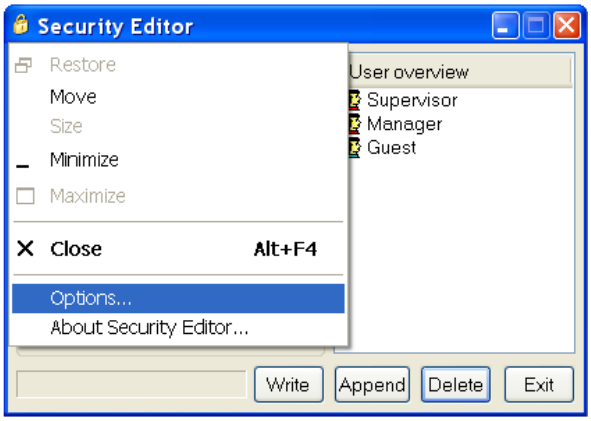
Setting saving confirmation

All user setting change will take effect immediately for the current running project. However, if the user setting is not saved to file when exiting **Security Editor**, the modified setting will not be

saved. When the **Lab-LINK** project is exited and run again, since the original user setting file will loaded, the setting change will be lost. To prevent this problem, be sure to save the user setting before exiting **Security Editor**.

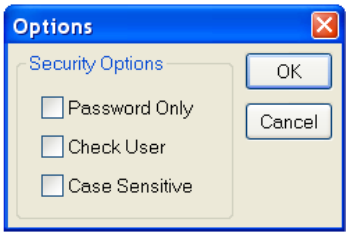
Option Setting

Advanced setting provides some extra configuration on the authentication behavior. These setting can only be set by the user with top privilege.



Open Options setting

First, run **Security Editor** using the top privilege password. Click on the  icon on the top-left corner of the **Security Editor** window and select **Options** to show the dialog below:



Options setting dialog

- **Password Only**: When the option is selected, only password can be entered in authentication dialog. There is no way to change user name at login.
- **Check User**: If the option is selected, the authentication dialog will require user to enter user name as well as password. Both user name and password must be valid and matched for the authentication to succeed.
- **Case Sensitive**: If the option is selected, the password is case sensitive.

Note: Only one of the first two options can be selected at the same time.

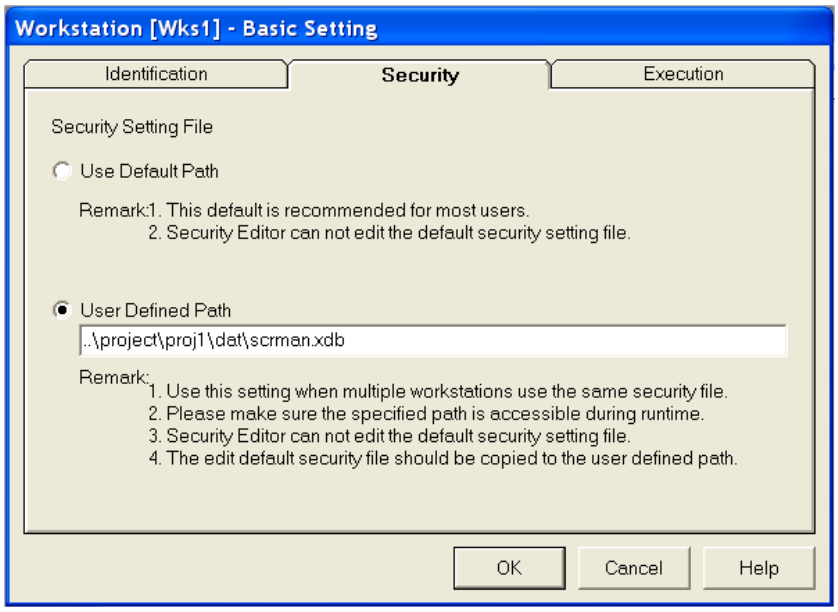
The first two advanced setting relate to authentication method. Lab-LINK has three authentication methods:

- Neither **Password Only** nor **Check User** is set: User can enter password and user name at authentication, but only password will be used for validation. The entered user name will replace the user name in **Security Setting File** and will appear in alarm acknowledge record and system tag **$USER**. However, the entered user name will not be saved to **Security Setting File**.
- Set **Password Only** but not **Check User**: User can only enter password at authentication and only password will be validated. There is no way to change user name unless using **Security Editor**.
- Set **Check User** but not **Password Only**: User has to enter password and user name. Both will be used for validation. There is no way to change user name unless using **Security Editor**.

Security Setting File

Security Setting File is used to store all user settings. When a **Lab-LINK** project starts, the system will load this file into memory. All modification on user setting is made to these setting in the memory instead of the file during **Lab-LINK** runtime. The content of the file is only modified when the user settings are saved to file by **Security Editor**.

The default location of Security Setting File is in Lab-LINK system folder, and its name is Scrman.xdb. However, it is possible to specify where the file should be loaded from by modifying the Basic Setting of Workstation. Please refer to chapter 3 of this manual for details.

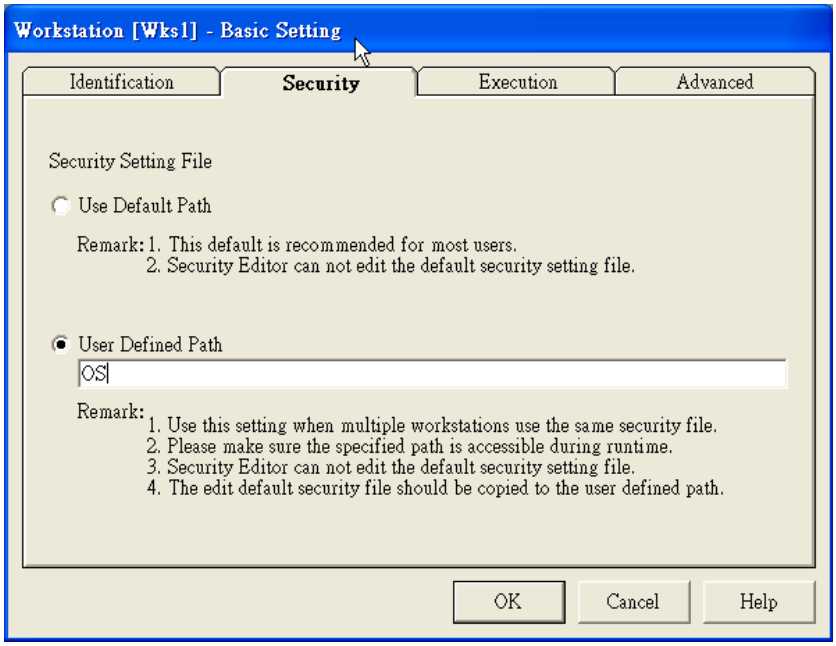


If **Security Editor** is executed when no **Lab-LINK** project is run, the security settings it modifies and saves is always the copy in the system folder. Developer can modify the default **Security Setting File** and copy it to the project folder for the use of that project in a real application. The **Security Editor** can run by an **Executer** object at run time if necessary. The **Security Setting File** modified will then be the one specified in Workstation basic setting.

Note: Since Security Setting File is very important for Lab-LINK runtime operation, developer should determine its location carefully to prevent improper use and modification.

Use Windows Authentication

Lab-LINK also support Windows user authentication for user identification validation. To use this feature, please open workstation basic setting dialog and select **Security** tab. Click on **User Defined Path** and enter “OS” in the field below.



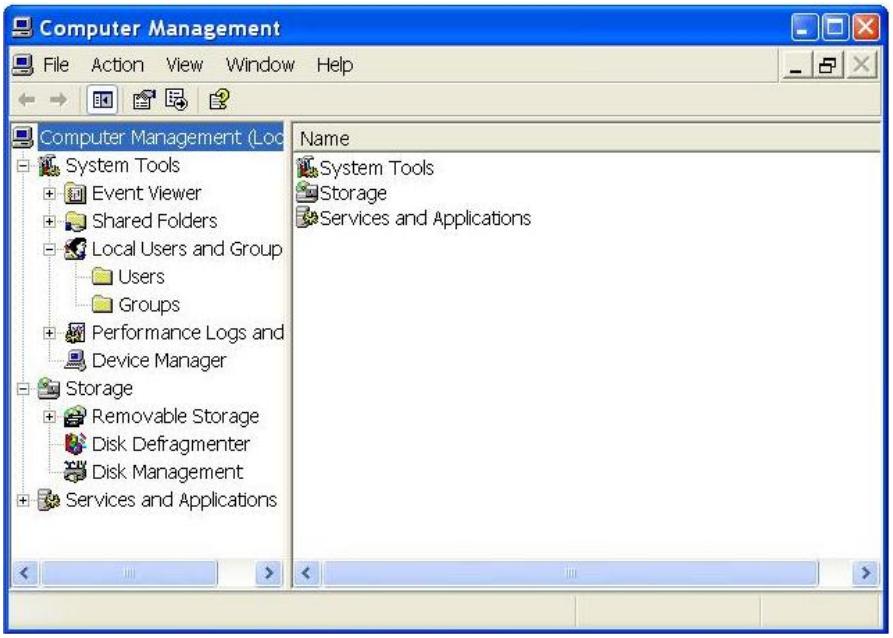
Regenerate and run the project, the security setting will be applied and the system will use Windows user and group authentication to validate users' identification.

Windows Group Setting

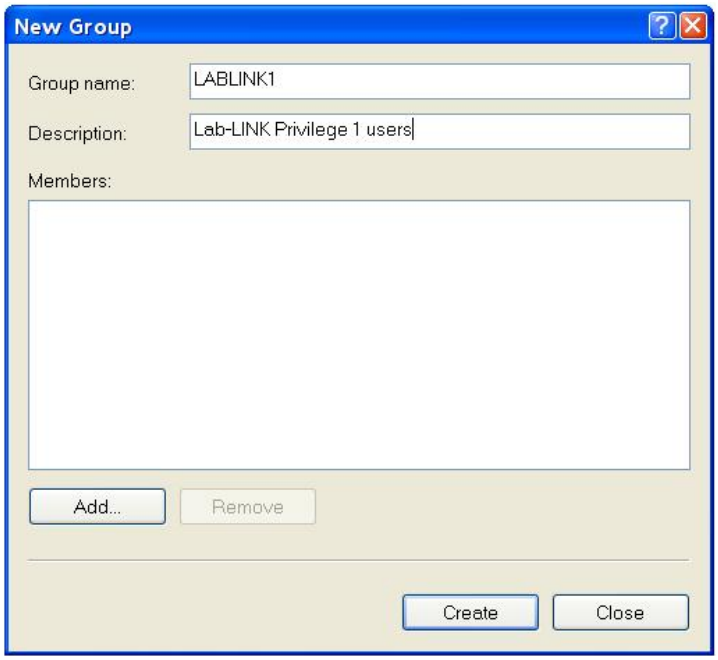
Since Windows do not use the Privilege concept as Lab-LINK does, a mapping between Windows user group and Lab-LINK user privilege must be defined to apply Windows authentication in Lab-LINK. A series of Windows user groups, named LABLINK1, LABLINK2, …, LABLINK255, can be defined. The users in these groups will be assigned as having corresponding privileges of 1 to 255 in Lab-LINK. In a practical application, not all 255 privileges are used. Only groups corresponding to those privileges used need to be defined. For example, if privilege 1, 2 and 3 are used, only three groups, namely LABLINK1, LABLINK2 and LABLINK3, need to be defined. Every user should be added into one of these groups according to the privileges they have.

The following paragraphs will explain how to create groups and how to add users into the groups in Windows.

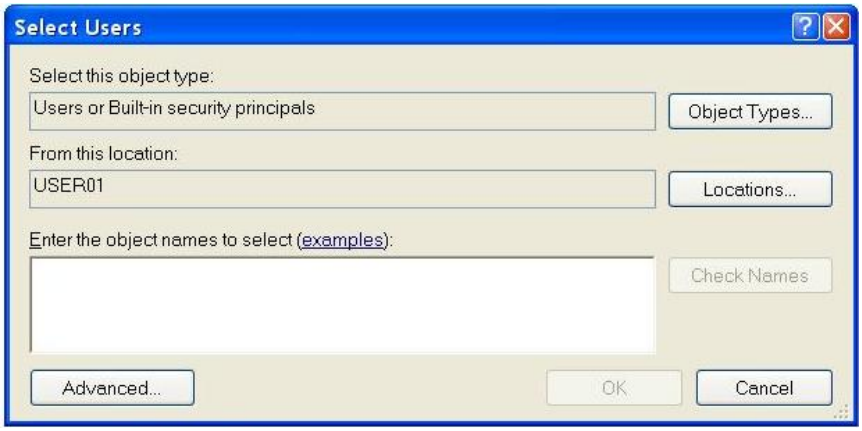
Open **Control Panel** of Windows system and select **Administrative Tools**. Select **Computer Management** from the Administrative Tools folder and a window as shown below appears.



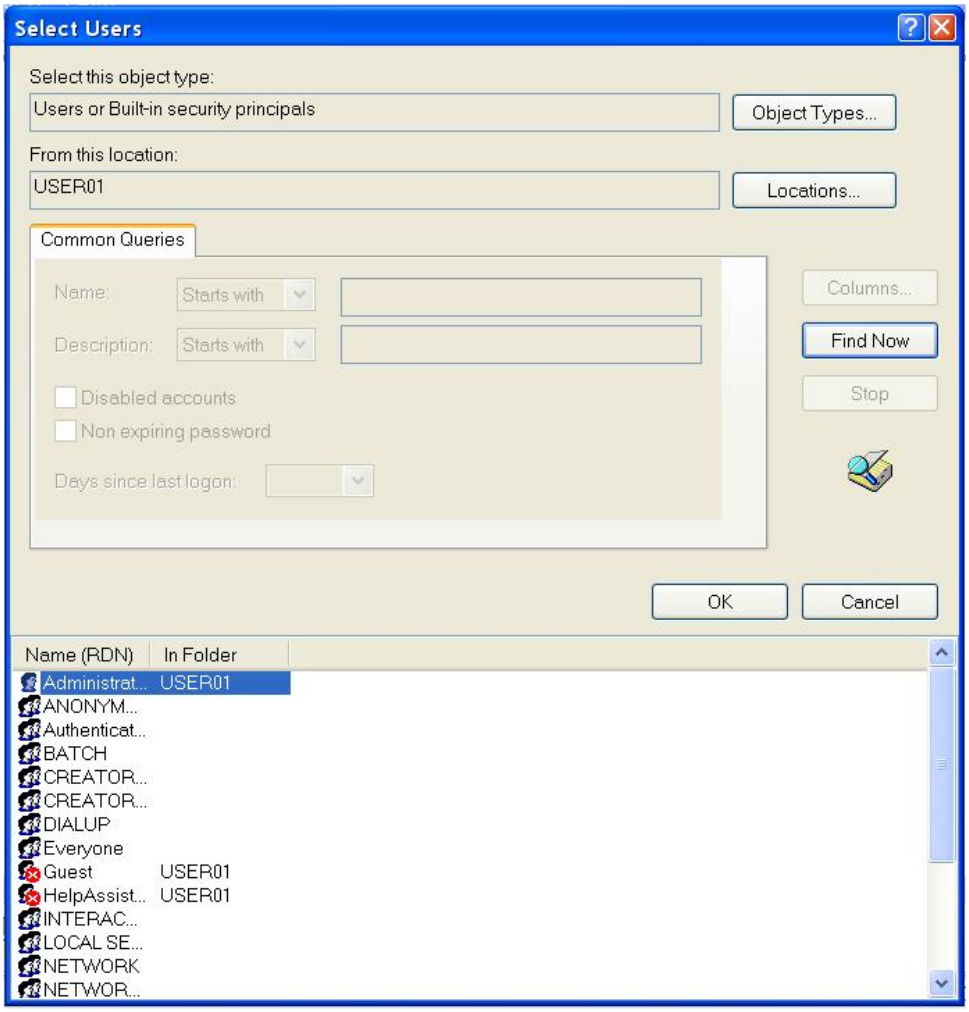
Click **Local Users and Groups** to expand the node. Right click on **Groups** and select **New Group…** from the popup menu. A **New Group** dialog appears to request of detail setting of the new group.



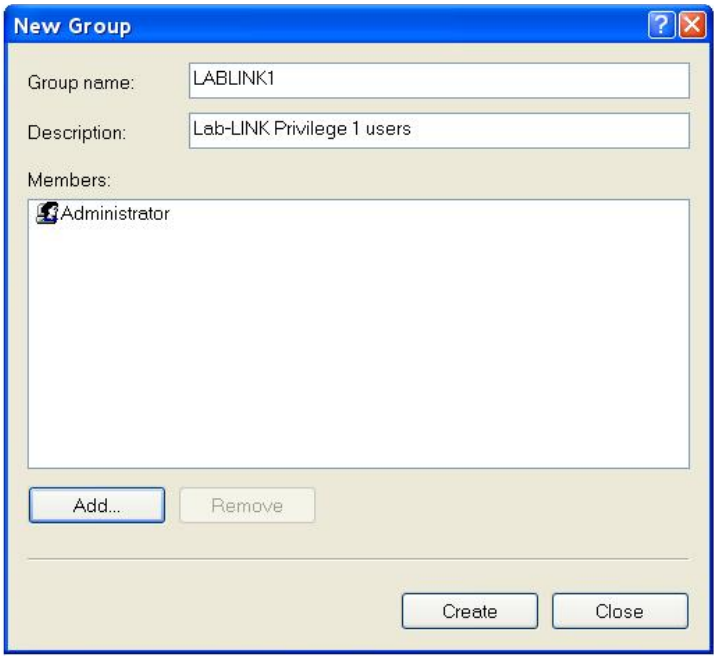
Enter the group name according to privilege needed, ex. LABLINK1 for the group with privilege 1. Press **Create** button to create the new group. To add users into the group, press **Add** button in the **New Group** dialog. When the **Select Users** dialog appears, press **Advanced** button to further expand the dialog.



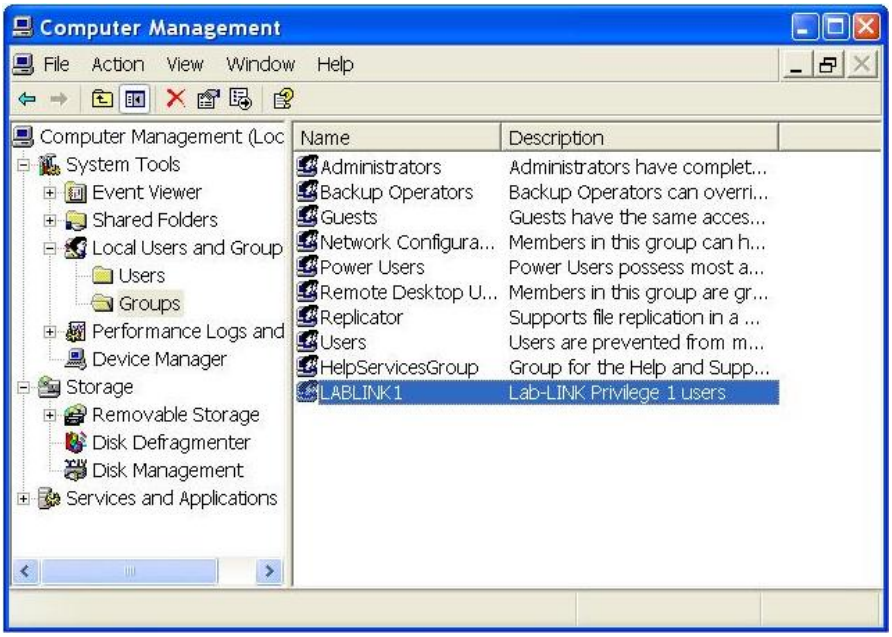
In the expanded **Select Users** dialog, press **Find Now** button to show all the established users on the computer. Select a user and add it to the group by clicking on it and press **OK** button.



The newly added user can be seen in the **Members** list in the **New Group** dialog. Press **Add** button again to add more users, or press **Close** button to close the dialog and return to the Computer Management window.



The newly added group can be seen in the Groups list in the Computer Management window. Follow the description above to add all Lab-LINK group needed and add Windows users appropriate groups to finish Lab-LINK users setup.



Chapter 14 Tag View

Introduction

Tag View is one of the tool program provided by **Lab-LINK** for Windows Development edition. It is a tool program to view and modify real time data in Lab-LINK runtime. It is usually used to test and debug a Lab-LINK project at runtime.

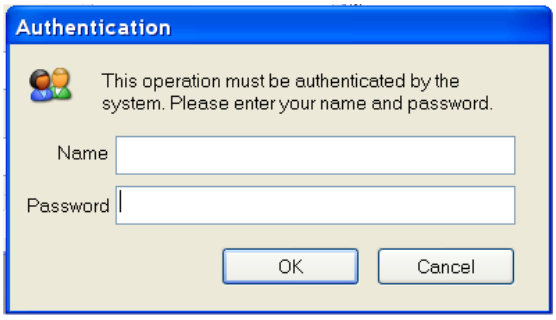
Features

- ❒ Display all real time tag data of a running Lab-LINK project. Tag data can be shown include name, date, time, value, message and state.
- ❒ Modify all real time tag data of a running Lab-LINK project. Tag data can be modified include name, date, time, value, message and state.
- ❒ Provide easy to use user interface for run time testing and debugging including sorting of tags and isolation of tag data.

Run Tag View

There are two way to run TagView. It can be run by pressing **Tag View** button on the tool bar or selecting **Tag View** from the **Tool** menu in **PAM**. **Tag View** can also be run in Windows by selecting “Start\All Program\Lab-LINK 4 for Windows\Tag View” shortcut.

When **Tag View** is run, password authentication dialog will appear to request for authentication. A password with privilege higher than or equal to 200 is needed to run the tool.

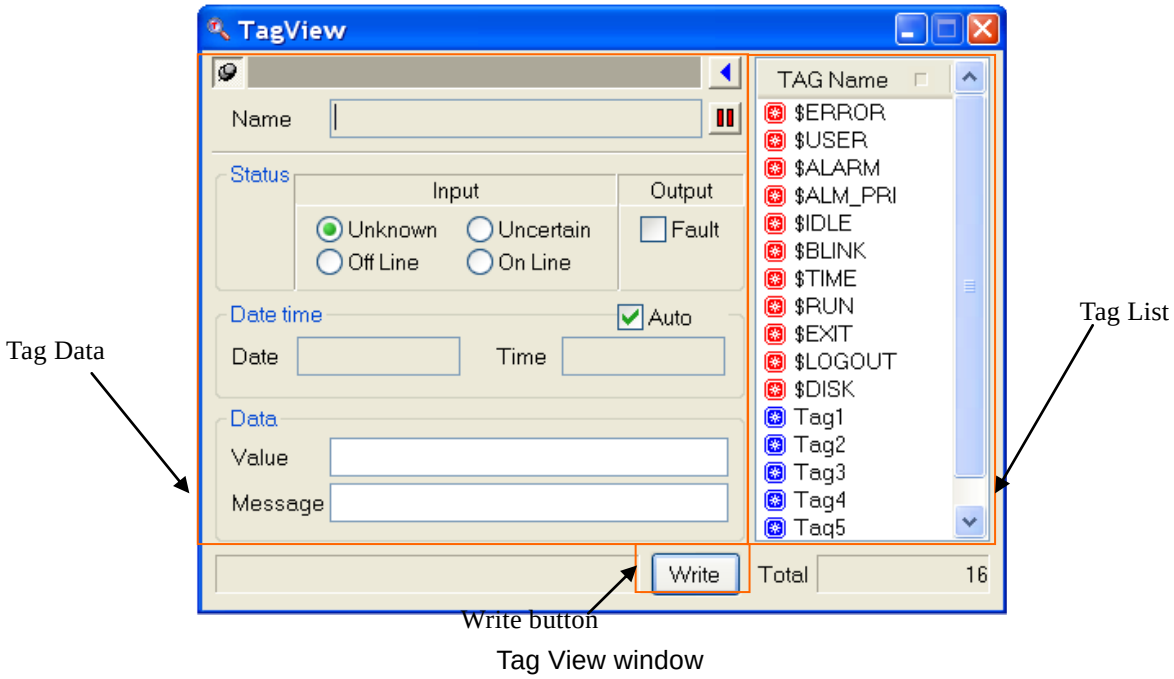


Password authentication of Tag View

TagView Window

The windows as shown below will appear when **Tag View** is run. The window can be divided to the areas:

- **Tag List**: List all the tag names in the running Lab-LINK project.
- **Tag Data**: Display the data of the selected tag
- **Write** button: Write the modified data to tag when pressed.



Tag View window

Tag List

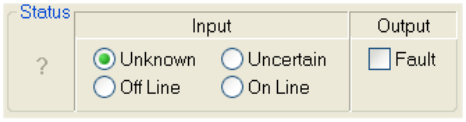
Tag List shows all the tags in use by currently running project, including user defined tags and system tags. Use the scroll bar to browse through the tags, and click on a tag to show its data on

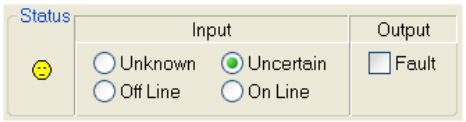
the left. Tags in the **Tag List** can be sorted by clicking on the **Tag Name** label. Tags will be listed in alphabetic order. Click again will reverse the order and the third click will return it to the original order.

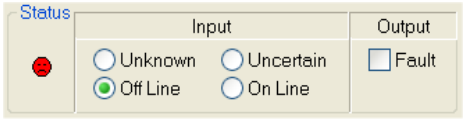
Sorting can help users to locate a tag in the list. After the tags are sorted, click to select any tag name in the list. The selected will be highlighted. Key in the tag name you are looking for on the keyboard and the list will scroll to the tag name typed.

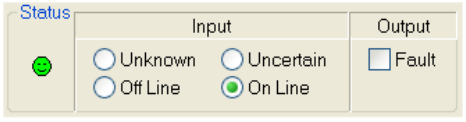
TAG Data

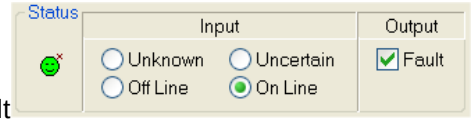
Tag data of the tag selected from Tag List is shown on the left half of Tag View. User can view or modify these real time data. Tag data include:

- ❒ Name: The name of the selected tag.
- ❒ State: The state of the selected. States are further divided into two categories:
  - ➢ Input State: Show the input state of the tag:
    - Unknown: 

    - Uncertain: 

    - Offline: 

    - Online: 

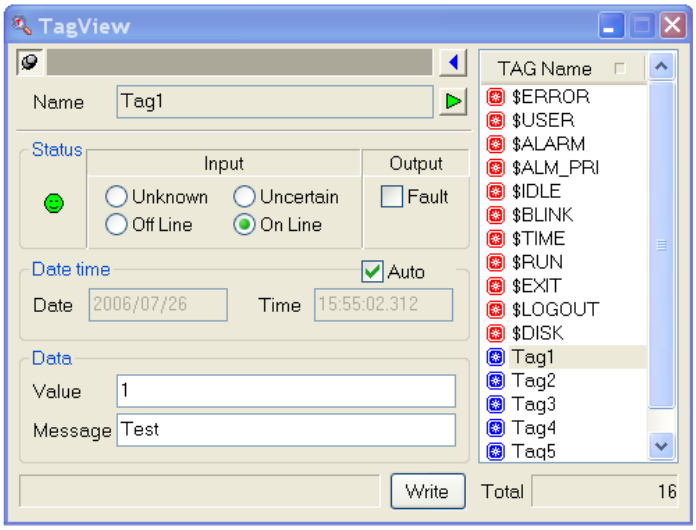
  - ➢ Output State: Show the input state of the tag:
    - Output Fault 

- ❒ Date/Time
  - ➢ Date: The date when the data of the selected tag changed. Ex. 2006/01/01.
  - ➢ Time: The date when the data of the selected tag changed. Ex. 16:04:59.645.
- ❒ Content

- Value: The value of the selected tag.
- Message: The message of the selected tag. The length limit of the message is 80 characters.

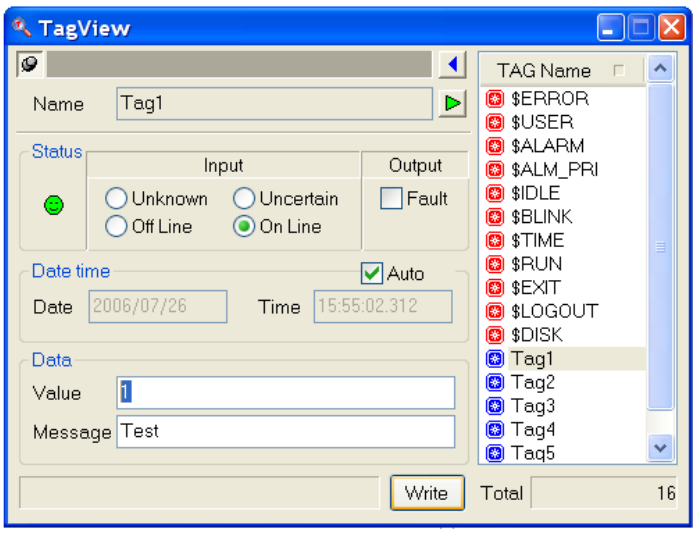
Show Tag Data

Click on a tag name in the Tag List to display its data. The data displayed will be updated as the tag data change.



Write Tag Data

Tag View can be used to modify real time tag data. Operation to modify each data item is discussed as follows:



Tag State

Click on a **State** name to modify the state of the tag and press **Write** button.

Tag Date/Time

When any other data field of the selected tag is changed, the **Date/Time** fields of the tag will be updated automatically to reflect the actual date/time the change occurs. To modify the **Date/Time** fields manually, unselect the **Auto** option to stop the automatic date/time update when other data change. Use keyboard to key in the date and/or time in the fields and press **Write** button to modify the **Date/Time** manually. Be sure to activate the **Auto** option by selecting it again to resume the automatic **Date/Time** update function in **Tag View**.

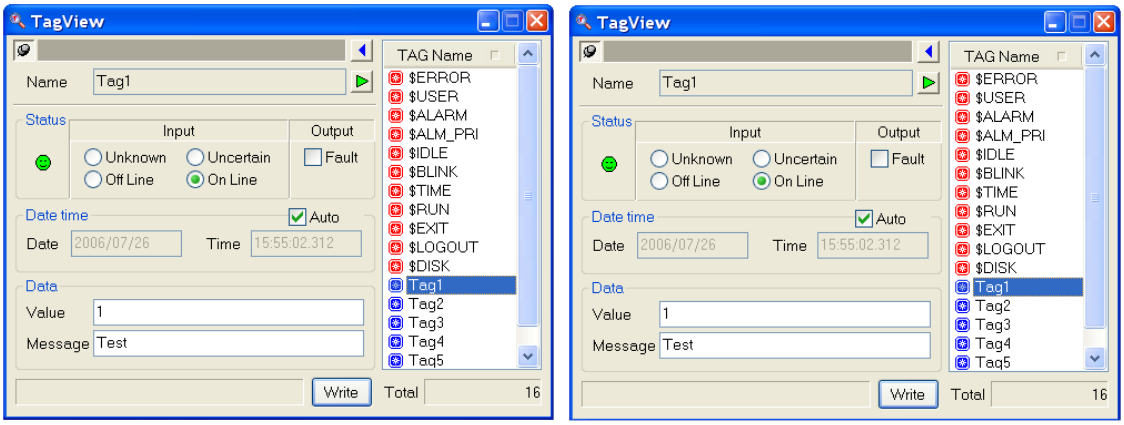
Note: **Auto** setting will only affect the operation in **Tag view**. Change of data by other source (ex. IO scan or object operation) will still update the **Date/Time** disregard this setting.

Tag Content

Click on **Value** or **Message** field and editing cursor will appear to allow editing of the content. Modify the content using keyboard and press **Write** button to change the data.

Isolation

The  button next to the Tag Name field is the **Isolation** button. When the button is pressed down, its shape changes to  . This indicates that the data of the selected tag in **Tag View** is isolated from the actual tag data change of the running project. In other word, the display data will remain unchanged even when the actual tag has changed.

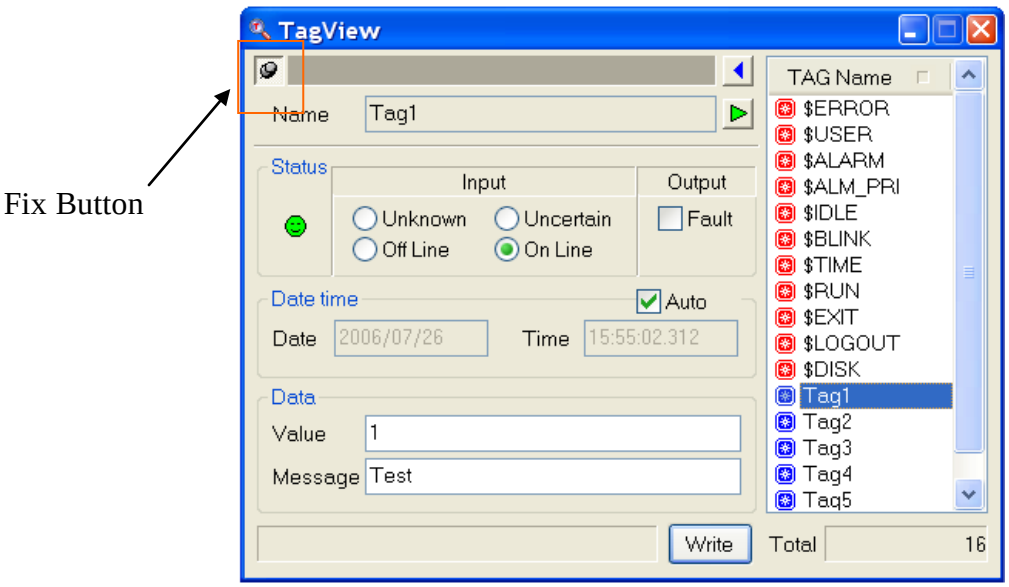


Isolation operation

The need of isolation is based on the reason: Since data displayed in **Tag View** will be updated whenever tag data change, it may changes very quickly in some case. This may cause trouble when user trying to modify the data because the data will be changed again before the editing is finished. By pressing the **Isolation** button, the displayed data will be separated from the tag database and thus stop it from being updated to allow editing.

Select any tag name from the **Tag List** will cancel the isolation setting, and the displayed tag data will start updating as tag data change.

Fix Tag View Window on Top



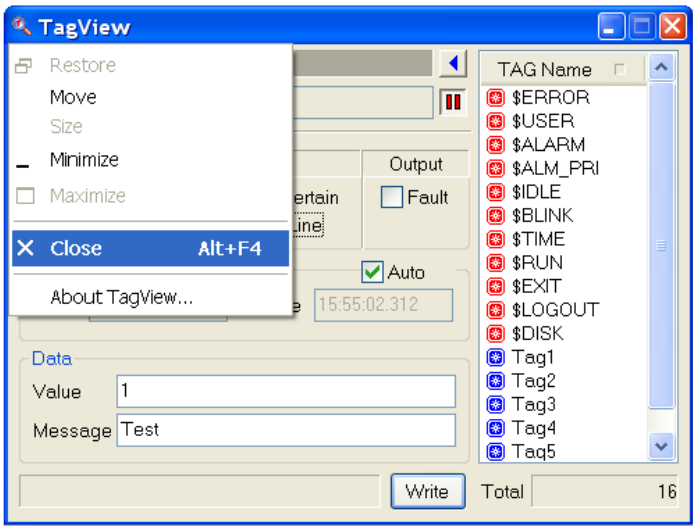
The button on the left top corner of the **Tag View** window is the **Fix** button. When it is pressed, the **Tag View** window is fixed on the top of other windows. This is the default setting when **Tag View** is started.

When using **Tag View** to test a **Lab-LINK** project, it is convenient to let **Tag View** window stays on top of **Lab-LINK** window since you may need to switch between these two windows from time to time. Without this setting, you may often need to use Windows Hot-Key such as <Alt-Tab> to switch between windows.

To cancel this function, Press the again and its shape will change to . The **Tag View** window will be covered by other window if another window is selected. Press the button again to resume the fix-on-top setting of **Tag View** window.

Exit Tag View

Click on the icon on the left top corner of **Tag View** and select **Exit** to close **Tag View**. You can also press the button on the top right corner of Tag View window to exit **Tag View** directly.



Exit Tag View

Chapter 15 Deployment

Introduction

After the configuration and testing of a **Lab-LINK** project, it may need to be deployed to the computer at the site of the control system. Deployment of a Lab-LINK project to a site computer involves two steps: **Installation** and **Deployment**. **Installation** is to install the Lab-LINK system to the site computer. Before the installation of the Lab-LINK system, please make sure the site computer is capable of running Lab-LINK according the requirement discussed in the Installation chapter of this manual. **Deployment** is to copy the entire configured Lab-LINK project from the develop computer to the site computer.

This chapter covers the process of installation and deployment of a Lab-LINK project. Two scenarios are discussed: Single machine and Networked project.

Single Machine Project

1. Install proper version of **Lab-LINK** for Windows on the site computer.
2. Install the keypro on the parallel port or USB port of the site computer.
3. Copy the entire project folder to project folder on the site computer. For example, if a project named Proj1 is to be deployed, the entire folder at path \lablink\project\proj1 on the develop computer needs to be copied into the \lablink\project folder at the site computer. If there are any other files or subfolders not located beneath the project folder used, be sure to copy these files or subfolders to exactly the same location on the site computer to guarantee they match the path description defined in the project and thus can be found when needed.
4. Copy the workstation runtime shortcut from the project folder to the desktop of the site computer. This shortcut is automatically created in the project folder when the project is generated in PAM. The name of the shortcut is ”WorkstationName_Panel” (Ex. \lablink\project\proj1\Wks1_Panel).
5. Run the runtime shortcut of the workstation to start the project on the site computer. The projects setting will be loaded and all the configured function will start.

Network Project

Server Workstation

1. Install proper version of **Lab-LINK** for Windows on the site computer.
2. Install the keypro on the parallel port or USB port of the site computer.
3. Copy the entire project folder to project folder on the site computer. For example, if a project named Proj1 is to be deployed, the entire folder at path \lablink\project\proj1 on the develop computer needs to be copied into the \lablink\project folder at the site computer. If there are any other files or subfolders not located beneath the project folder used, be sure to copy these files or subfolders to exactly the same location on the site computer to guarantee they match the path description defined in the project and thus can be found when needed.
4. Copy the workstation runtime shortcut from the project folder to the desktop of the site computer. This shortcut is automatically created in the project folder when the project is generated in PAM. The name of the shortcut is ”WorkstationName_Panel” (Ex. \lablink\project\proj1\Wks1_Panel).
5. Adjust Windows network setting to satisfy the need of the Lab-LINK project. This may involve sharing of data folder, network security and firewall related setting, etc. The purpose is to provide data files access of the client workstation and to let real time and historical data pass through the network security control such as firewall.
6. Run the runtime shortcut of the workstation to start the project on the site computer. The projects setting will be loaded and all the configured function will start.

Client Workstation

1. Install proper version of **Lab-LINK** for Windows on the site computer.
2. Install the keypro on the parallel port or USB port of the site computer.
3. Copy the entire project folder to project folder on the site computer. For example, if a project named Proj1 is to be deployed, the entire folder at path \lablink\project\proj1 on the develop computer needs to be copied into the \lablink\project folder at the site computer. If there are any other files or subfolders not located beneath the project folder used, be sure to copy these files or subfolders to exactly the same location on the site computer to guarantee they match the path description defined in the project and thus can be found when needed.
4. Copy the workstation runtime shortcut from the project folder to the desktop of the site computer. This shortcut is automatically created in the project folder when the project is generated in PAM. The name of the shortcut is ”WorkstationName_Panel” (Ex.

\lablink\project\proj1\Wks1_Panel).

5. Adjust Windows network setting to satisfy the need of the Lab-LINK project. This may involve the connection with the server workstation to share its data folder, network security and firewall related setting, etc. The purpose is to access data files on the server workstation and to let real time and historical data pass through the network security control such as firewall.
6. Run the runtime shortcut of the workstation to start the project on the site computer. The projects setting will be loaded and all the configured function will start.

Read Only Setting

If a CD-ROM or DVD-ROM is used as the media to transfer a **Lab-LINK** project to the site computer, care should be take since these media will record files and folders with Read-only attribute. Some of the Lab-LINK project files must be writeable for the system to work correctly. For computer running Windows XP, this will not be a issue since the operating system will remove the read only attribute when the files are copied from the CD-ROM/DVD-ROM to the hard disk. However, for computer using Windows 2000, user may need to remove the read only attribute manually.